DEVELOPING CONTROL MECHANISM FOR PROTECTING CUSTOMERS FROM FRAUD RISKS IN RETAIL PETROLEUM BUSINESS IN INDIA

A thesis submitted to the
University of Petroleum and Energy Studies

For the Award of
Doctor of Philosophy
in
Management

By
Harsh Kumar Sachdev

December 2018

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December, 2018

Declaration

I declare that thesis titled as "Developing Control Mechanism for Protecting Customers from Fraud Risks in Retail Petroleum Business in India" has been prepared by me under the guidance of Dr Neeraj Anand, Professor & Head, Department of Transportation, School of Business University of Petroleum & Energy Studies, Dehradun and Dr GK Sharma General Manager(QC), Indian Oil Corporation, Mumbai. No part of this thesis has formed the basis for the award of any Degree or Fellowship previously.

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07.01.2020

Certificate

I certify that Shri Harsh Kumar Sachdev has prepared his thesis entitled "Developing Control Mechanism for Protecting Customers from Fraud Risks in Retail Petroleum Business in India" for the award of PhD Degree of the University of Petroleum & Energy Studies under my guidance. He has carried out the work at Department of Energy Management, School of Business, University of Petroleum & Energy Studies, Dehradun.

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Certificate

I certify that Shri Harsh Kumar Sachdev has prepared his thesis titled as "Developing Control Mechanism for Protecting Customers from Fraud Risks in Retail Petroleum Business in India" for the award of PhD Degree of the University of Petroleum & Energy Studies under my guidance. He has carried out the work at Department of Energy Management, School of Business, University of Petroleum & Energy Studies, Dehradun.

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Abstract

The story of oil is said to be as old as the story of civilization but the earliest recorded reference to petroleum uses in India is described by the great Firdausi, a Persian poet in the epic Shah Nama in which he has described that "Alexander the Great" had used well-built horses each strapped with blazing oil-container during the fight with Porus (Paurava) in 326 BC just to spread panic amongst the war elephants.

In ancient times, India had Natural Gas from the earliest times and example is Jwalamukhi temple near Kangra which is believed to be the manifestation of goddess Durga. However, credit for building the first refinery in Asia perhaps goes to India when the country`s very own first refinery was built in the year 1901 in Digboi.

In the present age, diesel and gasoline (petrol) are the primary fuels (source of energy) for the vehicles. The liquid transport fuels are basically produced in Refineries from crude oil, by employing primary, secondary and tertiary refining techniques. As a result of these refining processes, refineries are able to produce high quality fuels like Bharat Stage BS IV/VI Fuels. For the purpose of this study, fuels are defined as Motor Spirit (MS) (which is known as Petrol in normal language) & High Speed Diesel (HSD) (Diesel in common language). The fuels meeting BS VI specifications are presently available in National Capital Territory of Delhi and are likely to be introduced in the entire country from 1st April 2020.

Total consumption of petroleum products in the country has been 194.6 Million Tons (source PPAC) in the year 2016-17; out of which Public sector oil companies sold equivalent to 77% of all product sales on all India basis.

The volume of MS has been 23.8 million tons in 2016-17 and that of HSD has been 76.0 million tons. In other words, the volume of combined MS & HSD accounts for 51% of all-product-sales in the year 2016-17.

It is estimated that total number of registered vehicles is around 23 crores in India as on 31st March 2016 including 2-3 wheelers**.** The majority of these vehicles run on MS or HSD (excepting few off-road or those vehicles which use alternate fuels like CNG or LPG etc). Therefore, a large population of the country remains affected by the quality and quantity of MS & HSD being delivered at Retail Outlets of Public Sector Petroleum Companies.

There are several reports in the electronic and the print media which suggest that there may be chances of cheating at petrol pumps in India and mostly it is reported that delivery attendants try to distract customers while filling up fuel tanks and then manipulate or reset meter before it hits the ordered value/quantity.

In today`s era, when auto liquid fuels are so expensive, probability of committing frauds by resellers (and / or their representatives) in fuel-delivery to customers is not ruled out. Based on above media reports, there may be general perception in public that customers do not get a fair deal in delivery of Liquid Transport Fuels, namely MS (Motor Spirit) and HSD (High Speed Diesel) at Retail Outlets in Indian Petroleum Industry but it may not be a fact in all cases, though in some cases, it may be true.

Though the existing Government set up (including the Oil companies) does its best to ensure delivery of correct quality and quantity of liquid fuels to customers, general perception of public about wrong doings at ROs is a cause of concern. The researcher thus had the motivation to do this study for addressing the common complaint of perceived fraudulent activities at petroleum Retail outlets as need was felt to study RO activities to identify factors which may lead to “frauds” at ROs, to estimate their impact and to work out the mitigation plan to curb such fraudulent activities.

This is a customer-centric study that analyses the current situation of fuel deliveries from buyer`s point of view and to suggest corrective actions; as end-

objective is to ensure delivery of value for money and to assuage grievances of public at large. Based on extensive Literature Review, Research Gaps are summarized as under:

1. Inadequate research on identification of factors leading to fraud risks at Retail Outlets
2. Inadequate Research on estimating Impact of these identified factors on fraud risks
3. Inadequate research on mitigation whether these can be mitigated through existing control mechanism and if not, what are the remedies and what would be the revised control mechanism.

Overall from the literature review, it has been gathered that there is no structured method for identification of various types of fraudulent activities at Retail Outlets and also whether existing control measures are enough to address the same.

Business Problem is therefore narrowed down to:
"*Perception of Customers regarding frauds/malpractices at retails Outlets & consequent dissatisfaction, inconvenience and financial loss to general Public."*

Since frauds cannot take place unless there is an opportunity to do so, the research problem is therefore defined as under:

"*To Identify factors which act as "opportunities" for causing incidents of frauds at Petroleum Retail Outlets, assessing their impact and how to close such "opportunities" by using an effective control mechanism".*

The Research Questions are under:

i. What are the factors leading to fraud risks at Retail-outlets?
ii. Whether these factors are impacting frauds risks if yes, how much.

iii. What are the controls available to mitigate such risks and whether these are effective enough to cover all types of frauds and related risks at Retail Outlets and proposing remedies.

The study has been conducted for the following Research Objectives:

i. To identify factors leading to fraud risks at Oil PSU Retail Outlets.
ii. To estimate impact of such identified factors on fraud risks.
iii. Document Analysis of these identified fraud risk factors vis-à-vis MDG (Marketing Discipline Guidelines) for proposing a new control mechanism for curbing such fraudulent activities to protect customers` interests at ROs.

Various fraud theories were also studied to understand resellers` behavior and motive because whenever poor quality or service is reported at a Retail outlet, the question normally comes to mind as to why dealerships should commit fraud when they are handsomely paid towards "Dealers` Commission". On going through literature on Fraud psychology, it was learnt that generally greed and dishonesty of individuals forces them to commit frauds but there can be other factors as well. Further, studies have also shown that fraud is not always committed by dishonest people, though it may not look real. This has been explained by Grabosky, P and Duffield, G in their Research paper titled The Psychology of Frauds (2001) published in Crime and Criminal Justice series for Australian Institute of Criminology. Therefore, indulging into fraudulent activities may be due to various reasons for which it is necessary to identify all such factors (leading to this menace) causing inconvenience and the financial loss to the buyers (general public).

Though there are various Fraud theories but being versatile in approach, Fraud Diamond Theory has been adopted for the purpose of this study, which states that following four factors make a person commit fraud in most of the cases:

1. Pressure or Incentive (mostly financial pressure) to commit a fraud.
2. Opportunity to do a fraud by finding a flaw in the control system
3. Rationalisation of actions
4. Capability to do frauds.

For Objective 1, Exploratory Methodology was used in which primary data was generated through Focused Group Discussions (FGD) by inviting Industry Experts and also through a questionnaire to get insights from actual customers visiting ROs for fuel requirements. Informal interviews were also held with select transporters / dealers /customer attendants / District Officials to get further insights. In phase 1 of FGDs, homogeneous groups were made and participants were carefully chosen based on their experience and long stints in overseeing/ handling of Retail Function in different capacities.

Following process was followed for conducting such FGDs:

1. Introductory Session to welcome invitees and briefing them with the purpose of doing this exercise.
2. The invitees were divided in groups and each group was given a distinct topic for discussion with a mandate that at the end of 50-minute period each group will come with a common answer to the problem mentioned in the topic.
3. Having collected information regarding individual topics, the groups were combined for discussions on all topics to arrive at a common answer to the problems mentioned in individual topics.

In FGD (Phase 2), all the factors emerged in phase 1 were sent to next level of Industry Experts drawn from PSU oil companies namely Indian Oil Corporation (IOCL), Hindustan Petroleum (HPCL) and Bharat Petroleum Corporation Ltd (BPCL) through a questionnaire. The feedback received helped in identifying factors which may work as 'opportunities' for resellers to do frauds. Findings of FGDs are on the basis of experience of 168 senior executives of Oil companies. Combined average experience (as per conservative estimates) worked out to 1881 years in the Oil sector. Following factors emerged during FGDs at Retail Outlets (from Oil Companies` perspective)**:**

1. Dispensing Units are tampered with or manipulated to accommodate quantities arising out of adulteration and/or to give short delivery.
2. Resellers take advantage of Customers lack awareness while buying fuel at ROs.
3. Non-payment by dealers to their staff, forcing them to do malpractices
4. Dealers complain of receiving short from Oil Companies
5. Lack of effective Monitoring during night
6. Vehicle Tracking system (VTS) is installed on every tank truck but it is bye passed to avoid detection of diversion from the specified route
7. Road transportation of products from supply point to RO is most vulnerable and unguarded
8. Non-visibility of product to customers at the time of purchase
9. Non-Availability of appropriate platform for "gauging" and "rating" services at Retail outlets
10. Unholy Alliance with OEM vendors
11. Fear among honest officers due to non-availability of mechanism for their protection
12. Fictitious Short Delivery to Dealers
13. Bulk sales to direct customers
14. Action as Transporter vs action as dealer
15. Very low payments or no payments to Tank Truck Crew
16. Additional tank within the premises
17. Un-authorized Tank outside the premises

In addition to FGDs, Customer Survey was also conducted at Retail Outlets to get insights from customer's point of view**.**

The details of survey are as under:

No. of respondents	**504**
ROs covered	84 (>10%)
Type of respondents	Fuel buyers

Coverage	NCR
Method	Manual
Survey period	03/01/2018 to 09/01/2018 & from 01/6/2018 to 03/06/2018
Survey Timings	Day time (08 am to 08pm)

For Customer survey, *Cronbach alpha test* was applied as basic technique to check reliability and for improving the questionnaire. This test is generally used for measuring internal consistency and reliability as it quantifies/ proposes a coefficient which theoretically ranges from 0 to 1. If value of alpha is near 0 then the results are not reliable, and if alpha is close to 1, the answers are quite reliable for results. In this study Cronbach alpha test has given the result of 0.652 which is acceptable.

Factor analysis was then done, which is a method of data reduction. Since there are number of variables, main purpose is to identify most significant factors and hence this was done using SPSS22 tool.

Before doing factor Analysis, sampling adequacy was checked by Kaiser Meyer method which signifies dependency of variables that they are dependent on each other and are correlated. This is a necessary condition to proceed with factor analysis. The sampling adequacy was found to be 0.796 which is acceptable. (below 0.50 it is unacceptable).

With the help of Factor analysis, 7 factors were found with cumulative percentage of total variance of 60.084%. In simple words it implies that the 60.084% of variance is covered and explained by these 7 factors. On applying chi-square test, null hypothesis was accepted in few combinations and was rejected in few others.

For Objective 2, quantitative methodology was used to estimate the impact of Frauds and the related risks by using multinomial logit model, because both fraud and related risks are unordered categorical variables. This has been done using the following equation:

$$ln\frac{\Pr(F_i=K-1)}{\Pr(F_i=K)} = \beta_{k-1}.X_i \quad \ldots(1)$$

$$n\frac{\Pr(R_i=K-1)}{\Pr(R_i=K)} = \beta_{k-1}.X_i \quad \ldots(2)$$

Where, F and R are Fraud and related Risks to be taken as dependent variable in the Equations 1 & 2. Xi for i= 1 to n are factors affecting frauds and related risks.

In this study results have been obtained for 2 dependent variables - 1) adulteration and 2) short-delivery. In this case RRR or relative risk ratio which is the exponentiated value of the multinomial logit coefficient was found out whether this is significant for certain impacting variables or not.

Methodology for Objective 3 was Document analysis which is a systematic procedure for evaluating documents to gain understanding and develop empirical knowledge, has been done for each of the identified variables with Marketing Discipline Guidelines (MDG). After thorough analysis it was observed that MDG Chapter 5 contains details of malpractices and irregularities, and hence chapter 5 was subjected to extensive 'search' by creating list of texts to be explored and by using Microsoft word.

The above document analysis was mixed with "As is" and 'To be" Business Analysis process. While "As-is" process identifies and evaluates the current processes, "To-be" process helps in solving problems and designing processes to achieve outcomes.

Further, "As-is" and "To-be" processes supplement each other in improving business results as "As-is" process defines current status, whereas "To-be" process maps where it should be after the improvement.

By using multinomial logit equation referred above, Impact of identified factors is interpreted at as under:

1. The relative risk of having adulteration relative to no adulteration is likely to increase statistically to 768.02% at 5% significance level when there is lack of effective control system relative to neutral control system.

2. The relative risk of having adulteration relative to no adulteration is likely to increase statistically to 407.40% at 10% significance level when there is insufficient payment made by dealers to their staffs that engages them to irregular activities relative to sufficient wages and payments.

3. The relative risk of having adulteration relative to no adulteration is likely to increase statistically to 1390.37% at 5% significance level when there is Average payment made by dealers to their staffs that engages them to irregular activities relative to sufficient wages and payments.

4. The relative risk of having adulteration relative to negative category is likely to increase statistically to 1126.70% at 1% significance level when there is lack of mechanism to protect honest officers in the system relative to availability of mechanism to protect the same.

5. The relative risk of having adulteration relative to no adulteration is likely to increase statistically to 3642.20% at 5% significance level when there are extra volumes generated in the RO due to adulteration are adjusted by manipulating totalizer readings relative to no such activities done or no adjustment made.

6. The relative risk of having adulteration relative to negative category is likely to increase statistically to 14.22% at 10% significance level when there is neutral action taken against transporter cum dealer relative to no such strict actions taken against transporters as compared to dealer.

7. The relative risk of having short delivery relative to neutral category is likely to increase statistically to 3111.15% at 5% significance level when

there is lack of effective control system relative to neutral regulatory control system.

8. The relative risk of having short delivery relative to neutral category is likely to increase statistically to 936.84% at 1% significance level when there is manipulation in totalizer readings relative to neutral manipulation.

9. The relative risk of having short delivery relative to neutral category is likely to increase statistically to 678.62% at 5% significance level when there is no manipulation relative to manipulations.

10. The relative risk of having short delivery relative to neutral category is likely to increase statistically to 994.79% at 5% significance level when there are unpleasant behavior of Customer attendants relative to neutral behavior of Customer attendants at RO.

The results were subjected to Reliability Tests as reliability is important for measuring the correctness of data. Since data for Objective 1 was primarily generated through Focused Group Discussion by inviting experts from Oil companies along with other stake holders and validity of variables generated in phase 1 was done in phase 2 by another set of experts and hence it does not require another validation. However, for customer responses through the questionnaire, Cronbach alpha test was applied as basic Technique to check reliability (and for improving the questionnaire) as this test is generally used for measuring internal consistency and reliability as it quantifies/ proposes a coefficient which theoretically ranges from 0 to 1. In this study Cronbach alpha test has given the result of 0.652 which is acceptable. Factor analysis was also done using SPSS22 tool and sampling adequacy was checked by Kaiser Meyer method to signify dependency of variables and sampling adequacy was found to be 0.796 which is acceptable. (below 0.50 it is unacceptable). With the help of Factor analysis, 7 factors were found with cumulative percentage of total variance of 60.084%. In simple words it

implies that the 60.084% of variance is covered and explained by these 7 factors.

There are certain limitations of the study:

- Only PSU Retail outlets have been covered as about 77% of MS/HSD retail sales take place at PSU ROs only.
- Study has been conducted in NCR area.
- The survey was done only during daytime.
- Control mechanism can be altered on Industry basis by mutual discussion among oil companies with appropriate approvals at different levels.

The study may generate interest among downstream oil companies, and other Government agencies such as Ministry of Petroleum & Natural Gas, Food and Civil Supplies, Weights and Measures Department, NGOs and various Consumer Forums etc.

Dedication

I dedicate this thesis to my parents Late Shri RK Sachdev (Father) & Smt Chandra Sachdev (Mother) who taught me lessons of life through love and care, and also to Mrs Sangeeta Sachdev (wife), Arushi (Daughter), Chaman (Son-in-law) and Shivam (Son) who have given me strong support in completing journey of this study.

Very importantly, this thesis is also dedicated to Dr Neeraj Anand (Internal Guide), Mr DK Samantray, IAS (Retd), Mr HS Bedi (a Senior colleague and my Mentor) and Dr GK Sharma (External Guide) who have been great inspiration for undertaking this study as topic of my Research.

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I also take this opportunity of expressing sincere thanks to Dr T Joji Rao, Professor and other members of SoB Research Committee for guiding me to do the research on the topic of my interest and providing continuous support in terms of valuable suggestions for betterment of my thesis.

I have no appropriate words to express my gratitude to Dr DN Pandey, Dr Tarun Dhingra, Dr Narendra Dalei and Dr BK Singh for providing meaningful insights to qualitative research and extending help in quantitative data analysis. I am grateful and also thank Dr SK Pokhriyal for his help, support and guidance through out my research study. I owe my deepest gratefulness to Ms Rakhi Ruhal for her continuous support and encouragement, facilitating my research by helping out with a number of administrative issues.

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and for providing meaningful insights and support which was not only helpful but also necessary in completing the research work.

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I would also like to thank Mr Shantanu & Ms Anchal from UPES for their continuous support in carrying out research study and resolving number of other issues. I would like to share my credit of work with Oil company officials who participated in two phases of Focus Group discussions and also with dealers and staff of Retail outlets where Survey was conducted and few transporters who came forward to share their experiences, adding further value to the research work. Acknowledgement will be incomplete without mentioning deep sense of gratitude towards Shri Amarjit Singh, Ms Usha Chandna, Ms Rita Rawat, Mr Sanjay Kumar Prasad, Mr Roshan and others who helped me in completing this study.

Most importantly, none of this would have been possible without love and patience of my family. I express my deep gratitude to my father Late Shri RK Sachdev, my mother Mrs Chandra Sachdev who even at the cost of personal inconvenience and ailments, allowed me to remain focused on my work, my wife Sangeeta who took care of my mother (and my father when he was alive) in my absence, my daughter Arushi & Son-in-law Chaman and my son Shivam who made significant contributions and always stood by me during the period of my absence in family functions. I am also thankful to my brothers Dr AK Sachdev, Shri Jayant Sachdev, my sister Ms Kiran Arora and my niece Ms Mani and her husband Mr Nitin Sharma for their useful support. I also express sincere thanks to Ms Monica and Mr Ketu Shah in providing me research material during my visit to USA when this study was going on.

Chapters

The study consists of seven chapters. The first chapter starts with Introduction including brief outline on occurrence of frauds at retail outlets, history as to how oil was discovered and how it took the centre-stage, post invention of IC (Internal Combustion) Engines - both SI (Spark Ignition) and CI (Compression Ignition) engines and respective principles of their working. The size of MS and HSD market in the country is also discussed in brief in this chapter.

The second chapter discusses functioning of a Retail Outlet including its typical layout and also the working of dispenser pumps. The third chapter discusses about the review of literatures undertaken on the subject, clearly bringing out the gaps in availability of literature that summarizes the fraudulent activities/irregularities at Retail Outlets causing financial harm to the customers. Since public at large may suffer on account of these nefarious activities, there is a greater motivation in pursuing this research and particularly so, when formal study has not been done in the past. Literature review has therefore helped in identifying variables or building blocks for the field work for developing a conceptual framework to help protect customers from fraud risks at Retail Outlets in India.

The fourth chapter covers theoretical premise adopted for achievement of the objective(s) of the study undertaken, as to why fraud takes place. Various theories of fraud have been discussed in this chapter along with most relevant theory pertaining to this study and its reasoning.

The fifth chapter covers the research methodology explaining the rationale of the study; by identifying and establishing the research problem followed by objectives of the study, research questions, the research design and sampling process, data collection, sampling size determination etc.

The sixth chapter discusses analysis and the interpretation of data for identifying the fraud areas due to which customers may suffer at ROs. This

chapter also maps these irregularities with existing regulatory frame work to specifically identify critical areas which are not presently covered in existing control mechanism comprising of Marketing Discipline Guidelines and/or MS/HSD Control Order issued by Ministry of Petroleum and Natural Gas.

The seventh chapter gives the conclusions and recommendations including conceptual Framework for incorporating in the regulatory guidelines for implementation in the field to help protect customers` interests at retail outlets; to create value for money. It also covers directions for future research and further studies, if so required.

Bibliography is given as eighth chapter at the end, covering the references. Appendices have been incorporated thereafter.

Table of Contents

List of Abbreviations

AOC	Assam Oil company
BOC	Burmah Oil company
BIS	Bureau of Indian Standards
BPCL	Bharat Petroleum Corporation Limited
BS	Bharat Stage
CNG	Compressed Natural Gas
FGD	Focused Group Discussion
HPC	Hindustan Petroleum Corporation Limited
HSD	High Speed Diesel
IOCL	Indian Oil Corporation Limited
IPC	Indian Penal Code
KL	Kilo Litres
LPG	Liquefied Petroleum Gas
MDG	Marketing Discipline Guidelines
MS	Motor Spirit
NGO	Non-Governmental Organization
NCR	National Capital Region
NCT	National Capital Territory
OMCs	Oil Marketing Companies
POL	Petroleum Oils and Lubricants
PSU	Public Sector Undertaking
ROs	Retail Outlets
SFO	Serious Fraud Office
SKO	Superior Kerosene Oil
TEL	Tetra-ethyl Lead

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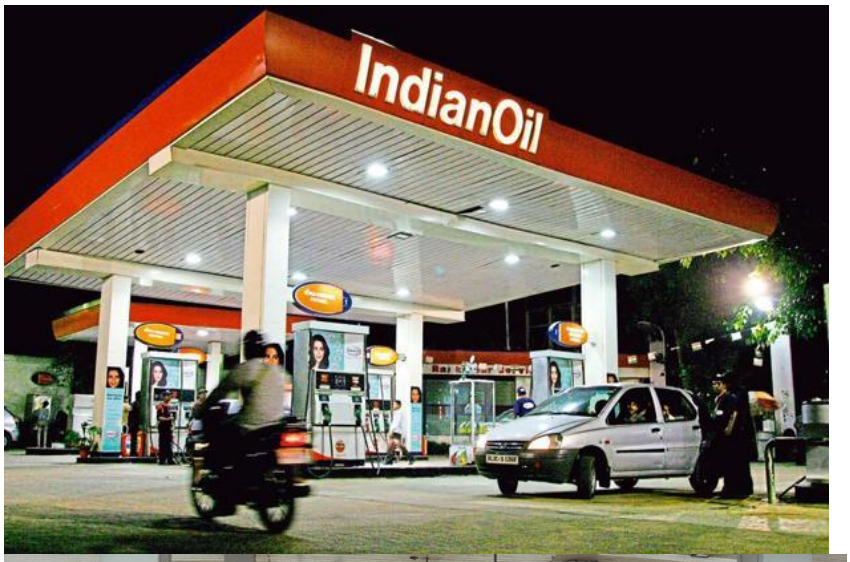
Chapter 1
Introduction


IndianOil


3
Petrol
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1
Petrol
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Pure for Sure

1. Introduction

1.1 Brief Outline of occurrence of petrol pump frauds in India:

There are several reports in the electronic and the print media which suggest that there may be heightened chances of cheating at petrol pumps in India and mostly it is reported that delivery attendants try to distract customers while filling up fuel tanks and then manipulate or reset meter, before it hits the ordered value/quantity.

As per "India Today" Report, which appeared in the edition dated 28th April 2017 *(https://www.indiatoday.in)*, seven petrol pumps in the capital city of one of the large states in the country were found indulging in fraudulent practices with the objective of cheating innocent customers. The law enforcing agencies in this case raided several petrol pumps after receiving the tip off and detained several persons including few pump-owners and their staff working at such unscrupulous petrol pumps. It is alleged that petrol pumps were using a chip-based device which altered the fuel quantity and resulted in delivering less quantity in the fuel tanks, as much as by 5%. The report also quotes that in such cases meters are manipulated to show incorrect readings to deliver less.

Another observation from a customer, registered at India Consumer Complaint forum, an online platform for experience sharing and submitting petrol pump complaints (source:*https://www.consumercomplaints.in/bycompany/petrol-pump-a35999.html*) mentions that in one of the private company petrol pumps, amount specific diesel was being delivered and not in terms of quantity. On being asked the reasons, the owner replied that they sell in rupees and not in litres. On the same web site, another customer has submitted that he got less because delivery attendant did not reset the meter to `zero'.

The online edition, "ET Online" dated 8th Jul 2018 suggests that adulteration or short delivery at petrol pumps is perceived to be a common phenomenon across the country as the capital city of Delhi reported one of the highest number of cases of short-delivery (785 in number) in a span of around 45 months between

April 2014 and December 2017, behind large states Maharashtra (1560) and Uttar Pradesh (913). (Source: *https:// economictimes.indiatimes.com/news/et-explains/you-are-probably-getting–conned-at-the-petrol-pump-but-theres-a-way-to-find-out/articleshow/64895241.cms*)

One of the well-known Chennai-based blogger and entrepreneur experienced cheating at a local petrol pump in Chennai when she caught the pump staff red-handed at a local petrol pump stealing petrol worth significant amount. (source:*https://scroll.in/article/656161/five-ways-petrol-pumps-cheat-you*) (2014).

Based on above reports and other complaints available on line, it is inferred that there are many types of malpractices experienced by customers at petrol pumps across oil companies pan India.

1.2 History of Oil: Ancient India Vs Modern times

BK Bashi writes in his book "*Downstream India: History of Downstream Petroleum Industry*" that story of oil is as old as the story of civilization. However, credit for building the first refinery in Asia perhaps goes to India when the country`s very own first refinery was built in the year 1901 in Digboi. He has described the history of Oil as mentioned in the following paras under this sub-section except otherwise specifically mentioned.

Ancient India and Pre-1900 era*:*

BK Bakshi writes in the above book that ancient Sumerians are said to be inhabiting the fertile valleys between the Tigris and Euphrates Rivers (modern-day southern Iraq) who began building Ziggurats (pyramidal temples) around 2100 BC at Ur, their capital, and became the first human beings to use hydrocarbon in its natural form.

In ancient India, it is said that the bottom of the Great Bath in Mohenjodaro (of the Indus Valley Civilization) was kept water-tight with 2.5 cm thick skin of

Bitumen seal between two layers of bricks (*Bakshi, 2006*). In addition, India had Natural Gas from the earliest times and example is Jwalamukhi temple near Kangra believed to be the manifestation of goddess Durga. But the earliest recorded reference to petroleum uses in India is described by the great Firdausi, a Persian poet in the epic Shah Nama in which he has described that "Alexander the Great" had used well-built horses each strapped with blazing Naphtha container during the fight with Porus (Paurava) in 326 BC just to spread panic amongst the war elephants.

As we all know that wood, coal or cow-dung was commonly used in India as fuel in Kitchen, prior to Oil. Although oil is said to have been used in early human history, it became important over a period of time from commercial point of view though pace of gaining importance was little slow in the initial years. In the month of August 1859, first Oil well was successfully drilled by 'Colonel' Edwin Drake in Pennsylvania; USA with an antediluvian derrick meant for striking water below the surface of the earth and to his pleasant surprise struck oil at the depth of 70 feet. Drake thus became the first man to launch the 'Oil Rush' who set the ball rolling for revolutionizing the economy of the entire world in further course of time.

Mr. Goodenough of McKillop Stewart Company, India drilled a well near Jaypore in 1866 and stuck oil but the production was insufficient and hence project failed. In the meantime, ARTC (Assam Railway & Trading Company) acquired rights for the exploration for approximately 48 square km in the same area. With subsequent efforts and success of striking oil at Digboi in 1889, the venture became a viable proposition for the commercial production of crude oil in Upper Assam. Thus a new chapter began, announcing the birth of oil industry in India.

Due to other developments taking place across the world, resulted in growth for demand for petroleum products at that time. In 1876, four stroke spark Ignition engine was invented by Nicholas Otto, leading to production of cars. This revolutionized the road transportation thereby generating huge demand for petrol

particularly in United States of America as all these developments were taking place in that part of the world. Simultaneously, Kerosene began illuminating houses and streets in cities like Bombay and Calcutta in late 1860s and the product used to be imported from United Kingdom or from United states of America. Though American Kerosene dominated Indian market at that time, small consignments of Russian Kerosene also began coming in 1885 at Indian ports which became substantial and significant from 1886 onwards due to spurt in crude output from Russian oilfields reaching one-million-ton mark. As a result, six thousand tonnes of Russian Kerosene arrived in India and the "very first cargo" brought to Bombay was a complete success and Russians "took a firm hold of the market" thereafter. As a matter of fact, Russian Kerosene was favourably priced primarily because of the short transportation distance as compared to American product, which had a longer lead as it came from a distant location.

Marcus Samuel launched a company called Shell Transport and Trading Company in 1897 in UK. He controlled a Russian product coming from their refineries, in collaboration with the Rothschilds. Earlier in 1892, Marcus Samuel managed to get consent and approval from Suez Canal Administrators for transportation of Kerosene in Bulk as it was meant for illumination under strict regulations. By obtaining this concession, Russian Kerosene became further competitive in comparison to American Kerosene because, the product travelled from Russia to India in 30 days, compared with the transit time of four-and-a half months from America.

In a smart move, Marcus Samuel also obtained a long ten-year commitment for supply of kerosene from the Rothschilds and in very few years, consumption in the six major markets namely Bombay, Calcutta, Hong Kong, Shanghai, Java and Japan had already reached the level of 25 million cases and as a result, Russia achieved a share 50.3% of world production as against 43.5% of United States of America.

During this period of the Russian-American price war, what perhaps turned out to be of far greater importance and significance was the birth of the Royal Dutch Company in 1890 under Henri Deterding.

Another British giant to enter the Indian market was the Burmah Oil Company (BOC) founded in 1886 with a very little capital but with a great determination by "a syndicate of Scotsmen". They majorly operated in Burma, where they operated the first machine-drilled oil-well, and set up two refineries near Rangoon.

The compression ignition (Diesel) engine was invented in 1898.

Assam Oil Company (AOC) had started showing interests in petroleum business in India in 1899 and very soon commissioned a refinery of 500 barrels per day capacity at Digboi in 1901. Thus, Digboi refinery became not only India's first but also the first operating refinery of Asia at that time.

Post 1900 and Pre-Independence period:

In another significant development, famous brothers Wilbur and Orville Wright flew their first aircraft (1903) thus creating demand for Aviation Turbine fuels. Further, Nobel brothers introduced the first diesel-fuelled oil tankers.

With all these technological innovations and developments taking place in USA, Digboi refinery was the first major step in the downstream oil industry in India. Hence it can be said that India was among the front-runner countries to adopt petroleum products as fuel.

The Burmah Oil Company (BOC) arrived in Assam around 1911, BOC purchased all the shares of Assam Railway & Trading Company and took over the Assam Oil Company. By 1901, Burmah Oil's production reached over one million barrels as the company also had access to crude from the Persian Gulf from its interest in British Petroleum (BP).

The Burmah Oil Company was a major player in India as it enjoyed two great advantages – the first, its proximity to the country`s vast potential market and second, the company acquired two Oil tankers (2,000-ton each) for transporting oil from Rangoon to the Indian river ports. The company also built its marketing network and soon expanded its operations to cover entire sub-continent as it enjoyed patronage from the then British Government.

Price wars and the rivalry between the three main competitors – Standard Oil, Asiatic Petroleum and BOC (The Burmah Oil Company) continued and major aspect of price war was the introduction of cheaper and the lower quality Inferior Kerosene in India. The oil companies used this product in cutting into each other's market share. In October 1905, Asiatic and BOC – finally called a truce and came to a market sharing arrangement and signed a product exchange agreement. Standard Oil, however, was left out of this arrangement (Bakshi, 2006).

Indo-Burma Petroleum Company (IBP) was founded in collaboration with Steel Bros in Burma in 1909 by an Indian entrepreneur named Abdul Karim Abdul Shakur Jamal for refining and marketing of petroleum products in the British Empire. The Company (IBP) had built and commissioned two refineries in Burma. They began operations through an office in Calcutta in 1909. In 1942, when the Japanese invaded Burma during the Second World War, the company was forced to suspend its operations and obtained registration in India. Unfortunately, from1901 onwards, little progress was made in India in the field of refining as no new refineries were built till well after Independence, possibly because India did not figure in global strategies, as also because no new major oil resources were discovered in India till then.

Prices and supplies stabilized from 1911 onwards after Abadan became the main source of supply of petroleum products into India and war of business between Royal Dutch and Standard Oil reached both in USA and UK. Since the companies were losing in this game, they decided to join hands and it saw the birth of Burmah Shell Oil Storage & Distributing Company of India with 50:50

partnerships between Burmah Oil Company (BOC) and the Royal Dutch Shell group. It was incorporated as a private limited company on January 6, 1928 in England with its registered office in London. It took over the marketing operations of Burmah Oil Company Limited and the Asiatic Petroleum Company (India) Limited in India. The latter came to be known as Shell Company of India Limited, a wholly-owned subsidiary of Shell Petroleum Company Limited, UK.

Burmah Shell's marketing operations covered the whole of India except for Assam, Manipur and Tripura, an area that was reserved for the Burmah Oil Company (India Trading) Limited, a wholly-owned subsidiary of Burmah Oil Company Limited. The British majors had thus joined hands and synergized to pool in their considerable individual strengths.

The need for co-operation between the oil majors was recognized by them, especially at a time when there were major oil discoveries in the Middle Eastern countries of Bahrain, Kuwait and Saudi Arabia, whose uncontrolled production would have proved a recurring source of instability in world oil markets resulting in frequent price-cutting wars. Consequently, Deterding invited Walter C. Teagle, President of Standard Oil, and Sir John Cadman, Chairman of Anglo-Persian, to his castle at Achnacarry in Scotland. An agreement was reached around August 1928 and was termed as ""Achnacarry Agreement" that laid the foundation for control and command over the world of oil outside the USSR by the oil majors (Bakshi, 2006). Through this agreement, the oil companies evolved seven principles to govern group action lending credibility to the Seven Sisters, consisting of Gulf Oil (now part of Chevron), Anglo Iranian Oil Company (Now BP), Oil Company of California (SoCal–now Chevron), Royal Dutch Shell, Standard Oil Company of New Jersey, Standard Oil Company of New York and Texaco (later merged into Chevron). Being called a 'Cartel' later, they controlled 85% of crude oil production, 75% of refining in the world outside USSR and maintained peace through controlled production and fixing of prices over the next half century, or even more. In 1901, the Asiatic Petroleum Company entered the Indian markets to be replaced by Burmah Shell in 1928,

while Caltex started their operations in 1937 by taking over the business of Texas Company (India) Limited.

Kerosene and Motor Spirit was initially sold in packs. In most markets, they were sold along with other items of trade, as no petrol or service stations existed. As the demand for the products grew, barrels replaced the jerry cans. It was in the late 1920s that manually operated pumps with underground tanks were installed at a few locations and with this the trend for installing automotive fuel retailing stations began. This led to the introduction of tank-trucks. In 1930s, a few fuel retail outlets were built with driveways facing the roads.

Hence it can be said that Oil Industry evolved in India in early part of 20th century when Superior Kerosene Oil (SKO) dealerships were opened in the country by the Oil Industry. Shortly thereafter, petroleum business began to prosper and it expanded with a great speed.

1947 onwards:

At the time of India's Independence, companies that were marketing petroleum products in India were: Burmah Oil Company (India Trading)/ Assam Oil Company, Standard Vacuum (Stanvac which later became Esso), Caltex, Burmah-Shell and IBP (Indo-Burma Petroleum Company).

Digboi produced only less than 10% of the country's requirements, the balance of more than 90% of India's oil growing needs of POL (Petroleum Oils and Lubes) were met by products imported from the sources owned by the multinationals operating in India. As a result, international oil majors (part of the Seven Sisters) overwhelmingly controlled oil industry in India in 1947 (at the time of country`s Independence).

In June 1947, the Government of India invited the co-operation of the oil companies operating in India through the Lawson Committee for establishing two small refineries at Vishakhapatnam and Bombay or other suitable ports.

However, the concerned oil companies expressed their doubts regarding economic feasibility of erecting small refineries.

The cartel operated by seven sisters as referred in the foregoing was challenged in 1959 by a similar association of the oil-producing Middle East countries in the form of Organization of Petroleum Exporting Countries (OPEC). While this group (or OPEC) failed to achieve success over the next decade and a half, during and after the Arab-Israel War of October 1973, price initiatives was passed on to the OPEC nations. As has been said earlier, seven sisters controlled around 85% of petroleum Reserves of the world, prior to Oil crisis happened in 1973. But soon thereafter oil dominance shifted to production and pricing understanding controlled by OPEC and other state-owned national oil and gas companies of oil producing and emerging- economies, such as "Saudi Aramco", "China National Petroleum Corporation", "Gazprom" (Russia, "Petrobas" (Brazil), "PDVSA" (Venezuela), and "Petronas" (Malaysia). In 2007, these companies were called as "new seven sisters".

At the time of India`s Independence, oil companies had started marketing of dominant automotive fuels like MS (Motor Spirit) and HSD (High Speed Diesel). Private oil companies like Caltex, Esso and Burmah-Shell had developed the reseller network. Indian Oil Company was formed as a public sector company for doing petroleum business in 1959, to write a new chapter in Indian Oil history. Five years later, its Refineries and Marketing functions were merged in 1964, and a new entity with the name of Indian Oil Corporation Limited (IOCL) was born. Subsequently, the companies ESSO, Caltex and Burmah-Shell were nationalised in the 1970s and the concept of petroleum business through public sector oil companies came into being, to witness growth and prosperity in this sector.

The World Oil consumption has witnessed growth of 30% during the period from 1990 to 2008 – up from 67 mbpd (million barrel per day) to 86 mbpd. However, consumption in India during the same period doubled and that in China, tripled *(Yergin, 2010*).

Thus Indian petroleum market has undergone a change over the years – from being fully controlled by International players at the time of Independence to domestic Indian companies being top players now. *India Brand Equity Foundation (IBEF), 2013* depicts the current competitive landscape and major players in the following figures:

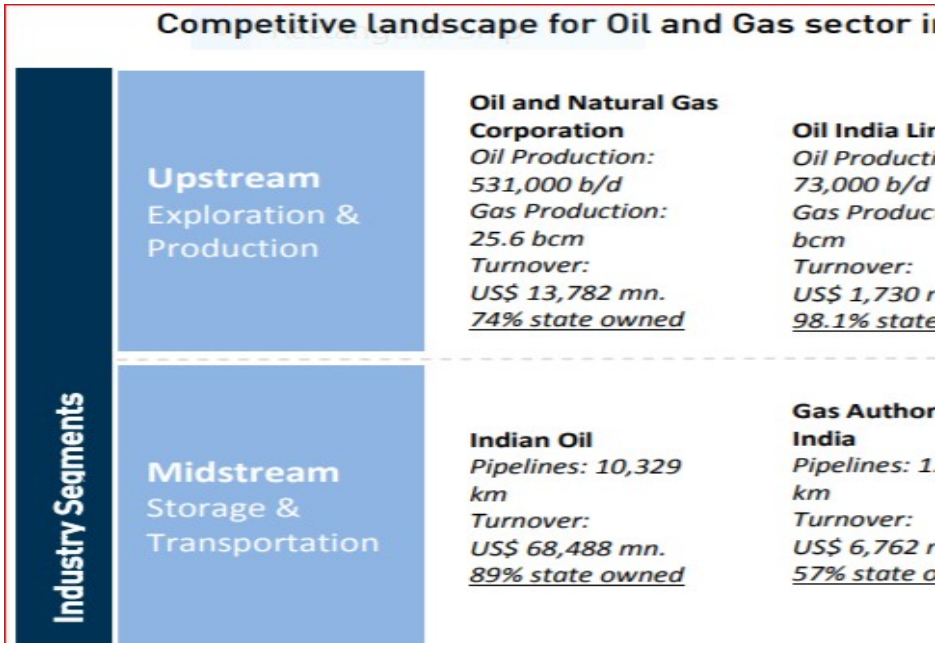

Fig. 1.1: Top Players in Oil and Gas sector in India

(Source : India Brand Equity Foundation (IBEF) (https://www.ibef.org/download/Oil-Gas-Sector-040213.pdf))

1.2.1 Developments in the field of Quality Upgradation of MS & HSD:

As per the inputs from Auto-Fuel Policy 2015 and Bureau of Indian Standards (BIS) Specifications of MS and HSD and Editions of IS 1460 & IS 2796 during the period from 1995 to 2017, there have been significant improvements in the development of specifications for automotive fuels in India. Today, there is an increasing demand for quality up gradation of automotive fuels for engines that are improving at a tremendous pace and they demand fuel of a very high degree of intrinsic quality. The Government quality control regulations against atmospheric pollution in the interests of environment protection have compelled the Bureau of Indian Standards (BIS) to draft a string of stringent specifications.

Vehicular emissions are produced as a result of a combination of several factors such as outdated vehicle engine technology, poor fuel quality, poor vehicle design, poor maintenance coupled with bad driving habits and various other factors. It is the tail pipe emissions and not the fuel itself that affects ambient air. Hence only the right combination of fuel and engine technology, meeting the prescribed vehicular emission norms was acceptable from the environment protection point of view. In addition, the very rapid increase in both spark ignition engines running on MS and compression ignition engines using HSD have made vehicular emission and consequential pollution an increasingly important issue.

The present trend in MS and HSD specifications is to match US and Euro norms and to accelerate improvements in fuel quality standards. As expected, future Indian specifications of Diesel and Motor Spirit have added parameters for further tightening and reducing the content of Sulphur, Benzene and Lead. To cope up with the future Euro equivalent of long term stringent specification, oil companies are gearing up and have taken the challenge to meet additional fuel quality parameters as per the schedule fixed by the Government of India by adopting advance process technology, stringent quality planning and automated systems of testing.

Petroleum Sector companies embarked upon a major quality improvement program and chalked out a time-bound schedule for supply of higher quality of MS throughout the country in a phased manner, in line with global trends which was also in line with the directives issued by the Ministry of Environment and Forests (MOE&F), As a sequel to this, Bharat Stage fuels were introduced in India from 2000 onwards in stages starting with BS II (equivalent to Euro II norms) which was available through-out India since April 2005. Further BS-III fuels were available throughout India from Apr-2010 and BS-IV fuels are available throughout India since Apr-2017. BS VI fuels will be available in the entire country from 01.04.2020 onwards.

The historical evolvement of BIS specifications and upgradation for key parameters and road map for introduction of "Green-fuels" in India are as follows:

1.2.2 MS Specification / Upgradation

- The BIS specification for MS was first published in 1964 vide Indian Standard code IS 2796 covering MS of 83 Octane rating only (Bakshi, 2006). Another variant – 93 Octane MS was added vide first revision of this Standard in June 1971. Thereafter, the first major change took place in November 1984 when the Rating of Octane Number (RON) of regular MS was amended from 83 to 87 in order to meet the requirements of the latest high-compression-ratio cars such as Maruti being manufactured in the country.

- Thereafter, second revision of BIS Standard came in 1995 when Anti-Knock Index (AKI) i.e. RON+MON/2, was additionally incorporated to indicate the Octane Rating. In this revision, Sulphur content was also reduced from 0.25% to 0.20% mass max. In addition, specifications like existent and potential gum, Vapour Liquid Index (VLI), limits for blending of Oxygenates and Water tolerance limit for alcohol blends were also introduced.

- In the year 1995, the Government of India decided that all new cars be equipped with catalytic converters, to help convert un-burnt gases such as Carbon Monoxide (CO) to the harmless Carbon Dioxide (CO_2) and the explosive and dangerous Hydrogen (H_2) to steam and water (H_2O) (Bakshi, 2006).

- The introduction of catalytic converters demanded almost lead-free MS because leaded MS could make the catalytic converters dysfunctional. This led to tremendous pressure to eliminate the addition of poisonous Tetra-ethyl Lead (TEL) to MS and to produce lead-free MS. This was a very welcome step not only from the point of protecting catalytic converters but also in eliminating a major hazardous operation of handling Lead at the refinery end. The new

specification required the lowering of Sulphur content of unleaded MS and was accordingly amended from 0.20 to 0.15% mass max in March 1997.

Based on emission considerations, major changes in MS specification were notified by the Ministry of Environment and Forest by their Gazette Notification No. GSR/176 (E) dated April, 2, 1996. The notification specified further reduction of Lead in MS from a max, of 0.56 to max of 0.15 g/1 of lead by December 31, 1996, for the entire country. Further it required the marketing of only Lead Free MS in Metros by April 1, 1995 and in the State capital, Union Territories, major cities by 1st of December 1998 and by April, 2000 in the entire country. For the first time, Benzene limits were set in MS of 5% volume max for the entire country and 3% volume, max for the four Metros & were achieved by the year 2000.

1.2.3 Lead Content

In order to meet the lead limits, Catalytic Reforming Units have already been set up and commissioned wherever necessary such as at IndianOil's Barauni, Digboi and Mathura Refineries. The production and supply of Unleaded MS was accomplished as given below:

a. Supply of low Lead MS with Lead content of 0.15 g/1 max. (against the earlier limit of 0.56 g/1) in the four metros i.e. Delhi, Mumbai, Kolkata and Chennai with effect from June 16, 1994 and in the Taj trapezium from 1 September, 1995 and throughout the country from December 31, 1996.

   Supply of Unleaded MS was introduced at selected outlets for use in cars with catalytic converters, in four metros and Taj trapezium, from 1 April, 1995, and for use in all other state capitals and Union Territories and major cities from June 1, 1998.

   Exclusive Supply of Unleaded MS was introduced in NCR from January 1, 1999, in Mumbai from October 2, 1999 and in the entire country from February 1, 2000.

b. The refineries made necessary changes in the MS blending pattern and modified mode of operations to meet the Benzene limit of 3 % vol. max. for the entire country and 1 % volume max for Euro-III petrol.

c. As regards Sulphur content, the MS produced in the country was meeting 500 ppm and 150 ppm as per BS-II and BS-III specifications respectively and further 50 ppm for MS as per BS-IV norms.

d. New limits with regard to aromatics, olefins content in MS were also incorporated in BS-III petrol specification.

In addition to the above, various other improvements have been accomplished since 1st of April 2000. Investments of about Rs. 3,000 crores have been made for the above petrol quality improvement.

1.2.4 HSD Specification / Upgradation

The BIS specification *(IS 1460*) for HSD was first published in 1959 and subsequently revised in 1968 and amended in 1971. The second revision was done in 1974 during which two grades of diesel were identified as HSD and LDO in place of grade A and B respectively. The cetane number of HSD was reduced from 45 to 42, and the flash point was reduced from 55^0 C to 38^0 C to enable the maximization of middle distillates in the country. Also total sediment content was incorporated as a new specification in order to keep control on the oxidation stability of HSD.

In 1980, the second revision was amended to incorporate the Cold Filter Plugging Point (CFPP) specification. In 1981, the flash point of Naval Grade Diesel was amended to 66^0 C minimum. In 1985, the flash point of HSD was further reduced from 38^0C to 32^0C again to increase indigenous production of HSD in order to minimize imports.

Dissatisfaction among large HSD consumers like the State Transport undertakings was brewing over the years on the Sulphur content of the HSD being supplied to them. For example, while GSRTC received its Diesel from the Koyali Refinery with practically no Sulphur content, on the other hand MSRTC received HSD either from Mumbai refineries or imported Diesel, both of which had a high Sulphur content. Market pressures were building upon for lowering the Sulphur content and raising the Cetane number.

The third revision of BIS specification of HSD was made in 1995 during which the Cetane number was again raised back from 42 to 45. The specification with regard to total Acidity, Carbon number and Viscosity were also revised upwards and the density specification (820-880) was introduced.

Based on emission norms, major changes in HSD specifications was notified by MOE&F vide Gazette Notification No. GSR/176 (E) dated April 2, 1996. The notification laid down drastic reduction of Sulphur content from 1.0% mass to 0.25% mass in phases so that 0.5 % mass to be achieved by 1 April, 1996 in the Metros and Taj trapezium; and 0.25 % mass by September 1, 1996 in Taj trapezium and 0.25 % mass was to be achieved by April 1, 1999 for the entire country.

The notification further specified increase in Cetane number from 45 to 48 to be obtained by December 31, 1998 by all refineries (except North East refineries at Digboi, Guwahati and BRPL). The existing distillation recovery specification of 90% volume minimum recovery at 366^0C was revised to 85 % of volume recovery at 350^0C maximum and 95 % volume at 370^0C maximum. The density specification was also revised from 820-880 to 820-860.

Major Quality Improvement program was initiated by petroleum sector companies to keep pace with global trend and in line government directives. The oil companies therefore formulated a time-bound phase-wise program for supply of desired quality of HSD to cover supplies in the entire country.

1.2.5 Low Sulphur HSD

The first step in this regard undertaken by the Petroleum Sector was in respect of lowering the Sulphur content in HSD and production of extra low Sulphur HSD. During the combustion process, Sulphur compounds in the diesel burn to form acidic by-products such as SO_2 and SO_3 which combining with moisture produces corrosive sulphurous oxides and Sulphuric Acids respectively and increases the burden of particulate matter in the exhaust. Reduction of Sulphur content in HSD was essential to reduce emission of particulates and the spreading of acid from the exhaust. In order to meet sulphur limits, Diesel Hydro De-sulphurisation Units (DHDS) have already been set up and commissioned at nine refineries. Modification of these units was again done to further bring down the Sulphur content.

The production and supply of low and extra low sulphur HSD has been successfully accomplished as given below:

- Supply of low Sulphur HSD with 0.5 % mass Sulphur (brought down from the earlier level of 1.0 %) in four Metros and Taj trapezium from April 1, 1996. Supply of extra low Sulphur HSD with 0.25 % mass Sulphur in Taj trapezium from 1st of September 1996, inside Delhi from August 15, 1997, entire Delhi, Mumbai, Kolkata and /Chennai from 1 April, 1998 and the entire country from January 1, 2000.

- Bharat Stage-II Diesel was made available across the country with 0.05% sulphur from Apr-2005 and BS-III fuel with 0.035% sulphur was available throughout India from Apr-2010. BS-IV HSD with 0.005% or 50 ppm Sulphur is available throughout India since Apr-2017. BS VI product with 10 ppm Sulphur content will be available in the entire country from 01.04.2020 onwards.

1.2.6 Cetane Number

The Cetane number of HSD was increased from 42 to 45 in 1995 and further raised to 48 in 2000. In this regard, the refineries processing Assam crude and other low Sulphur imported crudes, produces streams with low Cetane rating.

The cracked gas oil from Coker, Cycle oil from the FCCU and some of the straight run gas oil required further treatment to increase the Cetane number. Already Hydro-treaters have been installed at IndianOil's refineries at Digboi, Guwahati, and Barauni to meet this requirement.

While BS-IV fuels (both MS and HSD) are being currently supplied, product of BS VI grade with Sulphur content of < 10 ppm (parts per million) has been introduced in NCT (National Capital Territory) wef 1st April 2018 and extended to NCR (National Capital Region) from 1st April 2019 which will be supplied in the entire country from 1st April 2020 (as per mandate given by the Government) jumping from BS IV to BS VI norms. Oil companies have therefore implemented major programs for up-gradation of petrol and diesel quality in the past few years and they are continuing to do so to meet government`s expectations to reduce the pollution due to vehicle emissions.

1.3 Functioning of Internal Combustion Engines (ICE):

We all know that Combustion is basically 'burning' of mixture of air and fuel to release energy through the basic chemical process. In an IC (Internal Combustion) engine, the ignition first takes place followed by combustion and both these processes occur within the engine itself. The engine then partially converts the energy from the combustion to work. The engine is made of a moving piston and a fixed cylinder (*Energy.Gov, 2013*). The gas expands due to combustion and pushes the piston to rotate the crankshaft. Ultimately, it drives the vehicle through a system of gears in the power train.

There are two types of IC (internal combustion) engines: the gasoline (or petrol) operated SI (spark ignition) engine and the diesel operated CI (compression ignition) engine. While it can be a two stroke engine but mostly it is a four-stroke engine which means that four distinct piston strokes are needed to complete a cycle of processes from intake to exhaust. These processes include intake, compression, combustion & power stroke and exhaust. Both these types i.e. SI (Spark ignition) and CI (compression ignition) engines differ from each other the way they supply and ignite the fuel. In a spark ignition engine operated by petrol,

the air-fuel mixture is inducted into the cylinder during the intake process and it is compressed through the piston. The spark ignites the compressed mixture, resulting in combustion and expansion of gases, to push the piston during the power stroke. In a CI diesel engine, the process is different that only air (not the fuel-air mixture) is inducted into the engine and then compressed. Fuel is then separately sprayed into the hot compressed air at a measured rate, causing it to ignite. Research and development has progressed well in last 30-40 years to help reducing emission norms, particularly of pollutants such as nitrogen oxides (NOx) and particulate matter (PM) by 99% or above. It has also resulted in fuel efficiency and rate of acceleration to give improved fuel economy.

1.4 World and Indian Oil Scenario:

The primary energy consumption is increasing year after year. The consumption by fuel is shown below in MTOE (Source – *BP Statistical Review of World Energy, 2018):*

Table 1.1 : Primary Energy consumption : India and World (MTOE) in 2017 vs 2016

S.No.	Fuel	Consumption(MTOE)			
		2016		2017	
		World	India	World	India
1	Oil	4557	217	4622	222
2	Natural Gas	3073	44	3156	47
3	Coal	3706	406	3732	424
4	NE (Nuclear Energy)	591	9	596	9
5	HE (Hydro-Electricity)	913	29	919	31
6	Renewables	417	18	487	22
7	Total	13257	723	13512	755

(Source: BP Statistical Review of World Energy, 2018)

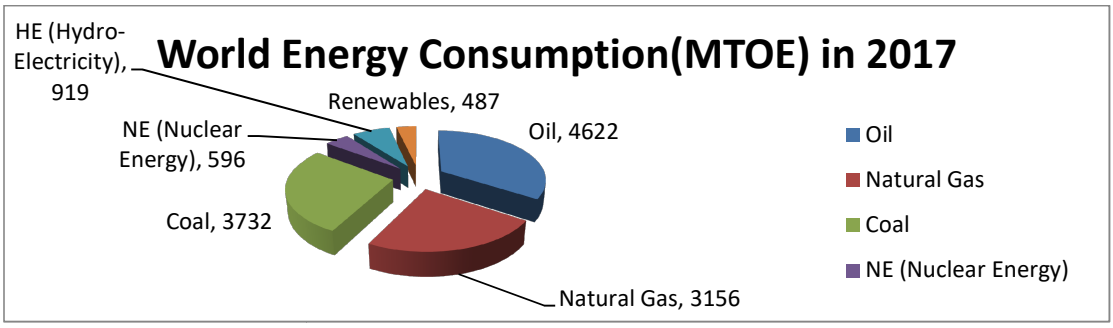

Fig. 1.2: Global Consumption of Energy in 2017 (MTOE)

(Source: BP Statistical Review of World Energy, 2018)

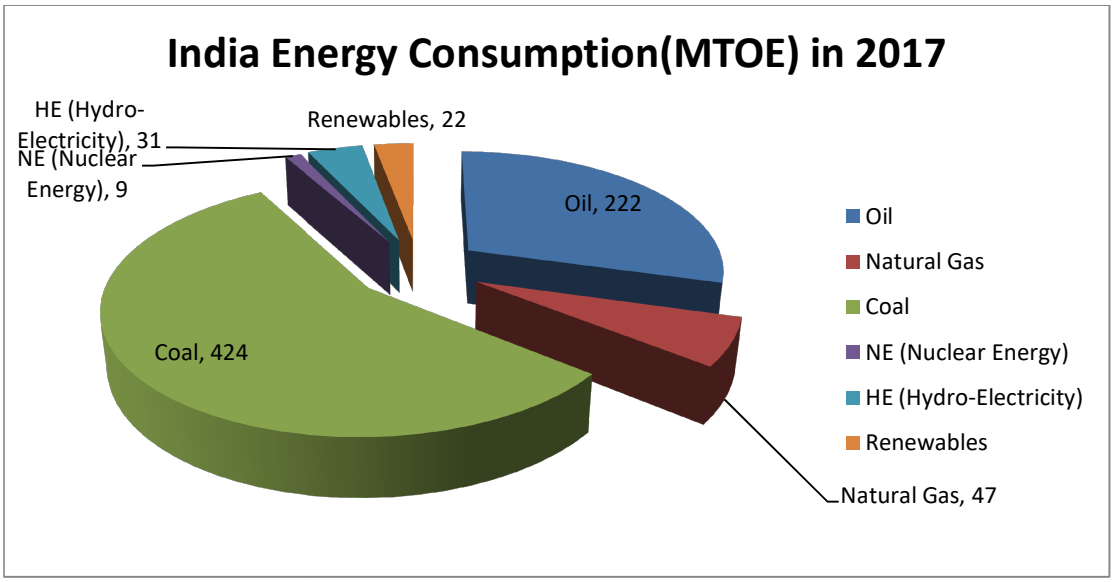

Fig. 1.3: *India's Consumption of Energy in 2017 (MTOE)*

(Source: BP Statistical Review of World Energy, 2018)

- Indigenous crude production in India in 2016-17 was 36.0 MMT. Crude oil imports, POL imports and exports were 213.9 MMT, 36.3 MMT and 65.5 MMT respectively in 2016-17 (*Source PPAC*).
- Total Refining capacity was 234.0 MMTPA as on 1.4.2017. Total crude processed from the 23 refineries was 245MMT in 2016-17 with total production of various petroleum products being 243.5 MMT. (*Source PPAC*).

- The consumption of Oil (petroleum products) is considered to drive the economic growth and it helps in maintaining wellbeing of any Nation (*Saanjaana Rahman, 2018)* and that one of the major drivers of GDP is the Oil consumption. Based on consumption figures of petroleum products in India in 2016-17 (*source PPAC- Petroleum Planning and Analysis Cell*), products MS & HSD account for over 51 % of all petroleum product sales in the country.

- It is estimated that total number of registered vehicles is around 23 crores in India as on 31st March 2016 including 2-3 wheelers. *(http://mospi.nic.in/statistical-year-book-india/2018/189, 2018*). Hence a large population consumes these products and remains affected by standard parameters of fuel products being delivered at Retail Outlets (ROs) of different Petroleum Companies. In the present age, these fuels are so expensive (*Kojima R. B., 2006*) and therefore it is important that customers get right quality and right quantity at Retail Outlets.

- In 2013-14, Petroleum Planning and Analysis Cell (PPAC) under Ministry of Petroleum got an All India Study conducted through M/s Nielsen (India) Pvt Ltd on sales volumes of Petrol and Diesel in the country. Source: **(***Nielsen, 2014)*,

- As per the report dated 28th Jan 2014 submitted by this Agency to PPAC, transport sector alone consumes about 99.6% of Petrol and 70% of diesel sales volumes in the country.

- Goa is the most petrol consuming state in India on per capita basis as its per capita consumption is 6 times of National average (source: *The Economic Times, 17th Jul 2018*) and 2 wheelers are the highest consumers of petrol in the country with 61.42% of total petrol sales volumes whereas the, cars use approximately 34% of total sales volumes (source: *The Economic Times, 29th Jan 2014).*

- In some of the states like Rajasthan, Bihar and Odisha, petrol consumption by 2 wheelers exceeds 72% (*Nielsen, 2014*) of the total sales volumes in the respective states.

- Diesel consumption is mainly in the following sectors apart from Transport Sector (*Nielsen, 2014)*:
    i) Agriculture – like Thrashers, Tractors, Pumping Sets etc.
    ii) Power Generation (DG sets)
    iii) Industrial Applications other than for DG sets
    iv) 'Others' – any other application not included in the above.

1.4 Explaining Fraud Risks at Petroleum Retail Outlets in Indian Context:

For the sake of convenience and easy understanding, possibility of extra profits to re-sellers in 4 metros namely Chennai, Delhi, Kolkata and Mumbai (in alphabetical order) has been discussed in this section, even with minor manipulation of 1% both in terms of quality and quantity which will throw light on the magnitude of the problem (in case it happens), considering size of business in our country.

The information hosted on website *https://iocl.com* indicates that Retail price of MS in Chennai was Rs 76.48 per litre as on 01.04.2018 and that of HSD in the same city was Rs 68.12 per litre on the same date.

Based on researcher`s study and understanding, assuming that a Retail Outlet in the city of Chennai is selling 5000 litres of MS and 95000 litres of HSD per month. These volumes are considered as 'average' sales volumes in rural markets based on discussions and interaction with many pump owners, transporters, company officials and others during the course of this study. Adulteration of even 1% in both the products (if carried out) will result in extra volumes of 50 litres of MS and 950 litres of HSD which would yield extra profit of 50 (litres) X 76.48 (price of MS) {= 3824} + 950 (litres) X 68.12 (price of

HSD) {= 64714} = Rs 68538 per month. The cost of 'adulterant' will have to be deducted from this amount to arrive at actual additional profit arising out of adulteration. The adulterants may vary from kerosene to solvents of different price structures (*Parivesh, Transport Fuel Adulteration, 2003),* but assuming the adulterant to be kerosene, cost of adulterant will work out to be 1000 litre (50+950) X 13.60 (kerosene price in Chennai as on 01.04.2018) = Rs 13600 and hence net additional profit in the entire operation works out to Rs 68538 – Rs 13600= Rs 54938 per month. This is the amount, by assuming that no discount is available and no other expenses are incurred by adulterator in sourcing the adulterants. The annual additional profit thus may work out to Rs 54938 X12= Rs 659256 per annum towards the extra profit, over and above the normal dealer commission which the seller is legally entitled to, by doing manipulation (if any) in quality of product.

Now, let us discuss quantity issues. Assuming a short delivery of 10 ml in a litre (1%), additional extra profit due to short measure will work out as follows:

MS: 50 litres X Rs 76.48= 3824
HSD: 950 litres X Rs 68.12= 64714
Total: 3824+64714= Rs 68538 per month or Rs 822456 per annum
There will not be any deduction in this case as no sourcing of adulterant is involved now. Therefore, combined additional extra profit due to adulteration (manipulation in quality) and short delivery (manipulation in quantity) will be Rs 659256+822456= Rs 1481712 per annum.

Similar calculations can also be done for other 3 metros. The corresponding details regarding selling price of individual products, selling price of Kerosene in these metros is shared in tables 1.2, 1.4 and 1.5 whereas table 1.3 gives details of number of ROs each oil company has on all India basis.

a. Current Retail prices of MS & HSD in four Metros is as under:

Table 1.2: Retail Price Structure in Metro Towns as on 01.04.2018

S.NO.	Metro	MS Retail Price (Rs/Lit)	HSD Retail Price (Rs/Lit)
1	Chennai	76.48	68.12
2	Delhi	73.73	64.58
3	Kolkata	76.44	67.27
4	Mumbai	81.59	68.77

(Source: https://iocl.com)

Oil Company wise number of Retail Outlets along with their MS & HSD Retail Sales is tabulated below:

Table 1.3: Oil Company-wise number of Retail Outlets as per MOP&NG Annual Report

Oil Company	No. of Retail Outlets
IOC	26212
BPC	14225
HPC	14628
Total PSUs	55065

(Source: MOP&NG Annual Report 2017-18)

b. Retail outlet business may be vulnerable as manipulation in stocks will yield extra profit to the dealers and/or their representatives. It is found through calculations that dealers/ their representatives can earn significant profits by doing stock manipulation even to the extent of 1%. Assuming average sales of 100 Kilo Litre (KL) MS and 100 KL HSD per month at a particular Retail Outlet, extra profits by short delivery manipulation has been explained in Table 1.4 and by adulteration has been explained in Table 1.5 below:

Table 1.4: Extra Profit margins through short delivery

S. No.	Metro	Rate of MS as on 01.04.2018 Rs/Lit	Rate of HSD as on 01.04.2018 Rs/Lit	Extra Profit in Rs in 1 KL MS Rs/Lit	Extra Profit in Rs in 1 KL HSD	Combined Extra Profit in Rs 1 KL MS & HSD each
1	Chennai	76.48	68.12	76480	68120	144600
2	Delhi	73.73	64.58	73730	64580	138310
3	Kolkata	76.44	67.27	76440	67270	143710
4	Mumbai	81.59	68.77	81590	68770	150360

Table 1.5: Extra Profit margins through adulteration

S. No.	Metro	Rate of MS as on 01st Apr 18 (Rs/lit)	Rate of HSD as on 01st Apr 18 (Rs/lit)	Rate of Kero (SKO) as on 01st Apr 18 (Rs/lit)	Diff in rate MS Vs SKO (Rs/lit)	Diff in rate HSD Vs SKO (Rs/lit)	Extra Profit in Rs in 1000 lit (1 KL) MS	Extra Profit in Rs in 1 KL HSD	Combined Extra Profit in Rs1 KL MS&HSD each
1	Chennai	76.48	68.12	13.60*	62.88	54.52	62880	54520	117400
2	Delhi	73.73	64.58	Kerosene Free State					
3	Kolkata	76.44	67.27	26.30*	50.14	40.97	50140	40970	91110
4	Mumbai	81.59	68.77	23.96*	57.63	44.81	57630	44810	102440

*Kerosene prices in respective metros as on 01.04.2018 as per iocl website.

The following two quotes from the famous book "who Moved My Cheese" authored by Spencer Johnson, very aptly depict the current situation and learnings as under (Johnson, 1998):

"smell the cheese often, so you know when it is getting old" to denote that system needs to be checked to see if there are problems in it and "If you do not Change, you can become extinct" represents the fact that if timely action is not taken to correct the situation, it may be too late and system will start harming the society.

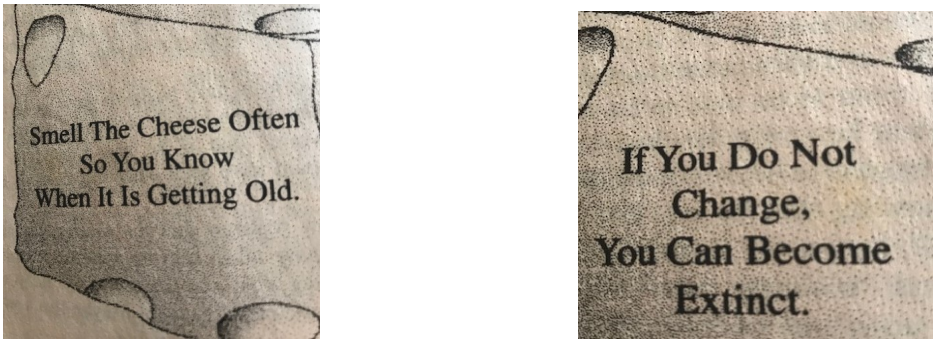

Fig. 1.4: Famous Quotes
(Source: The famous book, 'Who Moved my Cheese' by Spencer Johnson)

1.5 Control Mechanism:

a. As per *Motor Spirit & High Speed Diesel (Regulation of supply, Distribution & Prevention of Malpractice) Order 2005*, broad categories of malpractices at Retail Outlets are as under:

(i) Adulteration
(ii) Stock variation
(iii) Pilferage
(iv) Unauthorized Purchase
(v) Unauthorized Exchange
(vi) Unauthorized possession
(vii) Unauthorized sale
(viii) Over - charging
(ix) Sale of off - specification product
(x) Short Delivery

b. *Marketing Discipline Guidelines (MDG) – 2013*, issued by Ministry of Petroleum & Natural Gas prescribe the delivery norms as under for the dealers:

- The dealers will be responsible for checking delivery on daily basis and will also ensure that Weights & Measures certification for the unit is valid. In case W&M / totalizer seals are found tampered, sales would be immediately suspended from concerned dispensing unit and this unit will not be further operated until re-calibration is done again and seals replaced.
- It is mandatory for Dealers to keep a standard 5 litre Measure exclusively for customers to check delivery, if they want to, and the measure will be duly verified by the Weights & Measures Department.
- The measures used for dispensing bulk lube oil in Retail Outlets at the pump island will be necessarily stamped by Weights & Measures Department before put to use.
- As per MDG, responsibility for ensuring correct supply of fuel to customers all the time has been entrusted with the dealers. It has further been directed in MDG that nozzles of the Dispensing units should be

checked for the correct delivery on daily basis by dealers before commencement of sales. This is done with the help of a 5 litre Measure.

1.6 Motivation / Need for Research:

Diesel and gasoline are the primary source of energy for vehicles ever since automotive were invented in the 19th century (*Wikipedia)*. Currently, many other fuels like CNG, biodiesel, LPG, alcohol, methanol, etc. are also emerging as alternate to MS & HSD and some of them are environmentally and commercially viable. The auto liquid fuels are basically manufactured in Refineries from crude oil. In today`s refineries, there are distillation/ fractionation process and also various secondary and tertiary processes i.e. Vis-Breaking, reforming, Catalytic Cracking, and Hydrogenation etc. are employed to enhance extraction. These modern refining techniques help refineries in producing high quality fuels BS IV/VI Fuels (MS & HSD defined later in the section). Fuel quality coupled with technologically improved engine complement each other to achieve restraint in emissions.

India consumed a total of 184.7 million tons of petroleum products in 2015-16. Total share out of Products MS & HSD comes to nearly 52 % of all product sales. In the year 2016-17, total consumption of petroleum products in the country was 194.6 Million Tons (*source PPAC*); including 23.8 million tons of MS and 76.0 million tons for HSD. In other words, the combined volume of these products was 51% of all-product-sales in the year 2016-17. The Public sector oil companies sold equivalent to 77% of All India sales in 2016-17.

The further analysis of above data (done by the researcher) reveals that 85.6 % of HSD and 99.5% MS was sold in Retail in the year 2016-17. Since major volume of combined MS & HSD is sold in Retail, a large population therefore remains affected, the way these products are sold in the country. Since Public Sector Undertakings (PSUs) i.e. Indian Oil Corporation, Hindustan Petroleum Corporation & Bharat Petroleum Corporation are selling the major share of these products under various rules and regulations introduced by Government; hence

this study is primarily carried out at the retail outlets under the control of these PSUs and Private Oil Companies are not considered for this research work.

Petroleum products are expensive in today`s scenario. Hence probability of committing fraud by resellers (and / or their staff) may be significant because of obvious reasons of financial benefits involved. Hence it is important to understand various kinds of fraudulent activities and malpractices that may be happening at some ROs. It is also important to understand whether these frauds and malpractices can be effectively handled by existing control mechanism or whether there is a need for amendment & improvement in the same, to ensure delivery of "value for money" to the customers. The products under reference are MS and HSD including premium brands like XTRAPREMIUM and XTRAMILE (from IOC), Power & Turbo (from HPC) and Speed (from BPC).

The quality of products like MS and HSD is governed by Codes, specifications & standards, laid down in different countries and so is in India. These specifications which are nationally enforceable, prescribe the minimum quality that must be supplied. In India, Bureau of Indian Standards (BIS) notifies the requisite specifications for petrol and diesel. BIS specifications for diesel & gasoline that are being implemented all over the country in line with emission norms specified in the road map, issued by expert committee on auto fuels. With effect from April 2017, BS IV fuels have been introduced all over the country (*Economic Times, Oct 24 2018*). BS VI products are being supplied in NCT wef 1st April 2018 (*Economic Times, Sept 30 2019*). Upgraded product (meeting BS VI norms) is also being supplied in majority of NCR wef 1st Oct 2019. The entire country is likely to be switched over to BS VI grade fuels wef 1st April 2020.

Sale of MS & HSD which is a large volume affects a very large population of the country. In view of reports in print and electronic media about cheating at ROs, a systematic study in this field is considered necessary.

Comprehensive literature survey was done and also by doing web search, it is found that no systematic research has been done for identification of fraud risk areas other than those covered in existing control mechanism. Since there is no previous research, all types of malpractices and frauds are not systematically

identified & consolidated at one place for devising the appropriate control mechanism. Hence, this research is aimed at identifying and compiling different types of the malpractices, irregularities & frauds which may be currently prevailing at Petrol stations and for suggesting appropriate control mechanism for improving quality & quantity of liquid transport fuels delivered at Retail outlets in the country. This study may help in prevention of those specific factors which actually may be leading to fraudulent activities in the current scenario.

In fact, just to get a sense of magnitude of problem, it may be mentioned that *Centre for Science and Environment (CSE), New Delhi* submitted a Report on fuel quality at fuel dispensing stations, oil depots and tank lorries. This report mentions that dealers may be earning huge profits (more than Rs 25000 per day) by indulging in up to 15% adulteration with Naphtha. Other fraudulent activities like short delivery etc. may end up giving further incentives – unethically and illegally.

In a paper titled as "*Fuel adulteration Consequences in India: A Review*" it has been estimated that financial loss to the national exchequer because of adulteration may be roughly Rs. 10,000 crores annually. If social costs are further added, it may work out to be much more (*Gawande & Kaware, 2013*).

However, it may also be noted that these malpractices, irregularities or frauds are not committed everywhere or all the times, but fraud risk analysis is considered necessary for mitigating the same by improvising the control mechanism.

The products (MS & HSD) are mainly handled in three stages as depicted below:

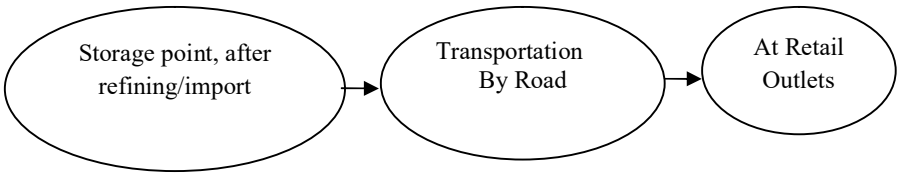

Fig. 1.5: Stages of Product Handling
(Own Source)

There are enough controls available to maintain quality and quantity at storage points as handling at this stage is in the hands of Oil company officials.

However, product handling during transportation and at Retail Outlets is not done by the employees of oil companies and is therefore handled mostly by private transporters and dealers respectively and their representatives. The Oil Company officials and other Government Agencies have the responsibility of doing regular inspections of Retail Outlets to maintain quality and quantity standards and hence it can be inferred that product handling at Retail Outlet stage is not completely unguarded. However, product handling during transportation is seldom-checked en-route and therefore has the potential to become the most vulnerable in entire chain of activities.

Being associated with a common cause, this study may generate interest among downstream oil companies, and other Government agencies such as Ministry of Petroleum & Natural Gas, Food and Civil Supplies, Weights and Measures Department, NGOs and various Consumer Forums etc.

Chapter 2

Functioning at a Retail Outlet and the Fuel Dispenser

2. Functioning at retail outlet and the fuel dispenser

2.1 Retail Outlet:

The Website www.businessdictionary.com defines a Retail Outlet as a store for selling smaller volumes and quantities to public in general by adopting a business model of buying goods directly from original manufacturers on discounted rates in Bulk and selling the same in Retail to end customers, at a price higher than cost price. (*businessdictionary.com, 2019*). During the journey of doing this study, the researcher had the opportunity of visiting sizeable number of retail outlets of all leading oil companies. A schematic diagram of a typical petroleum retail outlet is given below in Fig 2.1

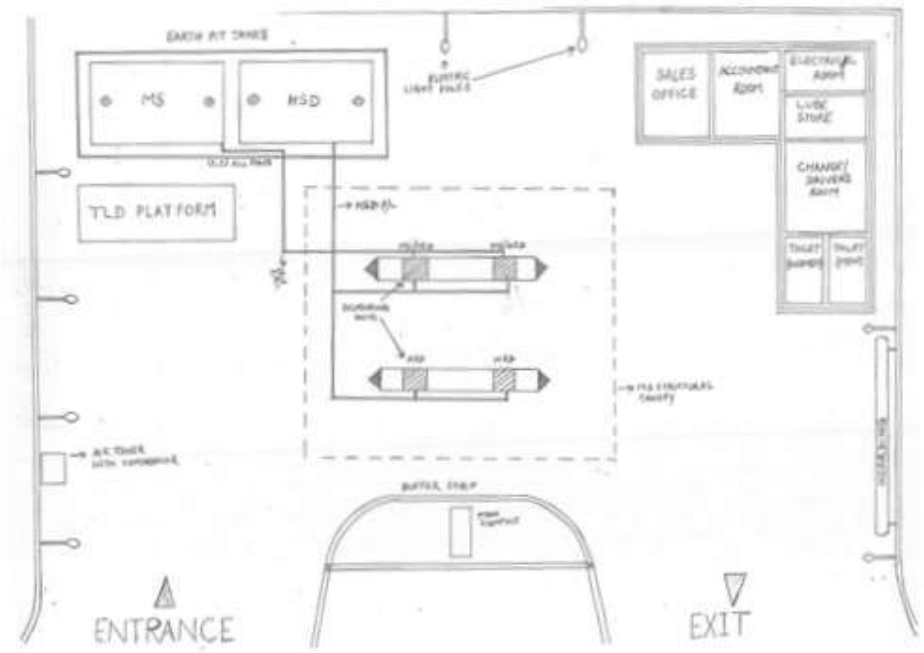

Fig. 2.1: Schematic diagram of a Typical layout of a retail outlet
(Own source)

Based on researcher`s interaction with Retail Outlet dealers and their staff, the following has been gathered but it may differ from place to place:

1. A typical retail Outlet has a Sales room in which all the sales related activities - such as interaction with Customers, addressing their grievances, if any, maintaining sales

and quality related records such as density register, Daily Sales record (DSR), Inspection reports, invoices for all receipts etc. are kept. The sales building is also used for CCTV monitoring of the RO premises and for doing Sales Promotion activities. In the present era of modernization, automation infrastructure is also housed in the Sales building. The dealer also sits in sales building but in few bigger sites his/her office is in a separate room.

2. There is another Accountant Room which is mainly manned by staff working at retail outlet, in which they issue sales invoices towards products sold, and they also maintain record of inventory in this room. The indenting to the supply point and criticality of stock position is also examined on day to day basis for giving report to the owners. All repair and maintenance issues are handled from this room only. All the sales accounting activities such as Stock inputs, stock outgo on account of issuing Invoices, proper record of Inspection Reports & various statutory activities in terms of both quality and quantity take place at Accountant Room.

3. Lubricant Store – This is a relatively smaller room as compared to sales and accountant rooms and it is mainly used for storing various grades of lubricants to be sold fro retail outlet. Since number of grades is normally very high, inventory of lubricants is also managed from this room. It also stores allied stocks like Battery water, some spares for emergency and other related material.

4. Earth Pit or masonry pit tanks- For storing different products, storage tanks are lowered in the pits at Retail outlets. These pits can be earth pit or masonry pit. Masonry pit is made of bricks with cement plastering inside. In an earth pit, concrete base is provided before lowering the tank. These tanks store liquid petroleum products i.e. MS and HSD or their other variants.

5. Air Compressor Shed- Air Compressor installed at Air Shed is used to provide Free Air service to all the customers. There are some innovations these days when all the four wheels of a four wheeler can be simultaneously serviced.

6. Hoarding- Hoardings are used at medium to brand various sales promotion scheme as well as Brand promotion by the means of Flex and Vinyl based advertisements.

7. Electrical Room- Electrical Room houses DG set/ Inverter for power backup as well as Electrical Panel which controls all the Electrical Operations of the RO such as DU operation, Air compressor Operations, RO lightning etc.

8. Canopy- It is the permanent steel structure provided at the RO which provides shade to the customers catered by the RO to protect them from rains or from sun in summers. Also the canopy houses LED lightning used to provide necessary illumination for RO operations at night time.

At a petroleum Retail Outlet in India (which is also known as 'petrol pump' in commonwealth countries or 'gas pump' in North American countries or 'bowser' in Australia), petrol or gasoline, diesel and other types of fuels are dispensed into vehicles through dispensing machines (*Wikipedia*). These Fuel Dispensing Units have other applications as these are also used for pumping liquid fuels from storage tanks and vessels to aircrafts, loose containers or another storage point, besides vehicles (*Engineering360, 2015*). However, at a Retail outlet these units may be single nozzle units or it can be multi-nozzle dispensing pumps, depending upon the sales volumes and infrastructure available.

There are various sections in a typical dispensing unit but mainly these include metering unit, hydraulic unit, hose-pipe whose length depends on type of operation and the nozzle, through which product is actually delivered to the fuel tank or storage. Hydraulic section is used to draw fuel from storage tank using a rotary pump and the product flows through one-way valve to ensure that movement of product is only towards the nozzle and not backward towards the tank (*Engineering360, 2015*).

A dispensing unit can be a light duty machine for delivering petrol or a heavy duty machine to deliver diesel. The flow-rate of a typical light duty machine is 50 litres per minute and that of a heavy duty machine is 130 litres per minute (Wikipedia).

2.2. Functioning of Fuel Dispensing System

We will understand here major components of various types of fuel dispensing systems and their purpose along with functioning of these major components.

In modern times, dispensing unit has two main parts, comprising of an electronic console containing a computer to register and control all actions including display system of the unit and its communication with internal sales recording system. The second part is the mechanical system comprising of pumping unit with an electric motor, valves, pulsars and meters to record measurement of quantities. This is a self-contained unit sometimes submersible inside the fuel tank, mostly in hotter countries or where distance between pump and storage tank is longer than what the system can manage (*Wikipedia)*.

We will discuss these functions in detail in the following paras.

As already mentioned, Fuel-delivery units (called as Dispensing Units) are designed in such a manner that they measure and deliver correctly as per quantities of fuel products desired by customers and also register such quantities for future reference for records. A dispensing unit in the modern times looks elegant and exciting, consisting of a metal cabinet with height of around 8 feet and back-lit price and volume display armed with either a single dispensing hose pipe or multiple number of hose pipes and corresponding number of nozzles at the end. There are few buttons in the dispensing units to do certain activities and it also has a “card reader” and a “display screen” etc. While external appearance is attractive, it is complex structure inside combining dispenser hydraulic, mechanical and electronic systems as these parts are having series of components with grid of wiring, tubing, gears, and linkages to perform various functions (*team-bhp.com, 2015*).

The Dispensing Unit system performs many functions which are inter-related. It has several components out of which few components are used to maintain liquid continuity, to ensure and regulate flow-direction and the fluid pressure.

Other components may be used for pressurizing and moving the fuel through the system, registering the quantity delivered in the metering unit and accordingly computing the total price of product delivered. Of course, some other components are designed to perform other functions like switching it off and on, resetting the "Zero" and the price display, thereby regulating delivery, etc.

Since customer is supposed to pay for cost of motor fuel, it is essential that air or/and fuel vapours are prevented from entering the metering device so that air/vapour quantities are not measured/charged. To avoid vapours or gases entering the fuel filling system, the pipelines and dispenser must remain filled with fuel continuously, all the times. This is accomplished through a check valve which is a simple automatic valve. In schematic drawing shown in Figure 2.2 it can be seen that when fuel enters the valve inlet under pressure, it pushes the valve off its seat against the resistance of a spring and the pressure of liquid on the opposite side, the valve is opened, allowing liquid to flow through the valve in the direction of the arrows. When the source of pressure difference ceases, flow will discontinue, and the force of the spring will reseat the valve, preventing liquid from flowing through the valve in the opposite direction.

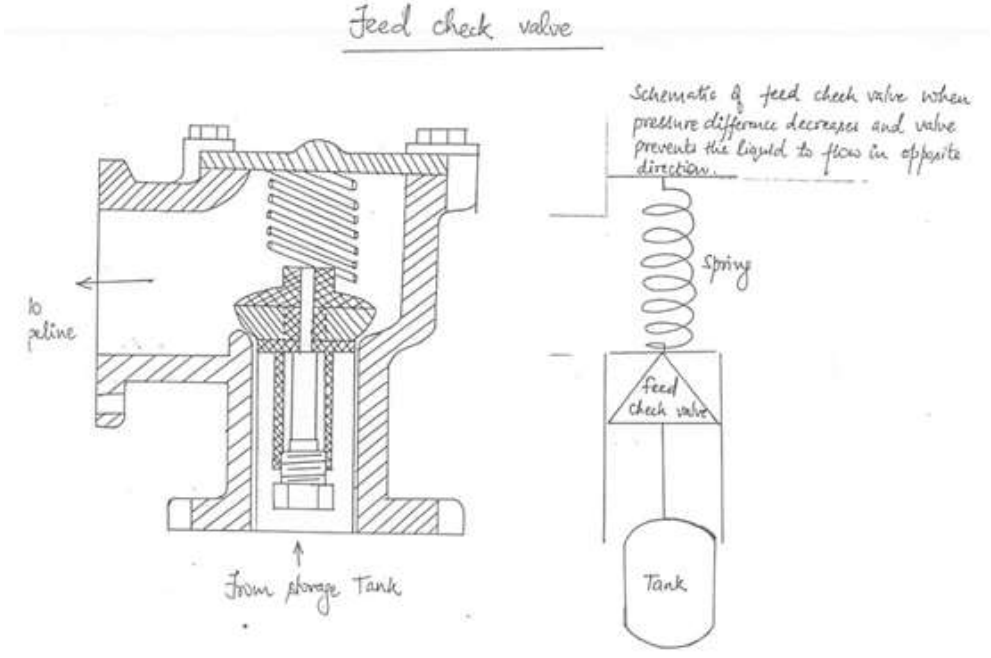

Fig. 2.2: Check Valve – a Schematic diagram (S*ource: team-bhp.com)*

In a dispensing unit system, return flow is stopped through a check valve which ensures unidirectional fuel of the fuel from hose pipe towards the nozzle. A check valve is positioned close to the outlet between the storage tank and the dispenser (as shown in Figure 2.3).

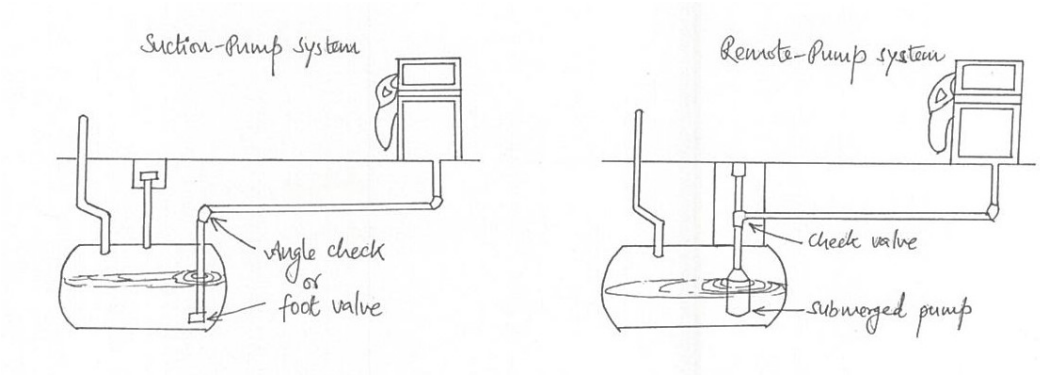

Fig. 2.3: Schematic diagram showing location of Check Valve
(Source: team-bhp.com)

As we proceed through the system, there are other automatic valves that operate in the same manner as check valves, to maintain direction of flow or liquid pressure of the fuel towards the meter and discharge nozzle. Similar valves located in the system prevent fuel from draining from the discharge hose, assuring delivery of the metered quantity of fuel.

2.2.1 Pressurizing the fuel and moving

The dispensing units are designed in a manner that pressure is generated through a pump (motor-driven) which pushes liquid-fuel from storage tank to the dispensing machine, through the meter to the discharge in the vehicle tank using hose and nozzle. These can be of two basic types - a self-contained unit or a remotely operated pump system. Mostly, it is remote pump systems which are also used for installation of larger multiple dispensers.

2.2.2 Self-contained Systems

In self-contained systems, the dispenser system itself houses the pumping unit inside the dispenser, with major components being a pumping unit with an electric motor, air eliminator system and the valves to regulate the flow of liquids.

Mostly, in a self-contained unit the pump, air eliminator, valves, and flow passages are all enclosed in a single casing, as in Figure 2.4. The electric motor is separate, and drives the pump by means of a belt and pulleys.

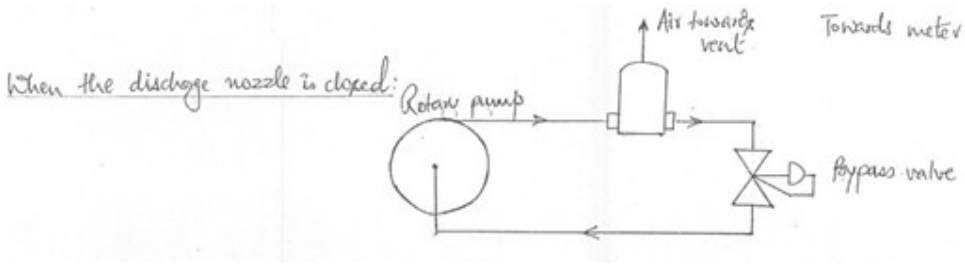

Fig. 2.4: Sketch showing Self-contained Pumping Unit and *Motor*
(Source: team-bhp.com)

When the dispenser unit is switched "on", the electric motor gets activated to turn rotary-vane pump, which propels fuel forward. It creates partial vacuum at the pump inlet due to displacement of the liquid- fig 2.5.

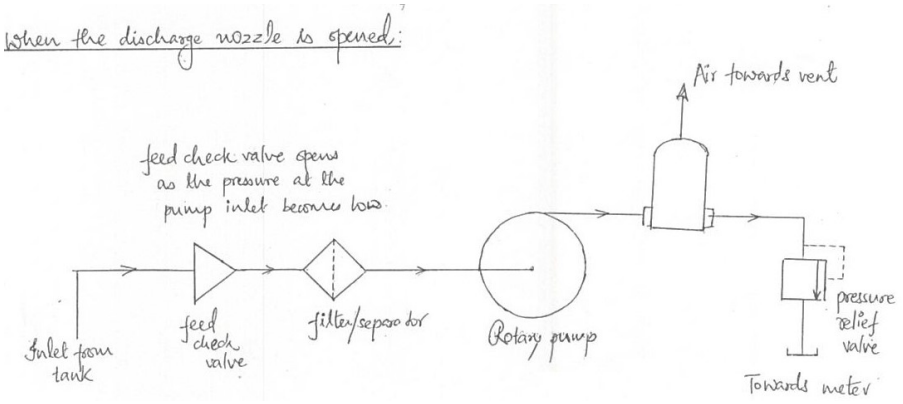

Fig. 2.5: Flow diagram of Typical Self-contained Pumping unit
(Source: team-bhp.com)

At the time when discharge through nozzle is closed, fuel keeps on circulating in the unit and the vacuum so generated is relieved. As soon as the machine is switched on, nozzle gets opened and the suction pressure is transferred instantaneously to the storage tank through the pipeline. Due to atmospheric pressure on the surface of the fuel, it forces the fuel to flow through the inlet pipe/check valve towards the dispenser. As the flow enters the pumping unit, solid impurities, if any are removed through a strainer or the filter inside the unit, which is drawn into the pump inlet.

For the accuracy of product quantity to be delivered it is important that air which might have remained trapped and the vapours are removed before the fuel passes through the metering device. This is done in the air separator chamber as its shape forces the fuel to swirl and as a result, air and vapours with a small amount of liquid fuel, are pushed into the atmospheric chamber. Here the fuel settles down at the bottom at atmospheric pressure. It allows mixture of air and vapour to rise to the top portion of the chamber and to leave through the vent. The liquid fuel continues to accumulate at the bottom which raises the float, thereby opening a valve and allowing it to flow back to the inlet of the pumping unit. It is to be noted here that heavy flow rate affects vapour recovery system which is installed to control emission of vapours into atmosphere and it also helps in controlling evaporation losses of products (*Wikipedia*).

At the same time, the fuel quantity passes from the chamber in which air and vapours are removed, to flow in the single direction through the automatic control valve, to move only in the direction of the meter, without returning towards the pump. It also regulates the fuel pressure as it leaves the pumping unit and it enters metering unit, by closing when pressure on both sides has equalized preventing excess pressure from building in the meter and hose.

The control valve also has a built-in relief valve, which normally operates only when the dispenser is shut off. It relieves excess pressure caused by expansion of fuel on the discharge side of the valve by allowing a small amount to pass back through an orifice in the centre of the control valve into the air separator chamber, where pressure can be relieved into the atmospheric chamber if necessary. The relief valve is very important, especially in warm-weather climates, because fuel expands when heated, and this expansion could raise pressure sufficiently to cause seals to fail, resulting in fuel leaks, or even burst the discharge hose if not relieved.

When the pump is operating (unit is switched “on”) but the nozzle is closed, the control valve also gets closed as soon as pressure is equalized as resulting increase in pressure opens the bypass valve, permitting fuel to flow back to the

pump inlet, thus relieving suction pressure and preventing additional fuel from being drawn from the storage tank.

2.2.3 Remote pump (or remote dispenser) Systems

In this type of system, liquid is pressurized and pushed towards the nozzle through a pumping unit. The pumping system comprises of a motor and pump with discharge head, an emergency shut-off valve and a control valve. These valves are located at dispensers with pumping unit located near the storage tank

In remote dispenser units, the pumping unit (rotary vane pump) is positioned at the top of storage facilities. However, in most of the cases, remote systems use submerged pump and as its name suggests, the motor and the pumping assembly are submerged in the fuel in the storage tank (Figure 2.6).

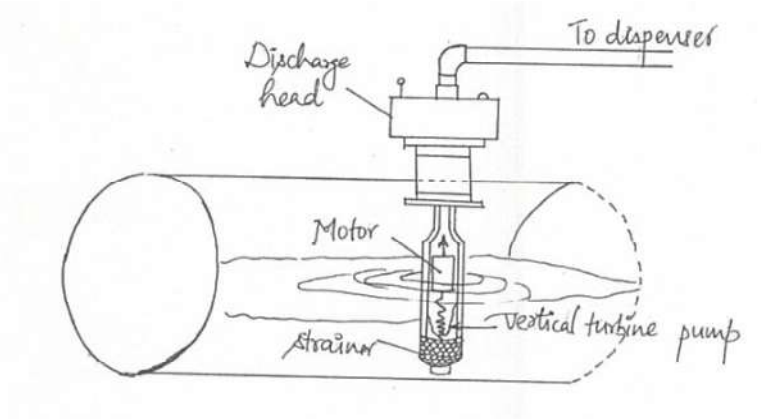

Fig. 2.6: Schematic diagram showing Submerged Pump and Discharge Head
(Source: team-bhp.com)

The check valve as well as the air separator unit is located inside the discharge head and air eliminator removes trapped air and the vapour. In the process, a little quantity of fuel is also separated as explained earlier.

Quite often, multiple dispensers are served by the same pumping unit in this type of remote systems. When any of the dispensers is switched on, the pumping unit is activated thereby pressurising all the pipelines connected to it (24-28 psi for a typical unit). There is a control valve in each dispenser to prevent discharge from all the dispensers. This control valve is not automatic as in self-contained system, but it is actuated by the machine “on-off” switch or otherwise it is controlled by the computer system of the dispensing unit.

There is piston and a cylinder to operate the control valve along with a spring. Further, a “filter” or “strainer” positioned at the valve inlet traps solid contaminants in the fuel before it enters the valve. When valve is opened by retracting the piston, it allows the product to flow towards the meter. When piston is seated, valve gets closed and product stops passing through (the valve).

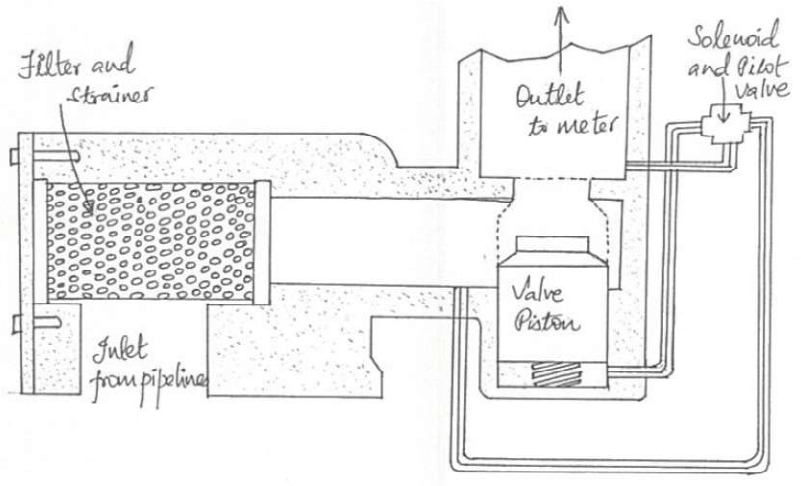

Fig. 2.7: Schematic diagram showing Remote Dispenser Control Valve
(Source: team-bhp.com)

2.2.4 Multi-product Dispensers

In the present age, dispensers at most of the urban retail outlets are of the multi-product type from which multiple nozzles of same or different products extrude to do refuelling. The machine cannot be operated simultaneously from both sides as delivery of only one product is possible from each side of the unit at a time. But proper care has to be taken for special requirements of flushing the line before taking samples for different products.

2.2.5 Metering and Price-Computing

There are two functions which are performed, one, the metering of product delivered and two, computing the price of product supplied. In both types of dispensing units (self-contained and remote pumps), pressurized fuel flows through a meter to measure the quantity of fuel as it is leaving the nozzle for being delivered in the fuel tank of vehicle. The metering device is connected to a

computer inside the unit to compute the price of product so delivered. Mechanical linkages are used to compute the price in mechanical analog machines whereas in case of electronic units, the computer receives its information regarding quantity delivered in the form of a pulse (electrical signal) from the pulsar (pulsing mechanism). Based on the pricing data already fed into the system, the computer calculates and reflects the amount of product delivered.

2.2.6 The Meter

Metering devices in most dispensing pumps are positive-displacement meters. In such a meter, limited quantity of fuel is separated into chambers whose volume is pre-calculated and known. These compartments may be cylinders within a piston meter, segments between two vanes in a vane type meter, or the space between rotors in other meters. The most popular type meter in retail fuel-dispensing systems is the piston meter. Metering through positive displacement method is used in dispenser systems because of its capability of measuring accurately.

Meter itself consists of two or more (but usually not more than four) reciprocating pistons (each in its own cylinder), intake and outlet ports, and fluid channels. The pistons are connected to a crankshaft, or other stroke-regulating mechanism, so that one cylinder is discharging fuel during its piston's forward (discharge) stroke while another is being filled during the backward (intake) stroke of its piston. This provides a continuous flow of fuel through the meter. In some piston type meters, the pistons operate in the horizontal plane whereas in others, pistons are positioned in the vertical plane to reciprocate action to drive either through the pulsar (electronic) or through the mechanical unit.

The pistons are driven by fluid pressure supplied by the system pump. The cut-outs on the piston heads function as valves, alternately opening and closing channels in such a way as to allow fuel to enter the cylinder during its intake stroke only from the inlet (pump side) and allowing it to exit the meter on the discharge stroke only through the meter outlet (nozzle side).

Other positive displacement metering concepts, as mentioned previously, are used, primarily for high speed dispensers in truck stop applications. In these

metering systems a precise quantity of fuel is isolated between vanes or rotor blades in the metering chamber. The result is the same, highly accurate measurement is accomplished and the dynamic movement of the fuel converts the fluid motion to register the quantity either mechanically or electronically.

The calibration of metering units is done calibrated at the OEM`s (Original Equipment Manufacturer's) factory, and are commonly designed to meter fuel accurately and reliably. The transducer (or pulsar, as it is called) is coupled directly to the meter shaft, just as in a mechanical analog. The function of the pulsar is to transform the mechanical action of the revolving shaft into digital signals. It does this by generating a fixed number of discrete electrical pulses per revolution of the meter shaft. (A discrete number of pulses are generated per litre delivered; while several dispenser manufacturers use 1000 pulses per litre, or 250 pulses per revolution of the meter shaft but it may vary).

The pulsar is essentially a switch, which is actuated periodically by the meter shaft (usually via a gear train). The terminals of the switch are connected to an external power source. Each time the switch is closed, voltage is applied; when the switch is open, voltage ceases to be applied. In most systems the low voltage pulse is generated by a metallic element making and breaking a magnetic field. In some cases, the magnets are imbedded in a disc and the magnet poles rotating in front of a sensor generate the electrical pulse. The result, diagrammed in Figure 2.8 is a single discrete pulse.

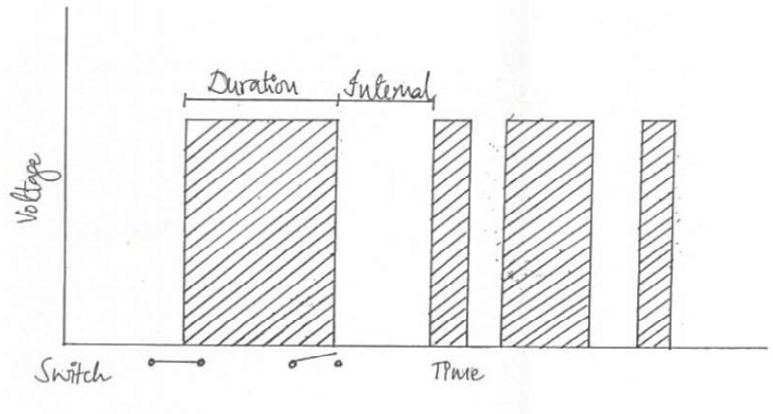

Fig. 2.8. Sketch showing Discrete Pulses
(Source: team-bhp.com)

The duration of individual pulses created in this way, and the intervals between them will vary with the rate of rotation of the meter shaft, but their value (voltage) will be the same and, for the duration of each pulse, constant.

These pulses are sent as input and transmitted to CPU – the central processing unit. The first thing the CPU must do is to recognize the pulses as signals from the pulsar and not from another input device. So the CPU checks the characteristics of the incoming signal against information stored in its memory. Once it has determined that the source of the signals is the pulsar, the CPU is able to process the information, "counting" the discrete pulses and computing the volume being delivered and its price with each pulse received. Again, its memory provides the necessary information for these computations (pulses per litre, price per litre, number of pulses already received, cumulative price).

The final step for the CPU is to convert the "results" of its computations into signals that will actuate the indicating devices, either through LEDs - light-emitting diodes or through LCDs - liquid crystal displays. This output is transmitted to the appropriate indicator (dispenser price/volume indicator or totalizer) where the display is generated automatically.

This all may seem complicated and even cumbersome when compared with the relatively simple clockwork operation of a mechanical computer. But remember that the functions we have just considered can be performed by the electronic computer virtually instantaneously, employing very few moving parts (only in the pulsar), and with great accuracy and reliability.

2.2.6 Controlling the operation of Fuel Dispensing System

All of the components of a fuel-dispensing system operate automatically or like the remote dispenser control valve—are activated by other components during fuel deliveries. Of course, many of these components are adjustable, like the meter and computer, but these adjustments are not part of the operating function of the dispenser, and are normally made while the dispenser is shut down.

2.2.7 The Discharge Nozzle

The customer is delivered the correct quantity of fuel he or she wishes to purchase from a properly installed and adjusted fuel-dispensing system. Yet the customer does not receive all of the fuel that has passed through the meter between the time when the dispenser was switched on and the time when it was switched off. These two statements seem contradictory, but they are really not, and this puzzle is solved through the discharge nozzle – the primary control device of the dispensing unit.

To summarize, the nozzle is designed to perform control functions as it controls the delivery of fuel, prevents spillage from vehicle tank through the automatic cut-off device and it also prevents hose-pipe from draining after fuel delivery is completed.

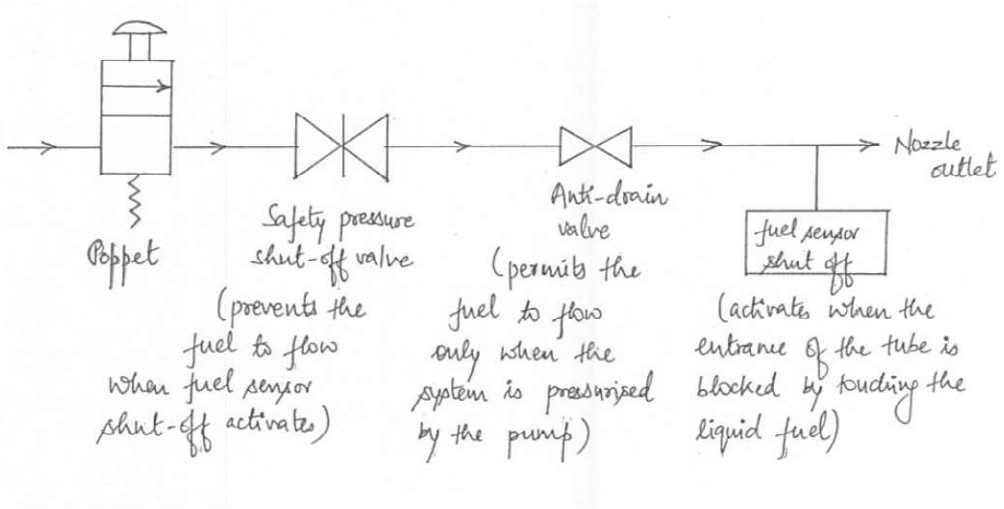

Fig. 2.9: Sketch showing working of Discharge Nozzle
(Source: team-bhp.com)

Additionally, the nozzle may be equipped with mechanisms which prevent flow of fuel unless the nozzle is inserted into the fuel tank of the automobile. Some nozzles are equipped with pressure sensitive devices which prevent the main poppet valve of the nozzle from opening unless the fuel system is pressurized. In pre-pay situations nozzles are sometimes replaced into their holders with the nozzle lever still cocked or in the open position. This feature causes the nozzle poppet to close when the dispenser is turned off and will not allow flow until the

system is again pressurized (by turning the dispenser on) and the nozzle lever released and then reopened.

Of these three functions, the last two are fully automatic, and require no action on the part of the operator (either the station attendant or the self-service customer). However, the nozzle outlet valve must be opened before fuel can flow into the customer's vehicle. In fact, fuel does not flow through any part of the system (except the self- contained air eliminator and by-pass circuit and the submersible pump riser tube and air eliminator) until the discharge nozzle is open. The operation of the nozzle outlet valve, by means of the control lever, causes fuel to flow—or cease flowing through the entire system; it also regulates the rate of delivery, so the valve must have a continuous range of opening.

Mostly, the dispensing units are equipped with ASDs (automatic shut-off devices) to prevent delivery of fuel once the fuel tank is full. This reduces the chances of product over-flow and the spillage, which is always hazardous.

There are several different designs of automatic shut-offs in common use. One design incorporates a small air tube, called a venturi, which runs down the length of the nozzle. The shut-off mechanism is designed to “breathe” through this tube. As long as air can pass through the tube, the delivery is regulated only by the outlet valve. But when the entrance to this tube is blocked—by touching liquid fuel, or anything else—even momentarily, the shut-off mechanism automatically trips the outlet valve shut, preventing delivery until the venturi is again unobstructed.

When the discharge nozzle is opened at the beginning of a delivery, fuel flows from the nozzle outlet immediately. This is because the discharge hose, like the rest of the dispensing system, is filled with liquid fuel at all times. The customers may have the anxiety to know that fuel which is already filled in the hose pipe before the delivery is actually measured through the meter in the previous delivery then how the quantities are measured and pricing computed.

Here, of course, is the answer to the puzzle that is introduced in this section. The answer to above question is that buyer always charged for the desired quantity on

the principle of displacement as quantity metered during a particular delivery will displace exactly the same quantity filled in the hose-pipe.

Fuel may flow with gravity. Since hose-pipe is required to remain full at all times to do accurate deliveries, there are systems in place to ensure that fuel is not drained from hose-pipe, after the machine is switched off because if this is not done, there may be variation in quantities to be delivered to different customers as one customer may get surplus and the other may receive the shortfall, which is not desirable.

The device that prevents this is called the anti-drain means. In retail systems its operation is automatic. It works by permitting fuel to flow only while the system is pressurized by the pump. Many newer nozzles will not allow the main poppet to open unless the system is pressurized by the pump.

The pressure-regulating valves in the pumping unit (or control valve in a remote system) will maintain stable pressure as long as the dispenser is turned on. System pressure drops immediately when the dispenser is turned off, and this drop in pressure activates the anti-drain means, preventing further delivery or draining of fuel from the nozzle and hose.

Chapter 3
The Literature Review

3. The Literature Review

3.1 Product Definitions:

As per Motor Spirit & High Speed Diesel (Regulation of supply, Distribution & Prevention of Malpractice) Order 2005:

- MS or Motor Spirit (petrol or gasoline) is liquid transport fuel which is meeting the requirements of BIS (Bureau of Indian Standards) specification number IS 2796 and is defined as any hydrocarbon oil, excluding crude mineral oil.
- HSD or High Speed Diesel is liquid transport fuel meeting the requirements of BIS (Bureau of Indian Standards) specification number IS 1460 and is defined as any hydrocarbon oil excluding mineral colza oil & turpentine substitute.

3.2 Research Papers

Since this study is focused on finding a solution to a common problem and developing control mechanism to protect customers from fraud risks in taking fuel supplies at Retail Outlets, it is essential to study previous studies if any, particularly related to identification of specific factors which lead to fraudulent activities at Retail Outlets and whether these factors have been considered in the existing control mechanism. Though significant numbers of research papers are available on fuel adulteration and pricing issues in the petroleum sector, sufficient literature/data is not available on fraud risk areas in retailing of MS or HSD at Retail outlets of Oil Companies, particularly for Indian conditions. Actually under-recoveries are much talked about in the petroleum business in India. The gross under recovery in fact is difference between desired pricing of a product determined by Oil marketing companies for supply to dealers and resellers and the price on which product is allowed to be sold (*Agarwal & Soni, 2013*).

The researcher has done systematic study of literature – starting from understanding retail Industry in India to Petroleum Retailing, its logistics and its

supply chain and the way it is dissimilar from other products and industries – along with various other factors which normally or may lead to fraudulent activities while delivering fuel at Retail Outlets.

Since delivery of transport liquid fuel is made to general public from Retail Outlets, "Retail Petroleum Business" in the title of this study is limited to activities that are happening at Retail outlets and therefore this research is focused on issues relating to 'quality' and 'quantity' of fuels being delivered at Retail outlets in India.

In terms of Retail Industry (as a whole), India has very large number of Retail stores (*Sharmila, 2014*) which can be segmented in different categories like cosmetics, footwear, sanitary products, entertainment, petroleum retailing etc. The number of such stores perhaps is the highest number in the world (13 million) – with financial estimates of close to Rs 9 lakh crores; out of which approximately Rs 1 lakh crores is contributed by petro-retailing. Though Retail Industry is quite big, only 2.5% comes under organised category, the remaining being the unorganised type. In the entire Retail Industry, petro-retail sector can be termed as one of the most organized sector of the country. Most obvious thing in petro-retail sector is service rendered to the customers (*G.Kavitha & Mary, 2016*) as pricing remains almost the same at retail outlets of different Oil Marketing companies at the same location, barring marginal variations (in some cases they exist) and hence quality of service becomes the core determinant for differentiation for Retail outlets of different oil companies. However, petroleum companies are trying to create differentiation in part of their product offerings by branding their products like "Xtrapremium" by IOCL (Indian Oil Corporation Limited), "Speed" by BPCL (Bharat Petroleum Corporation Limited) and "Power" by HPCL (Hindustan Petroleum Corporation Limited) (source: *Times of India, Sept 15 2012*). This trend is in line with International practices (*Gupta C. P., 2006*).

In today`s scenario, Retail outlets besides offering fuel, also offer value added services to consumers, taking advantage of their otherwise busy schedule by

selling branded products (*G.Kavitha & Mary, 2016*). In India, this phenomenon has been in practice for a while, in line with International practice of operating stores of convenience at petrol stations. A customer treats a Retail Outlet as a small market, if there is a food-shop available along with parking facility and the rest rooms which actually helps in providing all value added services to such customers under the same roof with the objective of reducing effort (by a consumer) and time in procuring these items (*Šafranić, 2017*). Such upgraded petrol pumps look smart in terms of physical appearance and are equipped with computerised meters for perceived accuracy in delivery, thereby avoiding arguments which at times arise from misconception and misunderstanding.

Looking at the history of Indian Petro-Retail sector, Govt of India had intervened in the aftermath of oil crises of the 1970s. The prices were controlled and the system used to be operated under the term "APM" which meant Administered Pricing Mechanism. It continued till late 1990s (*Kishore K, 2012*). Indian petro-retail sector has in fact seen changes with times and has emerged in the present form after witnessing three distinct phases – the petroleum sector being under the control of foreign Oil companies at the time of independence (in the first phase), forming Public sector Oil companies (in second phase), like Indian Oil Company was initially formed in 1959 and converted to IOCL (Indian Oil Corporation Limited) in 1964 and IBP was acquired in 1970, thereby bringing petroleum sector under the control of Government and then in the third phase, HPC was acquired in 1974 and BPC was acquired in 1976 (*Sharmila, 2014*).

Let us now look at logistics in the petroleum sector as to how it has evolved over the years, keeping pace with supply chain management principles. The Supply Chain Management (SCM) is the term mostly used for defining the process of an organization from "beginning" to "end" without assigning any specific importance to any particular function, considering that all activities are important for delivering the product to meet customers` demand *(Lambert, 2000*). It is actually the practice of co-coordinating between various activities to ensure flow of raw material, its processing into finished product. The ultimate objective is to meet the demand as customer wants the product 'early' and 'cheap' without

having any concern regarding 'how'. It involves 'optimisation', managing 'uncertainty and risk', 'Data collection' and inventory Management among other activities. Procurement and other logistic issues including outsourcing strategies are also part of supply chain Management in an organization *(David Simchi-Levi, 2013)* .

In India, Government dismantled the APM (administered price mechanism) through which petro-product prices were controlled. Therefore, it is expected that a situation would come wherein market forces will dominate the pricing mechanism. In such a situation, supply chain becomes all the more important for success of a company. The logistics of petroleum industry are different from supply chain of other Industries, this being a process industry (*Siddharth Varma, 2008*) because supply chains of this type of industry have somehow not attracted attention of practitioners. Process Industry supply chains have in fact distinctive features in terms of standardization, movement of normally bulk quantities, high risks in terms of possibility of adulteration than other supply chains and therefore are far more complex in nature.

Let us understand in brief the difference between Process manufacturing vs Discreet Manufacturing. While process manufacturing deals with formulas and recipes as in the case of food industry including beverages, Oil and gas in which ingredients are more important than parts whereas discreet manufacturing is associated with production units, materials and the assembly of components as in case automobiles, mobile phones, furniture, aircrafts etc. (*Wikipedia*).

India`s petroleum refining capacity is approximately 249 Million MTs in the beginning of May 2019 - the second largest in Asia. It is expected to increase consistently to meet increased demand of the country to reach a figure of 667 Million MTs by 2040 (*India Brand Equity Foundation - IBEF, 2019*). The supply chain of petroleum products starts right from sourcing of crude and it ends with delivery of finished product through nozzle.

Crude Oils are complex blends of different unrefined hydrocarbon compounds occurring through natural processes, which can be extracted from underground surfaces or from sea bed. These are fossil fuels made from natural processes

occurring for several million years from decay of plants and animals. The colour of crude varies from one place to another as the colour may be 'clear' in some oil fields or it may be dark black at another place. It may be liquid as water at a place but it may also be solid at another place (*Pearson Longman, 2008*). All types of crudes are useful as these can be processed and converted to useful products, refined through a process, to produce easy-to-use products like diesel, petrol, kerosene and various forms of petrochemicals containing hydrocarbons – containing both carbon and hydrogen – in varying structures from branching chains to rings or straight chains ((*HPCL website, 2019*). Though it may contain varying percentage of carbon depending on the oil-field but an average crude oil contains about Hydrogen (14%), Sulphur (up to 3%), carbon (84%), and mixture of Oxygen, nitrogen, other metals, and salts (less than 1% each). They can be classified as aromatic, naphthenic or paraffinic depending on the type of pre-dominant molecule in the crude oil *(Investopedia, 2019).* The commonly used crude oil types used in India are West Texas Intermediate (WTI), Brent, NYMEX Futures and OPEC Basket price. The classification of crude is done on two counts, one on the basis of sulphur content to be christened as "sweet" or "sour" and two, on the basis of API gravity – to be grouped as "heavy" or "light". The crudes having sulphur content of <0.5% are considered as "sweet" and those with API gravity of <20 degrees are considered to be "heavy" *(Ministry of Statistics and Program Implementation, 2019).*

West Texas Intermediate (WTI) crudes are high quality feed stocks, excellent for maximizing of Petrol output. These are "sweet" lighter crudes with 39.6^0 of API gravity and with lower content of sulphur (0.24%). This is a premium crude, commanding a price over & above OPEC rates by about $5 - $6 per-barrel and about $1 - $2 per - barrel over the Brent price. Brent is a mixture of crude extracted through multiple oil-fields in North Sea areas and the Brent. It has API of 38.3 and is reasonably sweet and light characteristics with lower sulphur content (0.37%). It commands a premium of $3 - $4 per-barrel over OPEC basket price. NYMEX futures denote the market determined price of 1000 barrels of WTI at a particular given time. OPEC basket price is pricing data of seven types of crudes like Saharan Blend(Algeria), Fateh(Dubai),

Minas(Indonesia), Isthmus(Mexico), Bonny Light(Nigeria), Arab Light (Saudi Arabia) and Tia Juana Light (Venezuela) (*HPCL website, 2019*).

Since crude Oils are mixture of useful hydrocarbon components, it is necessary to separate these components out for making them usable. Individual components are called fractions and these are separated from each other by 'fractional distillation' (*Abdullah Ashraf, Qatar University, 2012)*.

It is necessary to de-salt the crude before it is pushed for refining. After the de-salting process, feedstock is preheated in a chamber and then it flows to crude charge-heater before it is finally fed into the distillation column (VDU or a Vertical Distillation Unit) at a high temperature (*HPCL website, 2019)*. The basic principle of fractional distillation is that crude is subjected to heat and is allowed to evaporate and then different components are condensed at different temperatures depending upon their respective boiling points (*Pearson Longman, 2008*). For example, crude oil also contains lighter distillate naphtha (which is converted to petrol for use in cars etc.) and middle distillate kerosene (which is used in house-holds and also as aviation fuel). The mixture of both the products is evaporated and then condensed – kerosene gets condensed first, its boiling point higher – and then Naphtha. This method is used for doing fractional distillation. The products which are coming out of fractional distillation may or may not be ready to be sold in the market as it may further require chemical treatment. During further chemical treatment, products are mostly de-sulfurized and their hydrocarbon molecules are re-arranged or restructured by breaking bigger molecules into smaller ones through a process called catalytic reforming, to improve the quality and/or the yield per barrel of crude (*Wikipedia*).

Fractional distillation usually involves heating of crude at high temperature of 600 degrees Celsius when it boils and forms vapours due to evaporation. These vapours then reach bottom of a long cylindrical column where fractional distillation takes place *(Abdullah Ashraf, Qatar University, 2012)*. This column is fitted with trays and plates as shown in the diagram (Fig. 3.1). when hot vapours travel up in the tower, its temperature gets reduced by the fittings inside the chamber and successive higher points in the column give various streams and

cuts of major products including lighter distillates like Naphtha and Gasoline, middle distillates like Kerosene, Diesel and uncondensed gasses (which condense at lower temperature) from where these products are condensed. The fittings allow hot vapours to pass through them in such a manner that reaction takes place at different temperatures, as column is very hot at the bottom but cool at the top, thereby allowing condensation to take takes place at different temperatures, making it easier to draw off different streams of different products *(Abdullah Ashraf, Qatar University, 2012)*.

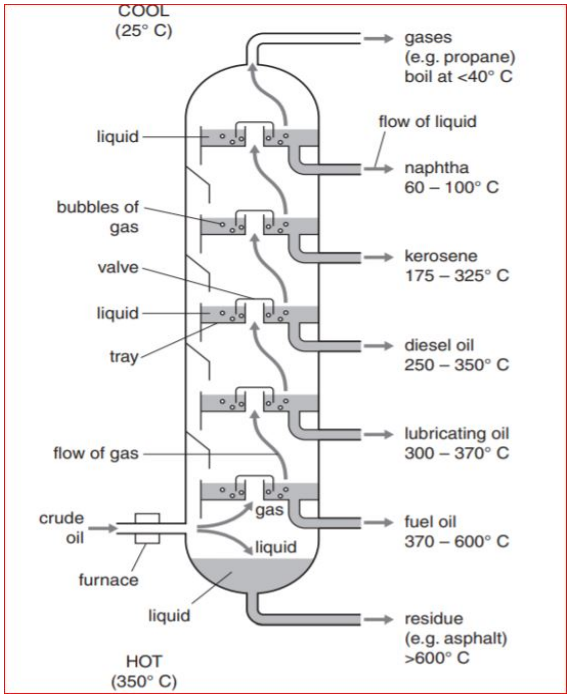

Fig. 3.1: Fractional distillation illustration
(Source: Pearson Longman, 2008)

After fractional distillation, residuum is transferred to vacuum distillation unit which also works on the same principles as fractional distillation unit except that reduced pressure is required in this column to prevent thermal cracking and therefore larger diameter column is used to regulate vapour velocities resulting in reduced pressure. In the internal fittings of vacuum distillation column, instead of trays there are demister pads and random packing. This column typically gives catalytic cracking feed stock along with gas oils, lubricating oil base stocks and heavy residual for propane de-asphalting.

After above distillation processes, further chemical processes are required in the refinery to make the products market-ready by altering molecular structure of products already obtained or by blending the new streams coming out of another process called 'cracking', with existing grades. The process of cracking breaks heavier products with higher boiling point range into fractions which are more profitable in the value chain. The cracking may be done using catalytic cracking methods. In catalytic cracking, complex hydrocarbons are broken into simpler molecules to improve the yield of lighter distillates which are more valuable. In this process, molecular structure is rearranged at a higher temperature but lower pressure, in the presence of catalysts such as aluminium hydro silicate, bauxite, zeolite etc. The catalytic process is flexible in nature and can be adjusted as per the requirement of products and can be accomplished by adopting Fluid Catalytic Cracking (FCC) or moving bed catalytic cracking or by thermo catalytic cracking (TCC).

India`s top three refiners namely Indian Oil Corporation, Reliance Industries Limited and Bharat Petroleum Corporation contribute more that 70% of country`s total refining capacity as on 1st April 2019 – total installed provisional refinery capacity being 249 Million Metric Tonnes. India`s primary energy demand is expected to exceed 1,500 million tonnes of oil by 2035 with demand of Diesel expected to reach a figure of 163 million tonnes by 2029-30 (I*ndia Brand Equity Foundation - IBEF, 2019*).

More than 85% of country`s Crude Oil requirement is met by imports (*India Brand Equity Foundation - IBEF, 2019*). Crude is moved to refineries through pipeline network in both the cases of domestic production and also in case of imports.

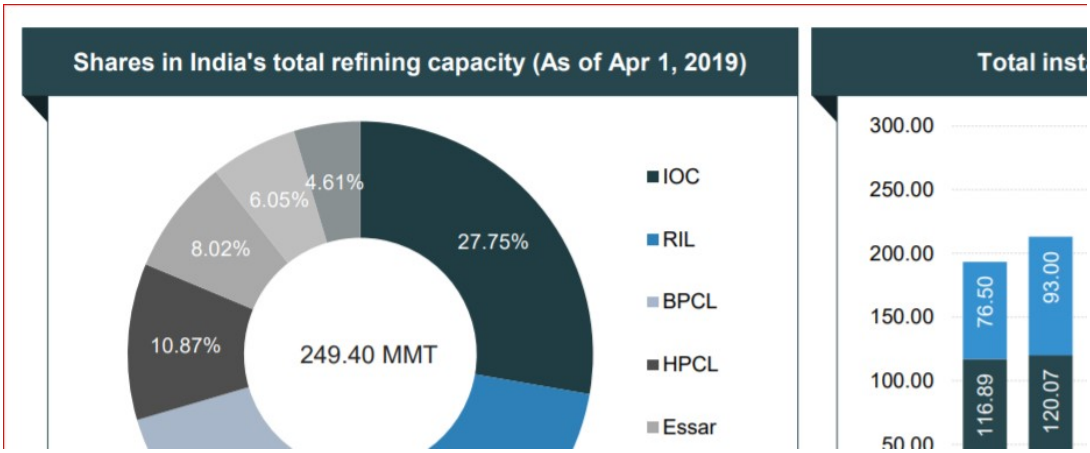

Fig. 3.2: India`s Total Refining Capacity as on 01.04.2019.
(Source: IBEF Report – August 2019 (*India Brand Equity Foundation))*

The finished products are initially stored at refinery locations after refining process and then moved to upcountry terminals & depots for further distribution to the consumption points. In some cases, finished products are also imported. The movement of products from a refinery location to a Terminal is mostly through pipeline but products may also be moved through coastal movement and/or by rail and/or by road. The pipeline network in the country is shown in Fig 3.3

Company-wise length and capacity of products pipeline and crude oil pipeline

	IOCL	BPCL[1]	HPCL[2]	OIL	ONGC	Cairn	HMEL	Othe
Length (Kms)								
Product Pipeline	8,769	2,241	3,371	654	-	-	-	
Crude oil Pipeline	5,301	937	-	1,193	1,283	688	1,017	
Total	14,049	3,178	3,371	1,847	1,283	688	1,017	
Capacity of Crude Oil Pipelines (MMTPA)								

Fig. 3.3: Pipeline Network in India as on 1st April 2019
(Source: IBEF Report – August 2019 (*India Brand Equity Foundation))*

The advantages of movement by pipelines are that it is the safest and cheapest mode of transport and it is also environment-friendly as no pollution caused when the product is moving from one place to another. High volumes can be moved in view of High capacity for daily movement along with flexibility to

regulate movement as per demand. But there are certain disadvantages and the biggest one being that laying a pipeline is capital intensive endeavour. Further, land area on the Right of way (ROW) is rendered useless for agriculture and other construction / infrastructure developmental activities (*Great Lakes Commission, 2015*).

Rail transportation is also highly cost effective for movement of quantities in Bulk as in the case of finished petroleum products. It is a cost-effective mode of transport especially when products are moved to destinations which have no pipeline set up (*Wikipedia*). This mode of transport is also beneficial in view of "not-so long" transit times and also flexibility to respond quickly to market fluctuations. if any (*STI, 2018)*. However, it has its own limitations due to route congestion etc. (*Great Lakes Commission, 2015*).

Coastal movement by ships and barges is advantageous in those cases where infrastructure to handle such movements is available. Such movements are cheaper in view of capacity to handle large volumes (*STI, 2018*). However, it has limitations as coastal movement is restricted to port locations only.

Road movement of products by Trucks has many strengths in view of absolute Flexibility with respect to pick up and deliver at a place where and when needed. Though it is not a cheaper mode of transport but can fine tune the balance between cost and flexibility and also for reliability vs speed. Trucks are generally deployed to transport smaller quantities of finished products from a Terminal or depot to petrol pumps or other consumers for relatively shorter distances. However, pollution is the biggest disadvantage in this case (*Wikipedia*).

On the basis of above, the researcher sums up the basic distribution network as follows:

- Movement from Port: Crude is moved from Port to respective refineries. However, when finished product is directly imported, same is moved straight from Ports to Terminal/Depots (storage points) by Pipeline/ ship/ rail/road as the case may be, for further distribution.

- Movement from Refinery: After refining, finished product is then moved to various storage points (Terminal/Depots) across the country from respective refineries. Movement usually takes place through ship/ Rail/ Pipeline.

- Movement of finished product from Terminal/Depot: From Terminal/Depots, the product is transported to Retail outlets and the consumers through Tank Trucks only. In some cases, product is also moved from one Terminal/ Depot to another Depot by Tank Trucks especially in hilly terrains due to "only road" connectivity or in case of emergent situations.

Since this Research is focused on fraudulent issues at Retail Outlets, which might affect quality and quantity of fuels being dispensed, the study was carried out based on previous Inspections and reports relating to Oil Industry in the past and other related issues.

During the literature review, it was gathered that random Inspections were previously carried out by the teams of Centre for Science and environment (CSE) New Delhi at Retail Outlets, Installations and tank trucks/lorries of Oil companies *(https://www.cseindia.org/fuel-adulteration-report-104, 2002*) for assessing and checking quality of fuel being dispensed (at Retail Outlets) and whether there is any link of fuel quality with quality of Air. These inspections were carried out in NCT (National Capital Territory) of Delhi and also in NCR (National Capital Region) based on directions under the order dated November 22, 2001 given by Honourable Supreme Court of India.

The National Capital Region (NCR) was created in 1985, which comprises of NCT (National Capital Territory) of Delhi and some prominent Districts from neighbouring states of Rajasthan, Uttar Pradesh and Haryana (source: Wikipedia). This was created with the objective of planning development of region and it includes districts of Delhi, Bhiwandi, Ghaziabad, Noida, Gurugram and Faridabad.

During inspections, samples were collected in the period from December 20, 2001 to January 18, 2002 and the report was submitted on February 5, 2002.

Regarding level of adulteration found during inspections, the report opines 'rampant' but it also says that gauging exact level of adulteration is difficult, due to lack of testing equipment. The report further describes that adulterants also belong to same family of hydrocarbons but in varying composition and therefore 'limited' adulteration may be possible without changing the specifications of fuels being supplied. Basically, exact adulteration rate cannot be ascertained due to high aromatic content, which is not part of standard specifications. The report further indicates that adulteration becomes easier when similar hydrocarbon components are adulterated; for example, Naphtha whose density is in the range 0.75-0.82 Kg/M^3 can be easily inter-mixed with Petrol which is in the density range of 0.71-0.77 Kg/M^3.

The report further analyses reasons for adulteration, and one of the major reasons is major price difference between the prices of product in which adulteration is done vis-à-vis the cost of adulterants due to higher tax rates on automotive fuels with lower tax rate on adulterating substitute hydrocarbons.

Different tax structure in-fact incentivizes adulteration *(Gwilliam, Bacon, Kojima, & Lvovsky, Transport Fuel Taxes and Urban Air Quality)* particularly in South Asia because Petrol (or Gasoline) and Diesel carry higher rate of tax than adulterating product mostly, Kerosene and therefore blending smaller quantities of kerosene in higher taxed products may go undetected and may yield extra profits (*Tharby, 2002)*. However, the fact is that fuel adulteration can increase tail pipe emission by releasing polluting elements like particulate matter(PM), carbon monoxide, oxides of Nitrogen (NOx). Further, adulteration also affects mostly the poor community because kerosene which is a subsidized product and is basically meant for down trodden, is consumed for adulteration and therefore becomes un-available to them. As a result, the poor are forced to continue using biomass, causing air pollution.

From the above it is interpreted by researcher that reducing adulteration is necessary for maintaining economic considerations and also for the betterment of

air quality in cities. Therefore, some of the steps would be necessary which include reducing/removing anomalies in the pricing mechanism and also to enforce effective control mechanism.

The Oil & gas companies are mostly major contributors for tax collection for revenue generation and exports in most of the countries and hence wrong doings in these companies affect the National interests in the respective countries (*Kartick Gupta, 2016*). Different and multiple agencies are involved in maintaining or opposing corrupt practices in any country as far oil trade is concerned because corruption is basically a self-reinforcing cycle *(O'Higgins, 2006)*. The chances of getting into unethical practices by these companies (in this case, the private owners/dealers) depend on competition level they face. Therefore, chances of unethical practices are less if a strong institutional framework exists; under an effective control mechanism, as non-competitive industries and a weak institutional framework may breed corruption & unethical practices, particularly those countries which rank poorly in law and order situation (*Gupta K. , 2016*). As regards malpractices in Nigeria, the main source of revenue in Nigeria is oil & gas, as it contributes for about 40% of the GDP (gross domestic product) and around 70% of government revenues come from this sector but malpractices are rampant, with kerosene adulteration to be in the order of up to 77% (*Obasi & Nkwor, 2013*). Young qualified Degree holders work at Retail outlets as Managers in Nigeria who are mostly young, below the age of 30 years, in comparison to attendants who are secondary school holders and lowly paid. They are supposed to give Descriptive information to their employers (marketers) indicating the condition and state of business at any given time (*Okemiri Henry Anayo, 2016*). It includes a range of information like financial position, test results, marketing of products, and maintaining proper records for maintenance. This type of input helps in identifying and addressing petrol station management problems. They also give diagnostic information to describe "what is wrong" in the business by assessing the current status versus what it is ought to be.

On studying the trend in other countries, it emerged that in fuel business, various types of malpractices are prevalent in other developing countries too, leading to evasion of tax by unauthorized movement of products from one territory to another or by doing smuggling and selling lower grade product in the pricing range of higher grade product - like selling normal petrol as premium petrol or to play with octane number of petrol *(Kojima & Bacon, 2001)*. Many developing countries are taking many steps to maintain quality of fuel being dispensed at outlets *(Krakowska, 2015*) like Kenya had initially adopted marker system to trace adulteration if any; along with tweaking taxation rates for products for exports vs local consumptions. Russian Federation started awarding quality signs to those meeting quality criterion and Shell in Pakistan doing on the spot quality and quantity testing at Retail outlets to generate confidence among the users; a practice which has been well received in that nation (*Kojima & Bacon, 2001*). This was resorted to in Pakistan as selling normal products as premium products, smuggling of products from other countries (Iran and Turkmenistan) and its adulteration, and short-delivery had become a regular practice in the marketing of petroleum products in that country and its ill-effects were understood because these wrong practices reduce the welfare of the common buyers and moreover, the concerned government loses revenue by the theft of excise and other duties and taxes. Apart from this, such wrong deeds create serious impact on general health of citizens due to greater tail pipe emissions, resulting in pollution through SOx and NOx. *(Heitner, Haider, Aziz, Garcia, Kojima, & Streifel, 2003*). It is estimated that Government of Pakistan is losing approx. Rs 5 billion in tax revenue on this account. There are unsafe storage points, illegal gasoline conversions to LPG in Pakistan which are also safety risks in that country.

It is estimated that quantum of adulteration in diesel delivered at petrol pumps in Kathmandu (Nepal) is as high as 35% to 50% (*R Yadav, 2005)*. Since Transport sector causes roughly 25% of total greenhouse gas emissions, these adulterants become a major cause of concern as Fuel adulteration can increase tail pipe emission of hydrocarbon, PM (particulate matter), Carbon monoxide, and NOx (oxides of Nitrogen) (*Gwilliam, Bacon, Kojima, & Lvovsky, Transport Fuel Taxes and Urban Air Quality, 2001*)

Since there is difficulty in detecting adulteration and that there is greater potential in earning undue profits due to adulteration, there may be a tendency to do mixing at delivery points which causes financial loss and also pollution issues and it can be controlled through the correct pricing policies and/or through an enforcement administration (*CSE, 2002*).

Heavily subsidized pricing structure in the past and Taxation disparities in India may have been perceived as the reason for malpractices in the petroleum business, leading to possibility of un-authorised diversion and adulteration of high-value products with low-cost products including kerosene and other solvents (*Kojima R. B., 2006*).

Now, focusing on malpractices and illegal activities, it is normally perceived that crimes are committed by lower rung staff working at ROs. But sociologist Sutherland EH in his presidential address in 1939 did not agree with this traditional thinking as he was of the view that violation of law may also be done by so-called "respectable" class of society because these "respectable persons" are generally in commanding positions and therefore influence decision making and also investigations to manage avoidance of legal actions (*White-Collar Crime: Arjan Reurink European Journal of Sociology, 57, 3 (2016*).

The researcher made a study to explore whether people at large react to such wrong doings. The answer was in affirmative when it was learnt 'whistle blowing' is gaining momentum not only in India but also in other parts of the world, because in the present scenario of greater competition and globalization economic considerations are becoming more important than traditions and virtues observed in earlier times. Due to this, there may be increased attempts for cheating customers by big corporate entities with the sole objective of improving bottom lines of respective companies/entities. Hence protecting larger public interests from such corporate big-wigs has become important and necessary. Therefore, the tool emerged in the present times for improving corporate governance is "whistle-blowing" *(Das, 2016).* This term was coined by *Ralph Nader* in 1970s; on the similar understanding as of 'referee' indicating a foul

play. In the corporate world, a whistle blower can be defined as a person who brings out wrong-doings of dishonesty or illegal activities, happening within an organization (*Wikipedia)*. It is generally perceived that whistle blowing is betrayal to the organization concerned but it is not so as it helps in detecting corruption, if prevailing.

In India, *Whistle Blowers Protection Act, 2011* came into being after few cases of corruption took ugly turn and the concerned whistle blowers were shot dead or suffered heavily, after they brought malpractices in their respective organizations to light (*Das, 2016*). In this regard, the first name is of Satyendra Dubey (1973-2003) who was shot dead in Gaya in 2003. He was handling a Road construction project of NHAI (National Highways Authority of India). He was a graduate from the reputed and prestigious institution (IIT Kanpur) in Civil Engineering and was working on Aurangabad-Barachatti road project (60 Km) in the state of Bihar which was a part of Golden Quadrilateral project. During the course of his supervision, he identified few financial irregularities - as he discovered that the main contractor L&T (Larsen and Toubro) - had subcontracted the work to lower rung contractor groups. He forced those contractors to re-build a stretch of six kilometres of Road, as he was not satisfied with quality of work done by them, causing a huge loss to sub-contractors. Though he reported the matter to his seniors in NHAI but cognizance of his findings was not taken. He also informed the matter to the highest office in the country, regarding malpractices going on at the local level. His letter was forwarded to the bureaucracy in concerned Ministry for taking further action. It was not known at that time the kind of danger he was exposed to *(Patra, 2008);* and therefore his identity was revealed in the entire process. In Nov 2003, he was shot dead in the city of Gaya. In another case of Ranbaxy, two of its employees Dinesh Thakur and Rajinder Kumar, became whistle blowers by narrating about drug test reports being fabricated by the company. Dinesh Thakur reported his findings within the company but he was implicated in a case of watching pornography on his official computer and was forced to resign. He then reported the matter to Food and Drug Administration (FDA) which started investigating his claims. (*Wikipedia*). The company agreed to settle his claims by paying hefty fines. Thakur`s fate is

different that he is alive and also received a substantial amount of money (Rs 244 crores) under the False Claims Act, as per which whistleblower is entitled to a certain percentage of the fine imposed on the fraud-doing company (*Das, 2016).*
As per another report published in Seattle times dated 2nd Oct 2019, one of the ex-employees of aircraft manufacturer, Boeing has alleged that crash accidents, the last one of being of Ethiopian Airlines in Mar 2019 could have been prevented had the safety system proposed by him was installed in the aircraft. He has filed a complaint in this regard in the capacity of a whistleblower (*Seattletimes.com, 2019*). It may be recalled that Pilots of Boeing 737 Max could not manoeuvre the aircraft from nose-diving despite following safety procedures as per their standards, killing 346 people onboard (*BBC, 2019*).

Talking about other prominent cases, Dr Santanu Kumar das further elaborates in his research paper titled as "*Whistle blowing: A step to strengthen the Corporate Governance (2016)*" that Lalit Mehta (1972–2008) was an RTI activist, based at Palamau District in Jharkhand and also ran "The Right to Food Campaign". On 14th May 2008, he was killed while he was on his way home. It is learnt that contractor lobby and the corrupt government officials perceived him as a threat, as he had developed a software which made it near-impossible for contractors and other officials to make money fraudulently (*Gupta A. , 2008*).
On a similar note, Jack B. Palmer filed a lawsuit against his own company i.e. Infosys in February 2011 (in USA) alleging that the company had misused US B1 visitor visas (which were easy to acquire and cheap) to bring Indian staff to the US as against H1B visas to work on long-term contracts. *(http://www.information-age.com/it-management/outsourcing-and-supplier-management /2098343/infosys-visa-fraud-whistleblower-goes-public.,2012 - Information Age, 2012*). The case went on but Infosys finally had to settle the allegations in Oct 2013, by paying a large sum ($34 million). The company also acknowledged that it had made mistakes on its I-9 worker-verification forms (*Jordan M. &., 2013)*.
Though whistle-blowing can be a tool to combat corruption, there is always a question attached to it, as to how much effective it is. Actually, effectiveness of this mechanism depends on various factors, 'tone at the top' being the major

influencer. Next comes, awareness among employees and other stake holders along with their accessibility to the mechanism, followed by their 'will' to use this mechanism correctly, instead of using the same for settling their own grievances (PwC, 2011).

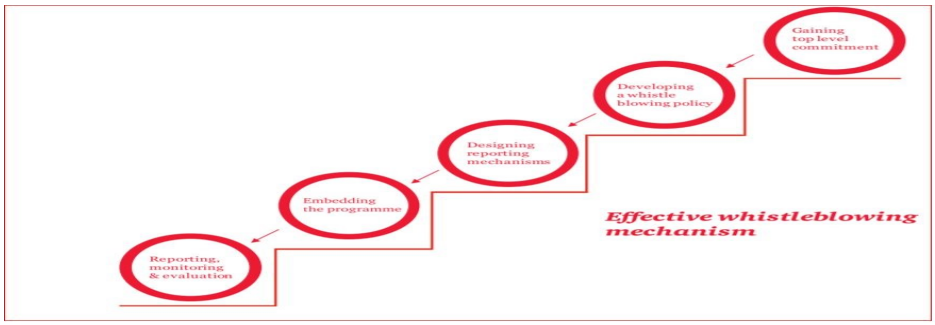

Fig. 3.4 : Effective Wistleblowing Mechanism
(Source: PWC Report- Whistle blowing: Effective means to combat economic crime, 2011)

But the fact remains that Whistle-blowing is not only those actions which are morally permissible (*Patra, 2008)*, it is in fact taking a difficult path of truth even at the cost of one`s life by following the principles of ethics and beyond. It reflects inner ingredients of one`s moral values in life which are perhaps more important & valuable to the individual than the life itself.

The researcher also tried to find answer to a common question that - how long the Oil will continue? Since exploration is capital intensive activity, it is estimated that very big annual funding to the tune of $1 trillion is required to continue meeting global energy needs for the next 2 decades. *(Kaushal, Pearce, & Walters, 2011)*. Though there are emerging trends of strong growth in renewable sources of energy, it is still expected that global demand of petroleum products will increase by 30% by 2035. Hence demand of oil & gas will continue to be on rise even though incremental demand may not be the same everywhere and it may vary from place to place depending on the Region and the sector. The prominent sectors which are likely to continue using petroleum products are Power, Transport and Building sectors in countries like China and non-OECD countries including India. Keeping in view the futuristic trends where role of Gas

is increasing in the energy mix and that alternative products like bio-fuels are becoming available, National Oil companies of many countries are joining hands with international companies to garner technological support to augment their business model to become major players in upstream/downstream sectors. These companies understand the need to think beyond 'Oil' to survive in the emerging scenario and that existing form of gaps in the quality and services are definitely not workable as customers are not likely to accept unethical players.

In the Indian context, substantial growth is estimated in demand for Oil for the next 10 years or so and demand of Gas is also likely to hugely increase by 400% during this period (*Strategic Partnerships: The Way to win in India`s Hydrocarbon Sector by AT Kearney*). Therefore, joint ventures or partnership between two big entities may help in meeting the increased future demand in the complex Hydrocarbon sector as both the parties may bring individual technical expertise, synergy of operations, mutually acceptable business model and more importantly the financial strength, which can be helpful in unlocking value for both the partners.

Indian partnerships can be in the areas of Refining & Petrochemicals to emerge as net exporter of Refining and petrochemical products. City Gas Distribution (CGD) can be another area to expand in select cities or to install more number of CNG - compressed Natural Gas stations. Partnership can also be in Exploration to create innovative economically viable solutions or it can be in terms of climate change solutions, oil spill response & job creation. Partners in hydrocarbon Industry in India can be at domestic level among National Oil and Gas companies or it may be with the help of International Energy companies along-with Regulatory bodies, Suppliers & equipment providers, and other local consumers and communities. Strategic partnerships can help at all the three levels i.e. Company level: mutually benefitting each entity in terms of new revenue streams, profitability and synergy of operations, Sector level: for delivering innovative ideas and at Community level: in terms of bio diversity protection, climate change, oil spill response or employment creation etc.

In Oil Industry of the country, there is a common perception that malpractices may be happening at many places with significant financial impact to the public, keeping in view of large number of ROs and millions of vehicles getting refuelled on daily basis *(https://www.jagoinvestor.com/2014/03/petrol-pump-fraud-in-india.html, 2014*).

Though frauds have been taking place from ages but it is observed that mostly frauds occur during economic slowdown or during recession period (*Bănărescu, 2015*). So anti-fraud policy should come in to play during economic recovery, after every recession, to reduce associated financial risks which otherwise may affect profitability. In these circumstances it becomes important to see every transaction happening, which cannot be done manually in view of magnitude and enormous data getting generated on day to day basis and hence IT systems plays a major role in processing of data through data analytics tools and programs. This helps to identify anomalies in the data stream or behavioural patterns, thereby giving a directional indication of a fraudulent activity, if any which can give leads for further investigation if required.

Focusing on possible cheating points at retail outlets, it can be done through applications of internet of Things (IoT) to ensure delivery of petrol and diesel in correct quality and quantity *(BJ Hubert Shanthan, 2016).* Internet of things (IoT) is a network between objects and human, its application can help by following certain steps at petrol pumps. These steps include (1) measuring fuel quantity filled, through a sensing unit (2) The measured quantity data is then sent to the user on mobile (3) Through Internet, the user also gets the current fuel price on mobile (4) Total cost that user needs to pay, by calculating price and the quantity. This information is also transmitted on mobile.

Since this study is focused on transport liquid fuels, all factors related to fuel supply to vehicles in transport and logistics business are of significance for the purpose of this research. It is a known fact that there is a tough competition in logistics business (*Adam Riekert, 2018*). Hence it is major concern in this business to avoid cheating while taking fuel supply at Retail Outlets and the fuel theft (if any), through monitoring and management. There are few common

actions by which customers are cheated at retail outlets, which become important for any customer in general and for such transport and logistics companies in particular, to be careful of, as part of monitoring and management of fuel deliveries (for vehicles).

Some of these are depicted below (*source: How To Detect Fraud at Petrol Pumps, 2016):*

a. **Extra Long hose pipe through which delivery is made:**
   When length of hose pipe is more, there can be possibility of some quantity of fuel remaining in the hose pipe even after the delivery is complete. The quantity of such fuel remaining in nozzle pipe may be miniscule and insignificant for individual customers but may become substantial for the reseller, considering the compounding effect in view of large number of customers being catered to, on day to day basis.

b. **Diverting attention for making short supply of fuel:**
   During the process of making delivery of fuel, a second person approaches the buyer to divert attention on the pretext of selling any other product like lubricant or credit card etc. and if the buyer is not alert, delivery attendant who is actually making supply, may manipulate to quickly finish filling. This way, there can be short supply of fuel worth Rs 20-100 which may be small for a buyer but becomes significant for the seller at the end of the day.

c. **Diverting attention for manipulating amount of money in transactions:**
   This may be common problem at upcountry locations as both the customers and customer attendants are not well educated and therefore the attendant may hold back Rs 50 or lesser denomination notes while returning the change against a cash payment.

d. **Re-start Trick:**
   The attendant will deliberately supply for a lesser amount say Rs 200 against ordered supply of Rs 1000 and when customer points out the mistake, the

attendant restarts and finishes at Rs 800 explaining that he had already delivered Rs 200; whereas actually he delivers only for Rs 800 as zero was not reset when he restarted.

e. **Mis-using Air Lock in dispensing pumps:**
By jerking the dispensing pumps, the attendants may not lock the nozzle fully and hence some fuel may be held back in hose pipe, due to 'in-built' air lock.

f. **Tampering of Dispensing unit:**
By using advanced electronic chips in the metering system, dispensing units may be tampered with to supply lesser quantities than ordered ones. The manipulated quantities in each case may be insignificant the level of only 50-100 ml but may become substantial for the reseller (or the attendant) considering large number of customers on day to day basis.

Now the question is how these transport companies manage to avoid fuel theft. One of the measures to fight against such malpractices is to spread this information and to educate public at large so that more and more people become attentive, whenever they go for refuelling.

Simple but significant steps to avoid cheating at petrol pumps are:

i) Educate staff (driver etc.) to be vigilant against frauds by giving training etc. *(CarDekho, 2016).*
ii) Insist for printed bill from the dispensing unit itself, with vehicle number automatically printed on it along with dispensing unit number rather than handmade or a computer printed copy *(Zigwheels, 2016)*.
iii) Take fuel delivery from a standard and known retail outlet based on reputation (*CarTrade.com, 2019*).
iv) Remain focused on resetting Zero by the attendant and do not get distracted *(quikrcars, 2016)*.

v) Take supplies against card payment instead of cash payment *(CarDekho, 2016)*.

In some developing countries markers are used to detect adulteration in MS and HSD to avoid loss of revenue on account of tax evasion. Fuel markers are those chemical compounds which are easily miscible with petroleum products like MS and/or HSD and help in detecting adulteration through clinical analysis. This way, product quality is protected and action can also be taken against tax frauds by culprits if any (*Verbanic, 2007)*.

There can be manipulations in odometer of vehicles *(Montag, 2017).* Primarily, such manipulations are done in the field of used car sales as it t has been established in previous researches that it is easier to reset odometer reading in present generation high tech cars by directly accessing odometer settings of car`s computerized system through a laptop than old generation analog odometers where the complete mechanical system had to be removed to do manipulations. But in the present era, it is only few commands which make the changes in odometer reading without even leaving signs of such manipulations.

Now the question comes as to who engages in committing frauds at Retail oulets - whether it is resellers and their staff who are delivering fuel at retail outlets or by others as well. It is commonly believed that individuals and dealership companies may get into committing frauds due to financial constraints but facts may not be so, because previous researches have proved white collar crimes, in which individuals with high status have been found to be involved in committing frauds but blame is passed on downwards (*Braithwaite, 1985)*. The past researches also show that greed is one of the major causes for committing frauds. Such studies also prove that upper class of people have tendency to be selfish, believing that they are entitled for a higher status over others because of their talent and attributes, leading to their unethical behaviour (*Buchheit, 2015)*.

By relating this phenomenon to the present study, it is inferred by researcher that there can be possibility of manipulations at retail outlet products by employees of transport companies (drivers or other staff) rather than resellers themselves or

their staff. Now a pertinent question arises as to why employees commit frauds. Ongoing through research papers, it was found that apart from the obvious reason of "greed", the employees who were dissatisfied in the work place are more prone to committing frauds (*Wells, 2001*) than others apart from either 'greed' or the 'need'. The other reasons for employees to commit fraud are: lack or low level of self-control, Opportunity to commit frauds due to poor control system, easy access to funds (*Nnaji, 2015*). If employees feel that their worth is more than their compensation, they will be prone to committing frauds *(why Do Employees Commit Frauds?, 2019)*. Though Fraud is global phenomena, as per the report put up by Association of Certified examiners to the Nation in 2008, it was brought out that organizations in United States alone, lose about 7% of their revenue to fraudulent activities (*Ramamoorti, 2008*). Therefore, it becomes important for companies to monitor fraud detection and its prevention. While legislation to control fraudulent activities is necessary which helps in limiting opportunities to fraudsters, it is up to one`s integrity and ethics to engage into such activities as individual ethical character cannot be legislated. Therefore, fraud investigation, detection and deterrence also require analysis of interpersonal and behavioural aspects of not only those who are suspected to commit frauds but also those who are responsible for organizational governance, policy makers and the auditors. Though fraud triangle of perceived pressure, available opportunities and ability to rationalize one`s action gives a conceptual framework *(Albrecht, N.C.Hill, & Albrecht, 2006*), understanding psychology and behavioural dynamics of all stake holders becomes all the more important specially for those companies who have implemented or those who are in the process of implementing anti-fraud policies. Since such crimes are committed by humans, it is also important to gauge their motivation level to get into such acts of fraudulent activities by cheating others (*Ramamoorti, 2008*). This helps in formulation of policies in organizations for fraud detection and its prevention.

Therefore, it is inferred by researcher that adulteration can be effectively dealt-with by taking following actions:

- Reducing Incentives and opportunities for doing adulterations
- Imposing severe punishments for those who indulge in adulteration.

- Periodical auditing of control systems in place.

As has been said earlier, Internet of things (IoT) is another way to give solution to the common perception of fraudulent activities in buying fuels at Retail Outlets. In the present era of greater connectivity and communication through internet, application of these IoT solutions can ensure that deliveries take place accurately using sensors, without giving any room for complaints later (*BJ Hubert Shanthan, 2016*).

The present day auditing practice started for the first time around 1941 after the economic crisis of 1929, when IIA (Institute of Internal Auditors) came into being (*Szabolcs Vilmos SZEKELY, 2017)*. *Audit* is a Latin word which means "to listen" and evolution of Internal Auditing can be summarized as under:

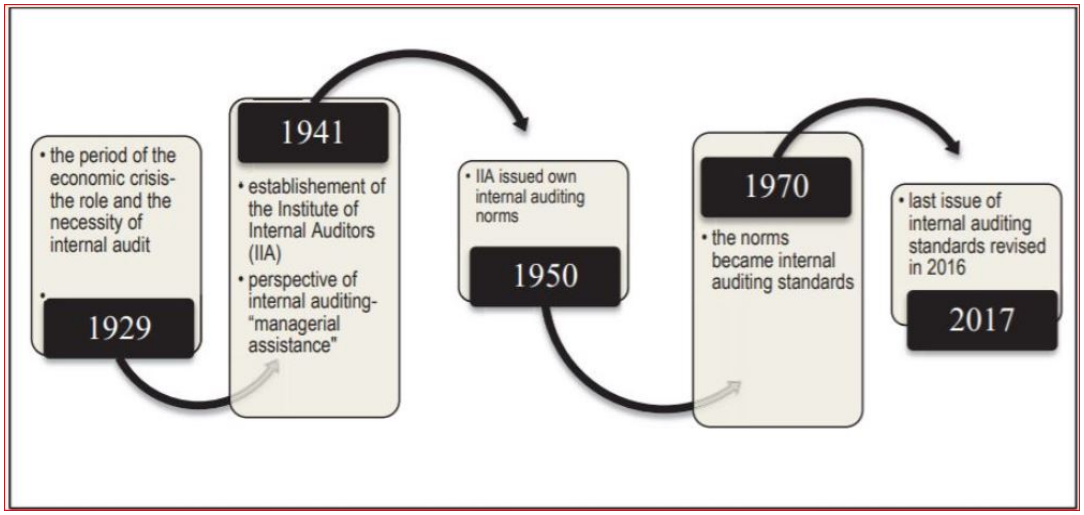

Fig. 3.5: Evolution of auditing standards
(Source: The evolution of the internal Auditing Function in the context of Corporate Transparency by Szabolcs Vilmos SZEKELY, Melinda Timea FÜLÖP)

This Institute i.e. IIA (Institute of Internal Auditors) has been continuously contributing and upgrading knowledge-base of its members through continuing education & research, standardizing the code of ethics, outlining the professional practice for Internal Audit and approving the statement of responsibilities *(Ahmad Sujan, 2008).* One of its charter members *Hald, Arthur* has been quoted as saying in 1994 that large businesses cannot operate without the proper system

of internal audit and if these organizations have not yet adopted it, they will have to do so soon (*cited in 1996, flesher).*

In today`s times when decision making is required to be so fast to keep pace with transformation of economy, Internal Audit plays a role of strategic importance in improving performance, as it has now become a part of management system and the control mechanism. (*Szabolcs Vilmos SZEKELY, 2017)*. The internal auditing function in any organization is supposed to be un-biased, which has responsibility to assess risks involved in the business of the organization, the existing control mechanism to mitigate such risks and on overall basis, to gauge governance issues by evaluating actions and activities, documenting it and then explaining the same, if required. This way Internal Audit plays an important role in ensuring effective governance through the control mechanism implemented by Management (*Hermanson Dana, 2003*). This entire work flow of this function therefore requires conceptualization of risk management and regulatory processes within the organization. Functioning of auditing team is viewed in reference to basic philosophy of corporate governance and therefore it is considered that assessment by (internal) auditing adds value to overall functioning of the organization by offering re-assurance on the control system implemented by top management, because this recommendation made by this function are seen to be independent and a consulting activity. Initially, the internal audit was treated as a support activity but today it has taken the centre stage and is viewed as Management tool in the role of consultant to top management *(IOVU, 2017).* In the present scenario, therefore internal auditors help in solving critical issues, related to line of business of the organization. Because of nature of their job, internal auditors sometimes get trapped in conflicting situation as they are supposed to be assessing effectiveness of governance issues to help management, whereas they are also supposed to be reporting the flaws in it to audit committee at the top.

As per *Consumer Protection Act 1986*, customers have the right to be informed about the quality, quantity and price of goods to protect them against unfair trade fair practices.

Keeping the above in view, organizations focus on implementing Citizen's Charter, which is a document that focuses on commitment towards providing standard of services, choice, information, to the citizens and consultation too, without any discrimination, to give 'Value for Money' *(MOPPGP, 2019).*

Citizens` Charter has been implemented by each oil company in the country. Its main objective is to improve the quality of service to the public *(bharatpetroleum.com, 2016)*. Though Citizen's Charter does not have new legal rights, but it surely helps in enforcing existing ones.

In India, MS/HSD Control order was introduced in 2005 (amended in 2007).

Theme-wise Summing up of Research Papers is as under:

i) Adulteration/Pollution:

a) Adulteration is rampant.
b) Adulteration if allowed to continue could be cause for increased ambient air pollution.
c) We are approaching tougher regime of Global emission norms.
d) Introduction of CO_2 limits should be introduced**.**
e) Many developing countries are taking many steps to maintain quality of fuel being dispensed at outlets.
f) There are some adulterants that affect Air pollution and others affect the tax revenue.
g) Fuel adulteration can increase tail pipe emission of hydrocarbon, CO, oxides of Nitrogen and particulate matter.

ii) Pricing & Taxation Issues

a) Due to skewed prices, incentive to adulterate is very high.
b) In fuel business, three types of abuses are prevalent in some developing countries: Smuggling, mis-labeling and tax evasion.

c) Differential Taxation on fuel pricing can lead to diversion and inter fuel substitution.
d) Though there are various tests to identify adulteration, important step in dealing with adulteration is to reduce incentives for doing adulteration coupled with serious punishment for engaging in it. Differential taxation etc. may also be tackled appropriately.

iii) Futuristic:

a) Although gasoline powered cars define the market today, future cannot afford it and therefore future is going to be electric cars**.**
b) For all green technology, shift will be slower in Brazil, China, India & Russia than developed markets.
c) Despite strong foreseeable growth in renewable source, global demand of petroleum products is expected to increase by 30% by 2035.
d) In downstream sector, alternative sources like bio-fuels are emerging.
e) Because of all these factors, Oil & Gas sector all over the world is facing challenges and is not going to be the same in future.
f) Companies with best value chain participation business model are likely to grow
g) In the Indian context, strategic partnership is more relevant.
h) Indian partnerships can be in the areas of Refining & Petrochemicals to emerge as net exporter of Refining and petrochemical products.

iv) Frauds/Curbing frauds at ROs/Whistle-blowing/General:

a) Incidents of Tricks used to cheat customers at ROs
b) Curbing of frauds is a must in todays` scenario and whistle blowing in cases of Manjunath, Satyendra Dube and others have been discussed to unearth frauds in the respective fields.
c) Incremental demand will vary from Region to Region and from sector to sector, most of it is expected to come from Power, Transport and Building sectors.

d) Govt. of Pakistan is focusing on making Oil & Gas sector more transparent and profitable.
e) Partnership can also be in Exploration to create innovative economically viable solutions.
f) Partners in hydrocarbon Industry in India can be National & International Oil & Gas companies, Regulatory bodies, Suppliers & equipment providers, and other local consumers and communities.

It is evident from the above that research papers studied do not address fraudulent activities which may be happening at retail outlets. Since fraudulent activities are the main area of study, various fraud theories were also studied as part of literature review. Broadly, following major theories on Fraud have been found relevant:

a. The "Differential Association Theory" by *Edwin H Sutherland* (1947): says that behaviour for committing crime is garnered through experiences and interactions as it is not inherent.
b. The Fraud Triangle by *Donald R Cressey* (1953): there are three important areas such as Opportunity, Pressure and Rationalization, for one to get into fraudulent activities.
c. Neutralization Theory by *Gresham Sykes and David Matza* (1957): neutralization of guilt and shame for denial of responsibility, injury and victim, blaming the prosecutors and putting higher loyalty to one's group above all else.
d. Concept of Fraud Diamond by *Wolfe and Hermanson (2004)*: Additionally, Capability to commit fraud is a must.

Predominantly, Fraud Diamond theory by *Wolfe and Hermanson* (2004) seems to be relevant theory which says that capability is the fourth dimension, apart from Pressure, Opportunity and rationalisation that plays an important role for individuals to commit frauds. The capability has been defined as individual's personal abilities and attributes which are essential to the fraud occurrence. The researchers in this theory have concluded that even if a person has intention to do frauds and that opportunity is also available, along with his ability to do

rationalization, fraud can still not take place if he or she does not have capability and required skills to execute the crime. Therefore, as per fraud diamond theory, opportunity includes the ability rather than just treating opportunity as a situation or as an environmental factor. In case of Retail outlets, capabilities of concerned resellers vary from person to person and therefore degree of performing fraudulent activities (if any) may also vary.

While three attributes (out of four) namely “pressure (or intent)”, “ability to rationalise” and “capability” are purely of personal nature which cannot be controlled, it is only the “opportunity” which can be reduced by implementing the effective control mechanism. Hence, this study aims to identify those factors which act as “opportunities” and finally lead to fraud risks at petroleum Retail outlets. Once these factors are identified, their impact on fraud risks can be worked out along with their mitigation by modifying the control mechanism.

3.3 Control Order:

a. As per Motor Spirit & High Speed Diesel (Regulation of supply, Distribution & Prevention of Malpractice) Order 2005, broad categories of malpractices at Retail Outlets are as under (in alphabetical order):
   (i) Adulteration
   (ii) Over-charging
   (iii) Pilferage
   (iv) Sale of off-specification product
   (v) Short Delivery
   (vi) Stock Variation
   (vii) Unauthorized Exchange
   (viii) Unauthorized Purchase
   (ix) Unauthorized Possession
   (x) Unauthorized Sale

b. *MS (Motor Spirit) & HSD (High Speed Diesel) (Regulation of supply, Distribution & Prevention of Malpractice) Order 2005*, defines the above malpractices as under:

b.1 Adulteration:

"Adulteration" means the addition of external and foreign substance into the products such as MS (motor spirit) or HSD (high speed diesel) through illegal means or in an unauthorized manner with the result that specifications of product under reference does not meet the requirements of the BIS (Bureau of Indian Standards) specifications number *IS 2796 and IS 1460* for MS (motor spirit) and HSD (high speed diesel) respectively or any other requirement notified by GOI (Government of India). Basic test to check adulteration is "Filter Paper Test" as explained below (*HPCL website, 2019*) and shown in Fig 3.6 below:

- Seek Filter paper (Whatman 2 quality as per Marketing Discipline Guidelines) from Retail outlet / its staff.

- Clean the mouth of nozzle (at the end of hose pipe) to draw small quantity and place a drop of petrol on the prescribed quality of filter paper.
- Wait for 2 minutes to allow petrol to evaporate. There should not be any stain left after this period on the filter paper as stain may indicate presence of high boiling point compound.
- If stain is noticed, there is a possibility of adulteration. However, one has to be careful regarding pinkish colour which may be the colour of petrol.

Fig. 3.6: Filter Paper Test
(Source: Google)

b.2 Over-charging:

As the name suggests, "Over-charging" means charging more by dealers towards sale of products like MS (motor spirit) or HSD (high speed diesel) at a price/rate which is higher than the authorised price set by the Oil company which has supplied the product to the concerned dealer.

b3. Pilferage

The stealing or making attempts to steal the product is defined "Pilferage" towards transportation of the product or from a storage tank. It includes any unauthorized action/attempt or to do tampering with containers or storage tanks.

b.4 Sale of Off-Specification product

Sale of MS (motor spirit) or HSD (high speed diesel) by resellers whose quality is not matching BIS (Bureau of Indian Standards) Specifications number *IS 2796*

& IS 1460 for MS (motor spirit) and HSD (high speed diesel) respectively, amounts to sale of Off-specification product.

The first check for ascertaining whether product(s) is/are meeting specifications or not, is by doing Density Test as explained under and shown in Fig 3.7:

Density Check (to check petrol and diesel) as per *(HPCL website, 2019)*

- Take a 500 ml clean glass-jar, a suitable hydrometer of corresponding range, a thermometer and conversion table as per ASTM (American Society for Testing of Materials). All these items are available at Retail outlets of all oil companies.
- Clean the nozzle of required product and fill about 3/4th of the jar with this product.
- Dip thermometer to measure temperature of the product. Then dip hydrometer in the jar and record the density at ambient temperature.
- With the help of ASTM table, convert the observed density as above into density at 15 degrees centigrade and compare the same with the density shown on the invoice or recorded in the register maintained at the retail outlet. If difference is more than +/-3.0 Kg/m^3, quality may have been compromised with and the product requires further clinical testing in the lab approved by Oil Company or the Ministry.

Fig. 3.7: Density Test
(Source: Google)

b 5. Short Delivery

Marketing Discipline Guidelines (MDG) – 2013, issued by Ministry of Petroleum & Natural Gas prescribes the delivery norms as under for the dealers towards delivery of products at Retail Outlets:

b.5.1 The dealer is supposed to check on daily basis the W&M (Weights & Measures) Department seal in the Metering Unit / Totalizer of the dispensing units for correctness and also for validity of W&M certification for the unit. It has to be valid for the unit to be operated. In case W&M / totalizer seal is found tampered with or validity has expired, sales by using the concerned dispensing unit is to be suspended with immediate effect and corrective action to be initiated by reporting the matter to concerned oil company. Utilisation of Unit or the sale through the unit will remain suspended till the corrective action is completed for replacement of seals.

b.5.2 Dealer will ensure keeping a five litre "measure" which is duly certified by the W&M (Weights & Measures Department) for use by customers as and when desired by them for testing of dispensing units at the same retail outlet.

b.5.3 For selling lubricating oils at retail outlets, small quantity measures from 100 ml to 500 ml (or any other denomination) are used. It is mandatory as per MDG that such measures are duly certified and stamped by W&M (Weights & Measures) Department.

b.5.4 MDG 2013 states that dealers are responsible for ensuring delivery of correct supply of products to the buyers always. Hence it becomes mandatory that delivery through nozzles of all Dispensing units at a Retail outlet is checked on daily basis for "correctness" with the help of a 5 litre measure (Fig 3.8)

Fig. 3.8: A 5-litre Measure
(Source: Google)

Proper accounting of quantity used for testing is to be done by recording the same in the stock register maintained at retail outlet. If there is deviation in delivery through dispensing pumps, the same should be immediately informed to W&M (Weights & Measures) Department, and also to the parent Oil Company Office. Re-stamping and re-certification will be carried out by the concerned authorities in W&M (Weights & Measures) Department. The unit can be operated only after re-stamping is done and delivery is set right.

Hence any "less" delivery through nozzle at the Filling station against full payment is termed as "short delivery". For example, if customer has paid for five litre of fuels and if by manipulation in the dispensing unit or otherwise, only 4.90-liter quantity is dispensed, it is said to be delivered short by 100 ml. Though short delivery of 100 ml may appear to be meagre, but considering average sale at a particular Filling station, suppose 100 KL (Kilo Litre) per month, the dealer may generate extra quantity of 100000/5=20,000*100/1000=2000 litres per month, which translates to extra profit of 2000X70= Rs 140000 if fuel is petrol, and Rs 2000X50=Rs 100000 if fuel is HSD. The extra profits will further rise if average sale is higher than assumed quantity of 100 KL per month or if short delivery is more than 100 ml per 5 litres. In some extreme cases short delivery can be of the order of 300 ml per 5 litres. As per W& M Act, permissible short delivery in any unit is 25 ml per 5 litres.

Fig. 3.9: Assessing short delivery at Retail Outlets
(Source: Own source)

The delivery can be checked through 5-liter measure. If meter shows reading of "5.10" as shown above when 5 litre measures get filled up, it means short delivery of 100 ml, since customer pays by 'meter reading' and not by 5-liter measure.

Fig. 3.10: Assessing excess delivery at Retail outlets
(Source: Own source)

Similarly, if meter reading shows 4.90 as above during 5-liter measure check, it means excess delivery of 100 ml, because when customer pays for 5 liters (in meter reading) it will actually be 5.10 liter. Excess delivery is also not desirable as it indicates either manipulation or system-malfunctioning, affecting the profitability of dealer – a non-sustainable phenomenon.

b 6. Stock Variation

It means variation in sales through meter and stock level in storage tank. It has to be within permissible limits as specified in the relevant guiding principle or the control order. The norms for permissible limits are as under:

Variation in stocks in underground storage tanks at any retail outlet may happen due to evaporation or due to handling losses and hence certain margins are allowed as per rules to give cushion towards such losses. Besides this, storage tanks are not physically calibrated as these are mathematically calibrated and hence (+/-) 4% variation in existing stocks is allowed as per existing guidelines.

Evaporation/handling losses in MS (Motor Spirit) as follows-

If Retail outlet sales are 0-600 KL per annum, evaporation loss in MS is allowed @0.75% of annual average sales.

Or @ 0.60% on annual average sales of above 600 KL

i) Similarly, permissible applicable rate of handling losses in HSD (High Speed Diesel) would be @0.25% if annual average sales are in the range of 0-600 KL
ii) Or @0.20% if annual average sales are above 600 KL

(also to be taken into account the Shrinkage losses and temperature variation allowance wherever the same are applicable)

b 7. Unauthorized exchange

The product exchange between two entities like dealers or the bulk consumers if not authorised through a legal instruction by any government agency or by the concerned oil company is “Unauthorized exchange”.

b 8. Unauthorized purchase

“Unauthorized purchase” is purchase of product by the reseller from a source other than the authorized source by concerned oil company.

b.9 Unauthorized possession

Keeping the product without any authorisation is “Unauthorized possession” of products.

b 10. Unauthorized sale

It means selling of product by an entity like a dealer or a consumer to another entity like another dealer or a consumer or to any other person without written directions to do so from State Government or the oil company.

3.4 Understanding the Marketing Discipline Guidelines:

As per *Marketing Discipline Guidelines (MDG) 2013*, basic purpose of such guidelines is to create benchmark for giving services to customers at Retail Outlets. As per guidelines, responsibility lies with Dealers to ensure sale of correct Quality & Quantity of the product and to provide excellent service to customers.

MDG contains 8 chapters as per following details:

Chapter 1: defines handling procedure of products by dealers at retail outlets.

Chapter 2: describes uniform guidelines for all oil companies regarding collection of sample and their testing in the laboratories.

Chapter 3: prescribes how products like MS / HSD / SKO would be handled at the storage location of oil company and regarding the duties of Oil Companies

Chapter 4: describes procedure for maintenance of equipment of oil companies at Retail Outlets

Chapter 5: describes various types of Irregularities which may happen at Retail Outlets (for sale of MS/HSD) and for SKO-LDO Dealerships

Chapter 6: Kerosene supplies under public distribution system: this chapter of MDG prescribes duties of SKO Dealers:

Chapter 7: This chapter covers details regarding Mobile Laboratories

Chapter 8: This is the chapter which prescribes punitive action to be taken by oil marketing companies under MDG, in case of irregularities found at ROs.

As is observed from the above, Chapter 5 contains details of malpractices and irregularities, generally observed at ROs which is covered from page number 30 to page 38 of MDG. Chapter 8 of MDG prescribes penalties against each of such irregularities by the classifying the same in three categories namely, Critical, Major and Minor as per details given below:

Table 3.1: Penalties as per MDG

SNo.	***Category of irregularity***	***Details of Irregularities as per chapter 5 (clause number in bracket)***	***Penalty as per Chapter 8***
1	Critical	a) In case of adulteration found at ROs in the stocks of MS/HSD (5.1.1) b) If it is found that seals of the metering unit are tampered with in the dispensing unit {5.1.2 (b)} c) In case, seal on totalizer of dispenser is found tampered or it is observed to be deliberately made non-functional or if genuine breakdown of totalizer is not reported to the officials that totalizer is non-operational (5.1.3 read with 5.1.2)	The punitive action prescribed in MDG is "Termination of Dealership" in the First Instance for all critical irregularities.

		d) If it is found that additional or unauthorized fittings or gears or electronic components are installed in dispensers or tampering of dispensing unit is observed. {5.1.4 (a), (b), (c)}. e) If it is observed that there are storage facilities at ROs which are unauthorised. (5.1.5). f) In case of any purchase or sale of products by the dealer which is not authorised. (5.1.6).	
		g) during transportation of product, if the carrier (Tank lorry) is found carrying unauthorized product which is under decantation at the RO (5.1.7)	
2	Major	a. In case of refusal by RO dealer or its staff towards drawl of samples or to do inspections. (5.1.8) b. If reference density is not found available at the RO during inspection. (5.1.9) c. If it is found that normal MS/HSD is being sold as branded fuels.	For a, b, d, e & f: punitive action in First instance is suspension of supplies and sales from RO for 15 days. In case of its second instance, suspension of supplies and sales would be for 30 days. For third instance, the punitive action of "Termination of the dealership" is prescribed.

		(5.1.10) d. If Stock variation is found beyond permissible limits but sample taken during inspection is found to be passing clinical quality tests. (5.1.11) e. If it is found that record of sales, stock and other critical parameters like density etc is not maintained since the date of previous inspection. (5.1.12) f. If overcharging is found in the sale of MS/ HSD/ CNG/ Auto LPG (5.1.13) g. If there is no provision of toilet or if it is not found clean (5.1.14.b). Ver. 5 / 02.10.2017 45 h. Automated Retail outlets : 5.1.16 (a), (b), (c) i. If payment is not made to staff of their salary including wages and other benefits (as per clause 5.1.18) to the manpower employed at the ROs. j. If Dispensing unit is found to be delivering Short, but W&M seals are intact :	For c: for first instance, differential price between the two products would be recovered from the date of previous inspection. But if it is Second instance, "Termination of the dealership" is prescribed. For g: for the first instance of offence, levy of penalty of Rs. 15000 (Rupees Fifteen thousand) and for Second instance of irregularity, penalty charges of Rs. 25000 (Rupees Twenty-Five thousand) would be levied and for Third & subsequent instances, penalty of (a) Rs. 35,000 or 45% of the monthly dealer margin (based on average of last 6 months), whichever is higher; and (b) Suspension of supplies and sales for seven days or till the defect is rectified in toilet, whichever is later. For h: In case of first instance of offence, there will be levy of Rs. 1,00,000 (Rupees one lakh only) as penalty Ver. 5 / 02.10.2017 46 For second instance of

		5.1.2 (a)	irregularity, penalty charges would be increased to Rs. 2,00,000 (Rupees two lakhs only) and suspension of supplies and sales for seven days and in case of third instance, punitive action of "Termination" is prescribed for the dealership. For i: for the first incidence of offence, punitive penalty of 20% of the amount equivalent to monthly margin entitled to the dealer, based on RO`s average sale of previous three months is prescribed. In case of second instance of offence, penalty of 30% is levied of dealers` monthly margin, to be calculated based on previous 3 months' average. But in case of third & onward instances, penalty amount increases to 40% of the dealer`s monthly margin to be calculated based on previous 3 months' average & suspension of supplies and sales for next 15 days. For j: Punitive action for first

			instance is Rs. 25,000 (Rupees twenty-five thousand only) for each nozzle found delivering short beyond permissible limits as specified in Legal Metrology Act/Rule. For second instance which is within one-year period from the date of 1st instance, penalty amount increases to Rs 50,000 (Rupees fifty thousand only) for each nozzle found delivering short beyond permissible limit as specified in Legal Metrology Act/Rule & suspension of supplies and sales for a term of 15 days. For the Third instance happening within one year from the date of 1st such instance, punitive action is "Termination" of the dealership.
3	Minor	a. though specified records from previous inspection may be maintained but if prior records are not available. (5.1.12) b. If there is no provision of facilities like air, first aid	For a, b, c: The action prescribed is issuance of a warning-cum-guidance letter to the dealers in the case of first instance, but it is penalty of Rs. 10000/- per irregularity for second instance and levy of penalty

		box or a telephone.(5.1.14.a) Ver. 5 / 02.10.2017 47 c. Miscellaneous.	of Rs. 25000/- per irregularity for committing the same irregularity in third instance onwards.
		I. In case of non-display of RSP (Retail Selling prices) duly authorised by Oil companies for MS/HSD/CNG/AUTO LPG. (5.1.15)	
		II. In case daily density and opening stock is not displayed at RO, and if message for ensuring "Zero" through a sticker before delivery on the dispenser is not available, or display of name of product on each nozzle of dispensers is missing along with contact details of authorized persons who may be approached/ contacted in case of any Complaint / Grievance / Emergency. (5.1.17) III. If complaint book is not maintained or if it is not provided when asked for/ demanded by the customer. (5.1.17) IV. If the housekeeping is Poor at Retail Outlet. (5.1.17)	

		V. If customer attendants or driveway Salesmen at the ROs not in uniform and/or they are not wearing badges. (5.1.17) (One or more irregularity under the above category a b, c, d or e will be considered as one irregularity only for the purpose of taking action).	

Though above punitive actions are prescribed, it is mandatory as per MDG-*2013* that such cases of offences and irregularities are to be properly established before any action is initiated against the dealership.

It has also been clarified in *MDG* that if during inspection of an RO, multiple number of irregularities (more than 1) are found concurrently happening, each irregularity would be independently counted as a separate incidence/instance of irregularity under the respective category prescribed for taking a suitable action towards that particular irregularity and the instance. In other words, prescribed action would be initiated for every irregularity (after establishing the same) thereby effecting a compounding impact. This has also been clarified in *MDG* that punitive penalties described therein are the minimum and it is left to competent authority (decision maker) of the concerned Oil Company to take suitable higher action if so required, against the dealership, in line with the provisions of the Agreement, including Termination in the first instance itself.

For calculating the second and third instances as prescribed under MDG, the same will be done in the previous five years, starting from the date when first irregularity was observed.

The *MDG* further prescribes that apart from Oil company officials, various Central/State government officials are also authorised/empowered to do checking

of RO dealerships for assessing / ascertaining and seeking securing compliance from the dealer with respect to provisions of relevant laws and the respective control orders. If there is any instance of "malpractice or irregularity" is observed by such inspecting authorities (outside oil company officials) at the time of inspection/checking, the same will be reckoned as a "malpractice or irregularity" under MDG and oil companies will be liable to take action against the dealership on receipt of suitable advice from such authority. Wherever the penalty is prescribed in the form of a "fine", the same will be payable by the dealer within 30 days from the date of notice issued by the oil company.

Auto Fuel Policy:

In Jan 2013, an expert committee was formed by MOP&NG (Ministry of Petroleum and Natural Gas) on "*Auto Fuel Vision and Policy—2025*" to chalk out a broad plan to ascertain required quality of fuel and to set norms and standards for vehicle emissions for a long term period up to 2025. There was a similar study carried out in 2003, which prescribed nation`s vehicle regulations in line with standards in Europe and adopted a long-term plan for enforcing stricter fuel quality norms and emission standards up to 2010.

The committee formed in 2013 was also assigned to recommend norms regarding emissions from existing in-use vehicles and the control measures, along with fiscal measures for upgrading and improving oil refineries, and suggesting alternative fuels in line with wide-ranging assessment/estimation by the *International Council on Clean Transportation (ICCT)* which provides a base to the expert committee for identifying and making recommendations to minimize greenhouse gas (GHG) and air-pollutant emissions from vehicles. The scope of assessment by the committee covered present based on past and the probable expected direction of control measures towards vehicle emission in the country, outlining various policy options based on global experience and internationally the best practices in this area.

As a result of policy frame work emanating from the study carried out in 2003, there has been considerable improvement in the context of vehicular emissions

of PM10 (particulate matter) which has been declining in the last decade and also growth pattern has slowed down in the emissions of NOX-oxides of nitrogen. But automobile sales have been rising as about 1.7 crore vehicles hit the road in a year at present and this number is continuously rising and is expected to jump to double the number, by 2030. So there has to be control on per-vehicle emission norm that needs to be reduced significantly to maintain or improve the progress made since 2003 towards reducing emissions, as growth in automobile sector is pushing air pollutant and greenhouse gas emissions swiftly upward. Besides this, nation`s economy is becoming more dependent on fossil fuels, which are not majorly produced in the country but are imported. These developments put general public and their health at ever-increasing risk and hence there is very urgent need for introducing effective regulations on fuel efficiency for all types of vehicles, to control the emission and air-pollution situation.

As per estimates by WHO (World Health Organization), there is very large number of deaths (over 700,000 people) especially in South Asia due to PM (particulate matter) pollution and as per these estimates PM2.5 emissions has become the sixth largest killer in this part of the world. In this context, few Indian cities also face this problem as these cities consistently fail to meet NAAQS (National Ambient Air Quality Standards) as vehicle population in these cities contribute more than 50% of all NOX (oxides of nitrogen) emissions and about 25% of PM2.5(fine particulate matter) emissions – the two prominent killers.

Though there has been improvement in the quality of fuel and tail-pipe emission standards in the country in the last few years, these still lag advanced countries almost by a decade or so. In the context of awareness and sensitivity to this global phenomenon, other major economies have definite plans in place to reduce sulphur content, which is harmful, in the fuel being used in their respective countries and they are on way to march towards stricter emission standards. Hence there is a greater need for stringent fuel-quality and tail pipe emission standards throughout the country, to tackle the menace of pollution on a long-term basis, particularly keeping in mind large number of existing (in-use)

vehicles-which may be quite old and therefore may be gross emitters- to address the issue of air pollution due to exhaust emissions coming from entire vehicle population. It can be achieved by enforcing that automobiles already plying on the road operate as per specifications and do not emit excess particulate matter and other pollutants – Nox and SOx etc.

This may also require changes in current program relating to PUC (Pollution Under Control) which can be made more stringent and effective by picking up vehicles off the road and testing them as per standard emission norms. Due to tendency among Indians to keep vehicles in service for a relatively longer duration, stricter norms are also required to be in place regarding length of vehicle age as otherwise emission controls get disturbed because they are currently based on certain assumptions with respect to serviceable age of the vehicle and keeping the same in service for longer period results in excessive emissions.

Further, a stricter fuel quality-assurance program is needed to enforce compliance of fuel-quality specifications at all levels, to ensure that vehicles take full advantage of technology by using adequately clean fuel to release lesser amount of emissions.

Vapour recovery systems are also required to be in place to control evaporative emissions in addition to tailpipe emissions. Evaporative emissions may be a health-hazard (due to benzene content) to those who are living near petrol stations and to those who are refuelling vehicles as organic compounds present in fuel vapours damage air quality.

It is expected that if India takes a concerted action in a well-coordinated manner on all fronts, there is possibility to reduce vehicular emissions by about 80%.

Chapter 4
Theoretical Premise

4. Theoretical Premise:

Fraud Theories:

Broadly, following major theories on Fraud have been found relevant:

a. The Differential Association Theory by Sutherland, EH (1947): Crime related behaviour is not inherent but it is result of learning through interactions with others who have done it before *(GM Sykes, 1957).*

b. The Fraud Triangle by Donald R Cressey (1953): As per this theory, there are three constituents to do frauds and first one is 'Opportunity' because unless there is an opportunity, frauds cannot take place. Next one is 'Pressure' which may compel one to do frauds and the last one is 'Rationalization' which enables one to rationalize his actions even though it may not be a correct action. (*Abdullahi & Mansor, 2015*).

c. Neutralization Theory by *Gresham Sykes and David Matza (1957):* neutralization of guilt and shame for denial of responsibility, injury and victim, blaming the prosecutors and putting grater loyalty to one's faction or bloc ignoring all else.

d. Concept of Fraud Diamond: Additionally, Capability to commit fraud is a must (*Wolfe & Hermanson, 2004*).

Predominantly, Fraud Diamond theory seems to be relevant towards fraudulent behaviour at Retail outlets. This theory will be discussed in detail in subsequent pares.

4.1 Understanding Fraud

The papers authored by *Peter Grabosky, Grace Duffield and Kelly Fisher/Dr. John Nugent* prescribe that Fraud is misrepresentation of certain existing facts, done intentionally by a person, knowingly fully well that it is false, with the intention of causing damage or injury to another person. The fraud is defined as follows:

As per Oxford Dictionary (*https://www.oxfordlearnersdictionaries.com*): Fraud is defined as "the crime of cheating somebody in order to get money or goods illegally"

As per Webster`s Learner`s Dictionary *(http://learnersdictionary.com/definition/Fraud*): fraud is defined as "the crime of using dishonest methods to take something valuable from another person".

As per Indian Contract Act (1872) *(www.advocatekhoj.com)*:

Following acts committed by a person or a party or with their collusion with the intention to deceive another person or the party or their representatives amounts to committing "Fraud":

1. the suggestion as a fact, of that which is not true, by one who does not believe it to be true
2. the active concealment of a fact by one having knowledge or belief of the fact;
3. a promise made without any intention of performing it;
4. any other act fitted to deceive;
5. any such act or omission as the law specially declares to be fraudulent.

In any organization, fraudulent payments may take place which covers payments on the basis of false invoices or theft through alterations made in cheques. It can also be in the form of false claims towards artificial business expense or through false claims in the cash register *(Albrecht C. K., 2008)*.

Section 447 of the *Companies Act*, 2013 defines Fraud as under:

*"*Fraud in relation to affairs of a company or anybody corporate, includes any act, omission, concealment of any fact or abuse of position committed by any person or any other person with his connivance in any manner, with intent to

deceive, to gain undue advantage from, or to injure the interests of, the company or its shareholders or other persons associated with the company, whether or not there is any wrongful gain or wrongful loss."

Fraud can also be understood as seeking undue and unlawful gains through unfair means by intentional deception to deprive the victim of a right which he or she legally deserves (*Wikipedia).*

Abdou & Pointon, J. (2009) in their paper titled as "Credit card fraud and detection techniques: a review" define that Frauds can be of following types:

1. Bankruptcy Fraud: Exceeding one`s financial ability
2. Theft/Counterfeit fraud: Using someone else`s funds without his/her knowledge.
3. Application fraud: using someone else`s details in the application form to apply for credit card etc.
4. Behavioural Fraud: stealing someone else`s behaviour like doing online transaction etc. for own benefit.

It is sid that fraud is one type of ethical breakdowns *(Albrecht, N.C.Hill, & Albrecht, 2006)*

Based on above the researcher infers that above definitions/interpretations of a "fraud" may be very well applicable to Retail outlet business as there is clear promise of supplying correct quality and quantity of MS or HSD to the customers but perhaps not delivered (as per general perception) which may be for obvious reasons of earning more money than permitted by law.

However, it is also vital to comprehend "Psychology of Fraud" before proceeding further. The authors *Grabosky P and Duffield G* have described Fraud in their paper published in the journals like "Trends and Issues in Crime and Criminal Justice series for Australian Institute of Criminology".

4.2 Fraud – Psychological Factors

The first psychological explanation for fraud gives indication towards greed and dishonesty of individuals, forcing them to commit frauds. However, this explanation is basic and simple as there may be many in our society who are law abiding in nature but are exceedingly possessive and materialistic. It may look unreal but it is a fact that fraud is not always committed by dishonest people. The previous researches indicate that it may not be possible to identify particular psychological characteristics which serve as a valid and reliable reason for tendency of individuals for fraudulent activities *(Ramamoorti, 2008).*

Based on above, this researcher has the view that it may only be a myth that Retail outlet dealers indulge into fraudulent activities only for extra buck of money. The exact reasons may be different and therefore this research is aimed at identifying all such factors which lead to this menace and because of which public has to suffer at large.

The basic elements of motivation for fraud are discussed in the following paras *(Duffield & Grabosky, 2001)*:

Generally, financial strain is the main reason for almost every type of fraudulent activity. It may be on account of carelessness, lack of judgement or misfortune or a combination of the any of these. The authors in this paper have felt that financial stress itself is questionable as affluent people may also feel economically deprived at times if they compare their standard with others who are rich and whom they perceive to be equivalent.

Therefore, in the context of retail outlet dealerships, this researcher infers that even those dealers who are affluent in the eyes of others may feel economically backward, if they compare themselves with others whom they think, are affluent as PPT (per pump throughput) varies from market to market, from dealer to dealer.

In some economically viable cases, sales may be just 75 KL per month whereas in other Retail Outlets it may go up to few thousand KL per month. Operational Income or affluence will therefore be different in each case.

Further, above authors have observed that financial strain may not actually exist in reality but a will to have in excess of one`s affording capacity may cause financial deprivation to the individuals. An element of ego by comparing oneself with other affluent people who are richer and an unrealistic approach to obtain the same standard of living in terms of materialistic possessions may lead to the feeling of financial strain and then to fraudulent activities.

There can be other financial losses as described by Peter Grabosky & Grace Duffield in the following para but these reasons do not appear to be relevant to our group of study:

One of the reasons for financial strain may be because of fear that something which is owned by someone may be lost due to some reasons, like high-performing businessmen may face a situation which is adverse to their current business models, that may damage or place their business interests in the acute financial exposure thereby threatening empire they have made over a period of time. Therefore, to get short term solution, some people may see fraud as saviour from threat of loss of wealth or stature in terms power & pride they enjoy.

The financial stress can also be result of other factors like compulsive gambling or it may result from other lifestyle choice like in present age, the habit of getting into costly addiction of smoking or consuming alcohol/drugs etc is bound to have financial strain on the part of those individuals who don’t care and indulge in them.

However, following observation in the study conducted by Peter Grabosky and Grace Duffield is absolutely relevant and perhaps is largely responsible for fraudulent activities in Indian Petroleum Industry:

The psychological explanation to commit fraud is reducing doer`s restraint by justifying his/her own actions and to rationalise his/her doings. This is also known as "neutralisation techniques" to commit frauds.

Generally, there is a tendency among behavioural scientists to use the terms 'motivation' and 'neutralisation' in the same manner. But these two terms are different in the sense that 'motivation' actually is what encourages or compels one to do frauds whereas "neutralisation" facilitates by overcoming or nullifying moral objections which otherwise may arise internally in a normal person.

Whatever may be the cause of committing frauds, it is true in all cases that most of fraudsters justify or rationalise their wrong doings.

Dwelling further to understand the nuances of fraud, a paper by Kelly Fisher/*Dr. John Nugent* was studied in which the author analysed Psychology of Fraudsters as to what motivates such people to commit crimes. He observed as under:

a. It is not necessary that fraudsters are hard core criminals as the researches have shown that in 87% of cases, culprits were first time offenders.
b. In majority of the cases, fraudsters were young male people of just over 30 years but less than 45 years.
c. More than 50% suspects were experienced work force (3-10 years) of respective organisations. So the new entrants are not a threat at least in the initial years.

4.3 The Differential Association Theory

Sutherland, EH discovered a significant theory on psychology of unlawful behaviour leading to crimes, in the late 1930s regarding the white collar crime but he introduced theory of Differential Association in 1947 to explain driving force for a person to indulge in crime (*Duffield & Grabosky, 2001*). This theory puts up a very valid argument that unlawful behaviour is not something which is inherent, but is quite developed through experiences and interaction with others. The author further opines that such learning mainly happens in limited and closed groups, through informal and personal interactions rather than from

formal and staggered communications. The theory also mentions that techniques and learning of criminal behaviour are also through interactions, and so is the motive and rationalization, associated with crime. In nutshell, basic principle of the differential association theory is that an individual will start engaging in criminal activity if he/she perceives that rewards for abiding by the law are less and can be exceeded by breaking the rules.

4.4 Neutralization Theory

David Matza & Gresham Sykes created the theory of neutralization in 1950s. It is somewhat similar as the concept of rationalization, which is considered as a necessary ingredient for committing a fraud.

The neutralization theory suggests that people tend to neutralise their shame in order to commit crime by overcoming beliefs of right and wrong and for doing so, they overcome their shame by neutralising their feelings (GM Sykes, 1957). As per this theory, there are five main ways of doing neutralization and these include:

1) Not owning the responsibility: This is done by assuming that there is no alternative but to do frauds or feigning that his/her action is beyond one's control.
2) Assuming no harm to anybody: neutralisation is achieved in these cases by claiming that there has been no harm to anybody due to one's wrongful actions.
3) Shifting the blame to victim: by claiming that it is victim who brought it upon himself and that he deserved it.
4) Shifting the blame to prosecutors: Blame is shifted to prosecutors on the perceived ground that they did not show ethical behaviour.
5) Loyalty to higher principles and likeminded groups: When fraudster assumes that his/her actions are to satisfy a higher principle and therefore it becomes important for him/her to put loyalty to one's bloc, ignoring all else.

In line with Neutralisation concept developed by EH Sutherland in 1947, methods of doing fraud including the 'neutralization' is result of learning

through experiences in closed social groups and not inherited from within. The mainstay principle of neutralization theory is that rationalization of one`s action to commit the crime is paramount, and that the rationalization is the first stage and it is a precursor and is necessary to happen for actually committing the crime.

The researcher has applied both the theories in understanding the typical behaviour of most of the dealers in the Indian context with respect to retail out business and the general perception about it.

On making further study with respect to as to what leads to frauds, Fraud triangle has been explained as under:

4.5 The Dimensions: Fraud Triangle

Donald R. Cressey developed a significant theory in 1950s regarding fraud motivation (*Abdullahi & Mansor, 2015*). The phrase "fraud triangle" was not created by Cressey himself, his model has been accepted to become so. As per this theory, there are three elements which are generally linked with fraudulent activity. These three elements are "opportunity" which means that without an opportunity, fraud cannot take place, "pressure" which means there has to be some force or compulsion to do frauds and "rationalization" which means the ability to rationalise one`s wrong action. The triangle of these elements is as illustrated below *(Glasbeek, 2014)*:

According to Cressey's (1953) theory of Fraud Triangle and his observations during the course of his study, all the three elements are essential and have to be present for the occurrence of a fraud. In simple words, it means that fraud will not occur if one element is missing.

Fig. 4.1: The Fraud Triangle
(Source: Association of Local Government Auditors (2014))

Elements of Fraud Triangle:

Opportunity: Opportunity is one of the most important and vital element for committing a fraudulent activity. A potential fraudster may not succeed despite having a strong desire, unless opportunity is perceived to be present and therefore the act of fraud may not fructify due to lack of Opportunity being there.

Donald R. Cressey proposed that opportunity has two basic aspects, the general information and technical skills. In the first aspect of general information, employees know that they are in a position to take advantage of their respective authority for committing a deceit. In other words, general information can be misused to take advantage of a company resource, based on individual authority. A company with poor internal controls and easier employee access to company`s assets, information and records provides a good opportunity to the prospective wrong-doers.

Another aspect in this direction is skill, which is possessed by fraudsters and the related individual abilities necessary for actually committing the fraud. If an employee is well versed with finance and accounting knowledge and he or she also knows how to conceal in the books, combination of the two, creates a

dangerous preposition for the company and an opportunity to such employees for committing frauds.

Therefore, like in any other Industry, frauds in petroleum Industry may also be caused due to possible gaps in the control system. If internal controls are strong or if they are effectively applied, there is no reason that there can be frauds in delivery of liquid fuels at Retail outlets.

As per fraud triangle theory, other elements for a fraud to happen are as under:

Pressure: As per Fraud Triangle Theory, second element after Opportunity is non-shareable financial pressure (*Abdullahi & Mansor, 2015)*. There can be actual financial pressure or it can be a perceived one. For example, failure to pay off certain dues can result in real financial pressures or unexpected medical bills or a debt of large may result in real financial pressure but instances such as the desire to improve one`s status or to lead a lavish lifestyle beyond one's resources are the examples of perceived financial pressure. The theory put forward by *Cressey* (1953) devised that these pressures (financial) can be divided into following six basic groups *(Shabnam Fazli Aghghaleh, 2013):*

1) Violation of attributed status: This type of dilemma is in those circumstances where one gets into financial problem due to reason which is not socially acceptable.
2) Personal failures: due to poor personal decisions, there may be personal failures or it may emanate from a bad financial planning. Since it is difficult for some to sustain pressure on account of such failures, they feel dejected, embarrassed and ashamed.
3) Failure of Business: Reversal of Business results in financial difficulties which arise not due to personal failures, but by external factors. Developments like slowdown in economy or reduction in demand may result in financial pressure. When livelihood is threatened even by external forces, some people resort to do wrong things for maintaining their existing prestige and status.

4) Being aloof: when the person is not able to share failures with anyone, helplessness thus caused may prompt him/her to do frauds *(Brazel, Jones, & Zimbelman, 2009).*

5) Status Enhancing: When there is strong urge to improve status, perceived financial pressure is allowed to get built up, leading to acquiring costly materialistic items through unfair means.

6) Poor relations between the employer and the employee: If relations of employees with employers are not good, it can cause perceived financial pressure, as per Cressey`s report. It means that employees in this situation would feel poorly paid or they would feel that they are over worked, and hence they would undergo feeling of perceived financial pressure.

But above reasons of pressure do not appear to be actual reason for frauds in the retail outlet business in India because such reasons can be in few cases, not wide spread as it is perceived to be.

Rationalization: As per fraud triangle theory, rationalization is the third element *(Abdullahi & Mansor, 2015))*. This term means that an offender justifies his action within himself, before committing the fraud. When two elements discussed above i.e. opportunity and financial pressure are present in a situation, someone may feel an urge to do fraud by presuming that there is nothing wrong in doing so after internally justifying action so taken.

The studies show that besides psychological factors, there can be different proportions of fraud. The research by *Peter Grabosky and Grace Duffield* shows that types of offences can be distinguished on the basis of psychological factors and so is type of offenders. The offenders can be grouped under the following four general categories of fraud (Duffield & Grabosky, 2001):

1. Fraud may be done against multiple number of persons through indirect means or through print or electronic media.
2. Fraudster can be a senior official of that organisation
3. Fraud may be carried out by one individual against another.

4. Fraud may be against an organisation by a client or employee

In the context of this research, fraudsters can be in any one of the categories or in the combination of more than one categories described above. It can therefore be understood based on above that risk of fraud may be factor of both the personality of an individual and also the environmental or situational variables. Therefore, capacity to commit fraud varies from person to person, according to their risk taking capacity at any given time because there may be low-to-high risk taking individuals in different situations.

Since dealers` business environment is different from one place to another or they deal with different sets of customers at different times, chances of fraudulent behaviour may vary depending upon the situations in the corresponding markets/environments. There can be very effective control mechanism to discourage fraudulent behaviour but at the same time there are some habitual offenders who do not change but indulge into fraudulent behaviour. On the contrary, there can be situations where enough supervision is lacking and there is no effective control mechanism, it would encourage frauds.

Ten common personal characteristics of fraudsters (*Hann, 2015*) are described as under:

1) Feeling of pay not being commensurate with job duties
2) Desire to live or living beyond one's means
3) Normal case of financial pressure with or without personal debt
4) Seeing opportunity and a strong challenge/urge to violate the system
5) Having a strong aspiration for personal gain
6) Possessing a wheeler-dealer attitude
7) Being surrounded or closely associated with customers
8) Family wanting more wealth and hence succumbing to family pressure
9) Having excessive gambling habits
10) Non-recognition of performance in the job

There may be another element which is different from three elements of fraud triangle. This element is “personal integrity” in place of rationalization. Albrecht (1984) took the concept and developed a fraud scale to help companies determine the level of fraud risk in different business/ environmental situations (*ACFE.com*). The fraud scale is shown below:

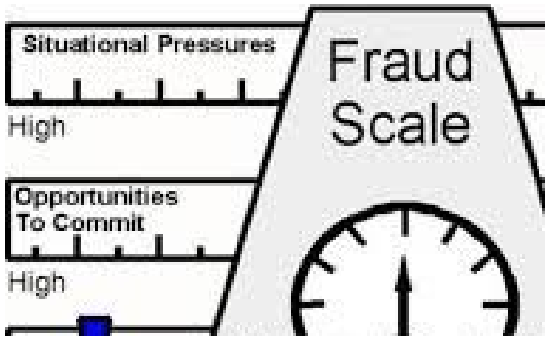

Fig. 4.2: The fraud Scale
(Source: ACFE.com)

As per the study, the likelihood of fraud may be ascertained by rating each of the three constituents of fraud on a scale from low to high. When there is a situation that elements like pressure and opportunity are open and wide (high) and personal integrity is narrow(low), there is greater likelihood of fraud to occur. But when integrity is high and other elements such as opportunity and pressure are low, there are lesser chances of fraud. Therefore, much more emphasis has been given on personal Integrity, for frauds to occur. In the context of petroleum Industry in India, integrity cannot be measured and so is with situational pressure which can neither be measured nor controlled. Therefore, it would be necessary to minimise *Opportunity* by making control systems more effective to minimise the risk of frauds at retail outlets.

4.6 The Fraud Diamond

There have also been further studies on Fraud theories, Wolfe, D. and Hermanson, D. (2004) further worked on fraud triangle theory to introduce a new concept known as *fraud diamond.* As per these authors, fraud triangle is lacking to identify other factors which may be necessary for a fraudulent activity to take

place. Therefore, they added another element, the fourth one, which is "capability", and this element is necessary for a fraudster to do frauds.

These researchers (Wolfe and Hermanson) have treated capability as a personal attribute and defined it as ability, an essential part, to do fraud. As per them, a person can have all the three elements of pressure (intention), opportunity, and rationalization, but still will not be able to do frauds unless ability and skills are present in the individual and are used. In the absence of this fourth dimension, the fraud will not occur.

The above researchers further elaborate the qualities of individuals as under with respect to one`s capability in this context:

1) Persons in the hierarchy with ability to misuse authority for taking advantage of the situation.
2) Persons with capacity to deal with stress well
3) Someone is confident that they will not be caught and is having a large ego
4) Someone has convincing and persuasive personality to cover up wrong actions.
5) Persons having intelligence to identify and take advantage of poor internal control mechanism (even though fraudsters may be well qualified).
6) Someone who has the ability of lying

Overall, the authors suggest individual capability to be a significant element which plays an important role in a fraudulent behaviour. Therefore, it should be included in the procedures for preventing or detecting frauds.

4.7 Preventing Fraud

The Researcher is of the view that Learning about fraud motivation helps understand reasons for fraud occurring. Therefore, it is a must to learn about motivation, for preventing them to happen. Though confidential checks are done - this may be considered necessary - but may not be sufficient to deter frauds. This is so because as we know that majority of fraudsters are first time offenders.

The organizations may get tempted to introduce anti-fraud policies by allocating resources for augmenting internal checks and control mechanism. However, need is to focus on all elements of fraud-occurring, to prevent the same through an effective counter-fraud methodology considering and taking into account the fact that an employee can still feel pressure and is motivated enough to do frauds. The studies show that chances of frauds can be reduced by way of appropriate policy making decisions at the top, promoting ethics at the work place and by introducing workable yet strong control measures.

Studies further indicate that five of every hundred people are insensitive to the aspect of theft, balance ninety-five percent consider themselves to be ethical and moral, feign ignorance on their mis-deeds, if any and treat themselves as law-abiding individuals and they are able to justify their crime.

It has been proved through studies that in companies which develop a culture of anti-fraud sentiments, there are lesser chances of frauds happening. (*KPMG, 2011).* Therefore, it is always suggested that ethical sensitization must be improved and suitably communicated at the work place in the entire company to drive home a point that unethical practices will not be tolerated. Framing of appropriate rules and guidelines must be given priority and properly communicated to all stake holders to avoid deliberate violation. The policy of zero tolerance and giving punishment to culprits involved in corrupt practices, sends a message – loud and clear. The concept of whistle blower must be introduced to improve intelligence on corrupt and fraud-making practices, if any. Anybody giving information on illegal action in the company must be suitably protected and rewarded (*ACFE, 2014*).

If the employees feel that they are not getting suitable compensation, they become more prone to commit frauds and risk in the company increases. (*Wells, 2001*). Another methodology used to prevent frauds is segregation of duties which has given excellent results and it has also been proved in studies that chances of fraud reduce in the companies which follow this practice. (*Bailey, 2015)*.

Similarly, in this trade, Oil companies may have to evaluate satisfaction level of dealers and their compensation package to ward off such possibilities of fraudulent activities.

For controlling frauds, companies may take suitable actions to reduce opportunities and also actions can be taken through anti-fraud intentions at the top and properly communicating the same to the employees to reduce rationalisation tendencies, there is little a company can do with 'pressure' because feeling pressure is a personalised issue. It is seen that in the companies which put excessive pressure to meet financial targets, chances of frauds are greater but in those companies which set realistic targets, chances of deceit are less because it becomes possible for the employees to achieve by honest means (*KPMG, 2011*).

Further, the authors Adebisi*, J. F. and Gbegi, D.O* in a research paper published in the journal of European Centre for Research Training and Development UK in Dec 2013 which is titled as "*The New Fraud Diamond Model* – How can it help Forensic Accountants in Fraud Investigation in Nigeria? have observed that the principles of Fraud Diamond may not be enough for investigating and stopping fraudulent activities. The authors felt that society value system in a nation and different cultures of corporate governance also play a significant role and should be considered as important factors. They suggested an new concept known as "New Fraud Diamond" to include 'motivation' as another element. They coined another term with the acronym: NAVSMICE where National Value System = NAVS, Money = M = Money; Ideology = I; Coercion = C; and Ego = E

As per their theory, there will be fewer cases of frauds if there is good corporate governance and if society Value System in any country is strong. They further suggest in this theory that key to success is to control factors that cause fraud and hence people have to be made accountable. As per them, principles and values which guide the organizations (or countries) for their routine activities and how stakeholders inter-relate them are constituents of good corporate governance.

Because “to err is human”, there can be possibility with most of the people of exhibiting unethical behaviour in a given situation – albeit there can be few habitual offenders. Hence strong control mechanism is needed in the company to help prevent fraudulent activities. The companies also look for early signs of system-failure to fight and prevent through stricter controls to minimise losses on this account.

Greed:

As explained earlier, basic factor which can be responsible for irregularities is greed for money, followed by ‘power’. In several other studies, it has been revealed that affluent or upper-class individuals tend to be selfish, wanting to have more with sense of better privileges. They are mostly self-centred and this attitude makes them feel that the wealthy don’t have to understand the feelings of others and hence they don’t need to invest in infrastructure which directly impacts daily lives in the society. As per the study, if there are more number of wealthy people in any society, lesser is the investment in infrastructure.

The study further states money becomes addiction and that enough is never enough for such addicts. As addiction of money and power grows, they constantly seek more and more of the same. In general, their feelings of “money high” work as booster to their self-imagination.

The theory of Greed says that such people do not depend on others and they are self-centred class. Hence public opinion about performance of Retail outlets may necessitate them to depend on customers and therefore may reduce level of greed among them thereby enhancing level of customer service to general public.

Risk:

In Business, we are making decisions at every turn. These decisions may involve risks because the concepts are complex and hence can be difficult to understand at the first sight. In fact, whenever we take a decision for business, we are dealing with risk. The word risk has strong connotations of danger and is generally associated with the sense of “Loss” or “Threat”. However, risk does

not always mean the danger as many a times the risk can be an opportunity for making improvements and therefore understanding risk and using it properly may bring benefits to the business. Though we can never be fully prepared for making perfect decisions in the business environment but with proper knowledge and understanding of risk, we can take informed decisions to reduce the threats. These risks can be operational risks, strategic risks, functional risks, fraud risks and so on and so forth.

To manage risk, we have to be able to measure it and to measure it we have to use probability. Probability pronounces the uncertainty and the quantitative number of risk involved. The probability of an outcome is the number of expressing the likelihood of it actually happening. It can be number between'0' and '1' where '0' indicates an impossible outcome and '1' is certain one or it can be expressed as percentage, therefore a number between '0' and '100'. For example, the probability of calling the toss of a coin 0.5 or 50 percent.

There are usually risks which have now become necessary part of business and our decisions. Therefore, we should focus on how well we will respond to them rather than trying to avoid them. While risk may not be eliminated, our attempt should be to minimize the risks.

Just to summarise**,** *Fraud diamond Theory by Hermanson & Wolfe* in 2004, which says that capability is the fourth dimension that plays an important part in committing fraud by individuals, apart from 3 other attributes of previous theory known as "Fraud Triangle", such as Pressure (or intent), opportunity and rationalisation. The capability is an individual's personal attribute and is the ability to do frauds. This is necessary ingredient for frauds to occur. As explained earlier, researchers in their theories have found that a person needs ability apart from intent which is pressure, an opportunity which is a convenient environment, and the rationalization which is the ability to rationalise own actions, to do frauds. Fraud will not occur unless there is ability and skills necessary to conduct the crime.

In the present study, Fraud diamond theory is significantly applicable because capabilities of concerned resellers vary from person to person and therefore degree of performing fraudulent activities (if any) may also vary.

While three attributes (out of four) namely “pressure (or intent)”, “ability to rationalise” and “capability” are purely of personal nature which cannot be controlled, it is only the “opportunity” which can be reduced by implementing the effective control mechanism. Hence, this study aims to identify those factors which act as “opportunities” and finally lead to fraud risks at petroleum Retail outlets. Once these factors are identified, their impact on fraud risks can be worked out along with their mitigation by modifying the control mechanism.

Chapter 5
Research Methodology

5. Research Methodology

5.1 Research Gap

Based on the above, Research Gaps may be summarized as under:

- Inadequate research on identification of factors leading to fraud risks at Retail Outlets in India
- Inadequate Research on estimating Impact of these identified factors on fraud risks
- Inadequate research on mitigation whether these can be mitigated through existing control mechanism and if not, what are the remedies and what would be the revised control mechanism.

Overall from the literature review, it has been gathered that there is no structured method for identification of various types of fraudulent activities at Retail Outlets and also whether existing control measures are enough to address the same.

5.2 Business Problem

There may be general perception that there are frauds in delivery of Auto-Fuels, namely HSD (High Speed Diesel) and MS (Motor Spirit) at Retail Outlets of petroleum companies, though these oil companies have system in place to show that correct Quality and Quantity is only supplied at their ROs. There are various newspaper reports *(Danik Jagran Meerut Edition 2nd Jul 2017 and web site News Telgu dated 31st Jan 2014*) which suggest that general impression created is that many fraudulent activities are performed at Retail outlets (ROs), adulteration and short delivery being the most prominent ones, resulting in cheating of customers. There are ten types of irregularities identified in Motor Spirit and High Speed Diesel (Regulation of Supply and Distribution and Prevention of Malpractice) Order 2005 (amended in 2007). Further, Marketing Discipline Guidelines issued by MOP&NG (Ministry of Petroleum & Natural Gas) also prescribe penalty for critical, major and minor irregularities observed at ROs.

The Newspaper reported in Oct 2017 (*economic Times dated 19th Oct 2017*) that licences of 91 petrol pumps were cancelled by the oil companies in the state of Uttar Pradesh (UP), who were found to have tampered with their dispensers to cheat fuel buyers. There are a total 6000 ROs in the state as per the report. This action was taken after state-wide inspection of all pumps across UP by state officials and the executives of oil companies during the period from June 2017 onwards.

Though closure of 91 Retail Outlets may be a significant achievement of law enforcing agencies – a step showing commitment towards providing quality services to the general public - it is still a small percentage looking at very large number of total number of Retail outlets in the State of Uttar Pradesh and also in the country. But no doubt, it is a considerable number in absolute terms and it is also a fact that these Retail outlets were caught in fraudulent activities and hence were terminated. This will certainly send a signal to others not to get into fraudulent activities and hence this step is likely to improve level of services not only in one state but also in the country as a whole.

Let's consider the following to understand and benchmark petroleum dealer's vis-a-vis other professional groups, because dealers as a group are as ethical and reliable as any other group of professionals:

Teachers: Though teaching has been a noble profession as education helps in building the Nation, but can we say that all school teachers are sincere and honest? There cannot be definite yes or No.

Similarly, for Doctors: can we say, all doctors sincere devoted to their patients?

Or for Journalists: can we say that all journalists are objective in analysing major events?

Shopkeepers: Do all the shopkeepers are honest? Or Dishonest?

Since there is no definite "YES" or "NO" to any of the above questions as there are some ethical professionals and some bad elements in every social and professional group. It may also be true for dealers as some of them might be indulging in wrong doings for cheating the customers. But it may also be true that majority of them are honest and may not be indulging in malpractices. In the first case that malpractices may be happening intensity &gravity may vary from location to location and from person to person and at different time intervals during peak or non-peak hours of the day. Therefore, Business problem can be summarized as:

Perception of Customers regarding frauds/malpractices at retails Outlets & consequent dissatisfaction, inconvenience and financial loss to general Public.

5.3 Research problem:

"To Identify factors which act as "opportunities" for causing incidents of frauds at Petroleum Retail Outlets and how to close such "opportunities" by using a mechanism which is aimed at mitigating such "opportunities" for preventing frauds at ROs**".**

5.4 Research Questions*:*

i. What are the factors leading to fraud risks at Retail-outlets?
ii. Whether these factors are impacting frauds risks if yes, how much.
iii. What are the controls available to mitigate such risks and whether these are effective enough to cover all types of frauds and related risks at Retail Outlets and proposing remedies.

5.5 Research Objectives

The Research objectives are as under:

- To identify factors leading to fraud risks at Oil PSU Retail Outlets.

- To estimate impact of such identified factors on fraud risks
- Document Analysis of these identified fraud risk factors vis-à-vis Marketing Discipline Guidelines and proposing a new control mechanism aimed at curbing such fraudulent activities to protect customers` interests at ROs.

5.6 Methodology for Objective 1:

5.6.1 Exploratory Research

This research is exploratory in nature; hence field observations were made. Based on interaction with various dealers, oil company officials and other stake holders during the course of dtudy, it was found that there are 769 Retail outlets of PSU oil companies out of 799 in total (including Pvt Oil companies) in NCR comprising of NCT (National Capital Territory) of Delhi, districts of Gautam Budh Nagar and Ghaziabad (in UP and districts of Faridabad, Gurugram (in adjoining Haryana) as on 01.01.2018. The Oil company wise break up of Retail Outlets in this designated area is as under:

Table 5.1: Number of Retail Outlets in Delhi/NCR as on 1st Jan 2018

Oil Company	Number of Retail Outlets
IOCL	391
BPCL	185
HPCL	193
Pvt Oil Co.	030
Total	799

(Own Source through interactions with dealers and other stake holders)

A survey was conducted in the above districts of NCR using a questionnaire. This target area was chosen because it comprises of National Capital Territory of Delhi, adjoining areas of Uttar Pradesh & Haryana. It is noteworthy that this is the typical area representing all types of clientele from rural to semi urban to urban. It is also felt that this area covers various segments of society, which are known for notoriety factor and hence is considered appropriate for the purpose of this study. As per the Delhi Police report on crime rate (*www.delhipolice.nic.in*), number of heinous crimes in Delhi have been as under:

Year	No. of Heinous Crimes in Delhi
2011	2171
2012	2402
2013	4159
2014	10266
2015	11187
2016	8238
2017	6527

In one of the reports, *(Shubhagata, 2019)* Delhi ranks 1st in the 19 major Metropolitan cities for the reported crimes as against 15th ranking of Mumbai, and that Delhi ranks 5th in terms of most number of murders reported whereas Mumbai comes at 16th place. In terms of kidnapping and abduction, Delhi is on 1st place whereas Mumbai is at 7th place.


TIMES CITY

Despite dip, Delhi still the crime capital

City Accounts For 28% Of Violent Crimes Reported In Metropolitans, 40% Of IPC Cases

FEWER VIOLENT CRIMES

At 2,677 cases, juvenile crime highest in city

Fig. 5.1 Newspaper cutting
(Source: Times of India, Delhi Edition 23.10.2019)

Further, as per a report published in *Times of India dated 23.10.2019* with the headlines that Delhi is the Crime Capital.

In all response was received from 504 respondents. The following formula was used for working out sample size:

$$n = N / \{1 + N_e^2\}$$

where, N = population size, e = Margin of error {MoE}, n = corrected sample size, in this case e = 0.05 based on the research condition.

Browsing internet, it is gathered from the website *https://www.mapsofindia.com/maps/delhi/delhi-ncr-map.html*, there 54 million

people residing in NCR. Taking this figure of population, sample size works out as under, assuming margin of error as 5% (or 0.05):

$n= 54000000/\{1+54000000*(0.05)^2\} = 399.99$ or 400

Actual Survey size as stated above is 504.

5.6.2 Research Design / Type of Data:

This is an exploratory research and hence primary data was generated through FGDs among Oil Company experts and also through a questionnaire to get insights from actual customers visiting ROs for fuel requirements.

5.6.3 Source of Data:

a) From focused group discussions (FGDs) duly revalidated from another group of experts. Informal interviews were also held with select transporters / dealers /customer attendants / District Officials to get further insights

b) Collection of data from customers through questionnaire

5.6.3.1 FGDS (Phase 1):

Focused Group Discussion (FGD) was conducted to gather inputs from experts drawn from Oil Companies and other stake holders. Multiple groups were formed, comprising of experienced officials who had significant experience of working in Oil Companies. Separate FGDs were also conducted for select dealers and transporters. Homogeneous groups were made and such stake holders were invited separately for ensuing freedom of expression by each group. Focused Group Discussions (FGD) were conducted on 25th Nov 2017 in which participants were carefully chosen, based on their experience and long stints in overseeing/handling of Retail Function in different capacities.

The experts invited for the focused group discussion were senior executives, having more than 10 years' fuel retailing experience in oil industry. These

executives were of diverse background and were divided into six groups who were given six different topics for discussion.

Following process was followed for conducting such FGDs:

Table 5.2: Methodology for conducting FGDs.

Focused Group Discussion (FGD)

Sl No	TIME BREAK-UP	ON THE AGENDA	OBJECTIVE/ PURPOSE	(Expected) KEY OUTCOME
1.	**15 minutes** *Introductory Session*	Background: - Welcoming invitees - FGD Process	Provide an overview of the ongoing Research work and the FGD process to be conducted	Participants' know the nature /scope of the study and what is expected out of the FGD process
2.	**10 minutes**	Q&A	Provide clarifications, if any	
3.	**50 minutes**	**Group Exercise**: - Participants to be divided into **Groups**. - Each group works on a	To initiate a discussion with senior Officers of Oil companies	Each group develops a clear and common understanding on the topic/question assigned to

	(to provide some further direction/ guidance during the session)	single topic (topic for each group as mutually decided) - *Each topic is a question* to which the group members following discussion must come up with a common answer/answers. - *Topics are inter-related and inter-linked* Topics/Questions shall include: A. **Additional Frauds currently in vogue over and above the ones mentioned in Control Order and MDG at Retail outlets**: What are the challenges in delivering correct quality and quantity of liquid fuels at Retail outlets? B. **Whether existing control mechanism is sufficient to deal with all types of frauds happening at Retail outlets?**: How differently and critically control mechanism can be implemented to ensure delivery of correct quality and quantity at Retail outlets? Brief details of shortcomings to be mentioned and ways to bring	and get their views on some of the key issues related to Frauds at retail outlets.	them for discussion. The findings of each group are to be tabled before all groups to reach a common understanding among all participants.

		amendments in the control mechanism for fraud-free delivery of products at Retail outlets. C. **Engaging Dealers / their representatives**: How Dealers can be brought on Board in taking the lead to protect customers` interests? D. **Engaging Transporters and their Representatives**: What can be the role of transport community in improving end quality and quantity of deliverables at Retail outlets? E. **Who are the other stake holders**: How in your view role of other stake holders can be crucial to bring fraud free transaction at ROs? F. **Company Policy/Strategy** - What could be the policy/strategy to make the control mechanism more effective and workable too?		

4.	**50 minutes**	• Presentation by each of the Groups • 20 minutes moderated discussion on the presentations	To get a group perspective on each of the topics/questions discussed by the groups	A clear and common understanding among all participants of the answers shared by different groups on different questions/topics
5.	**35 minutes**	***Rapid* Team Exercise**: All participants participate collectively. All participants will have to reflect back on the group presentations to be able to participate actively in this session.	To identify max.5 core strategies to promote ethical transactions at Retail outlets management	5 Core strategies/pathways identified to promote the culture of giving `value for money`
6.	**20 minutes** *Concluding Session*	Closing the Session with summing up and Q&A and a Thank You ☺	Responding to any Queries	Participants leave relatively satisfied with the FGD process/session ☺ ☺
Total Time:		**3 Hours**		

In the end, there was a discussion on a common topic combining all the six issues given to individual groups. The discussion took place in the homogenous groups for ease of exchange of ideas and fruitful conclusion of issues emerged.

Based on discussions, transcript was prepared. Transcript of discussion is attached as Appendix A.

The network diagram after processing the transcript using ATLAS Ti tool emerged as under, which captures the existing set up of retail petroleum business in the country:

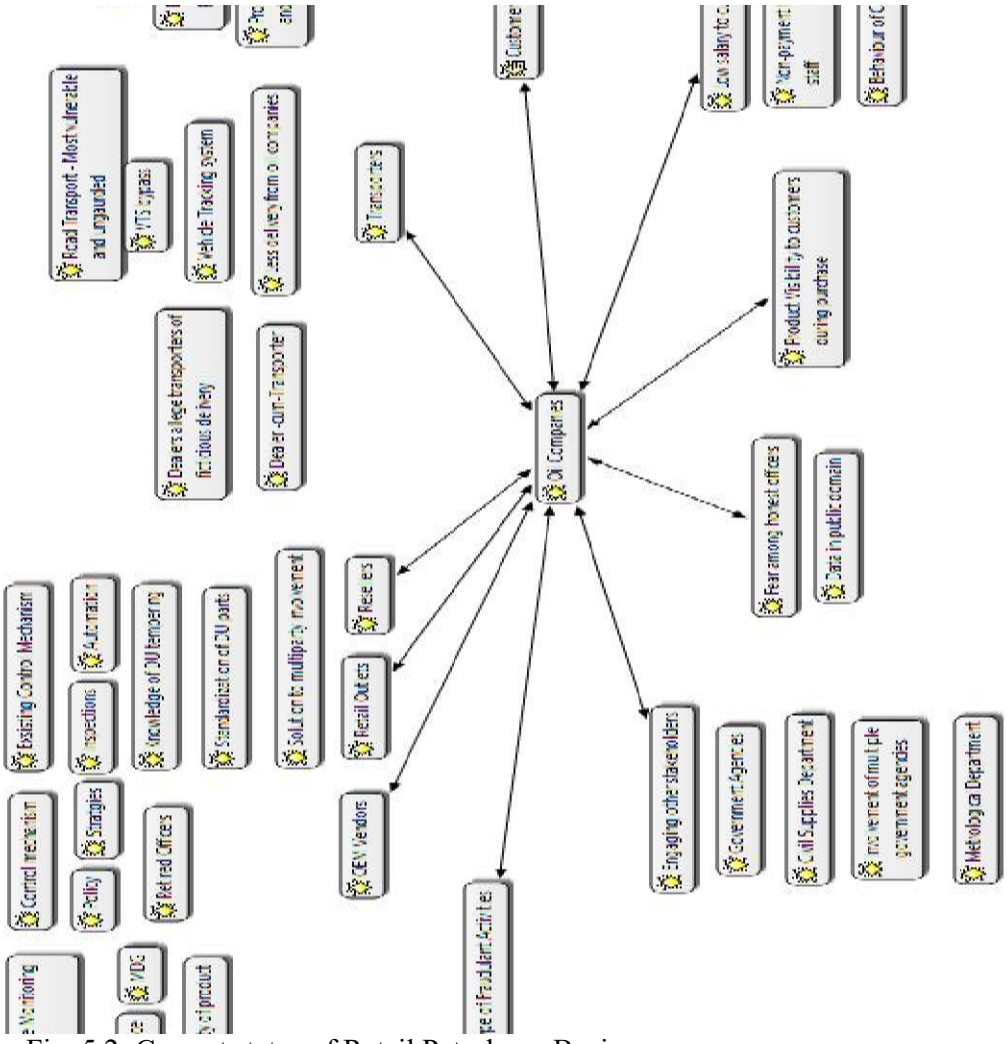

Fig. 5.2: Current status of Retail Petroleum Business
(Source: Generated from Atlas Ti)

Following factors emerged during discussions:

- ***Dispensing Units are tampered with or manipulated to accommodate quantities of adulterants and/or to give short delivery.***

On the basis of press reports, it is widely perceived that adulteration is prevalent at Retail outlets along with short delivery. The methods of adulteration or the

adulterants may be different but society at large feels that these malpractices including the short delivery do exist at retail outlets.

- **The Customers lack awareness while buying fuel at ROs**

  It was felt by the group that most of the times manipulation for short delivery takes place by taking advantage of customers` lack of awareness and mostly they are not so alert at the time of re-fuelling.

- **Non-payment by dealers to their staff, forcing them to do malpractices:**

  The group was of the view that small time manipulation takes place because customer attendants who make delivery in the fuel tanks are not sufficiently paid by the respective dealers.

  As has been said earlier, in the event of workers not getting suitable compensation, they become more prone to commit frauds and risk of manipulations increases (*Wells, 2001*). But as they are the employees of the dealers (and not the Oil Companies), petroleum companies have no direct control on this particular activity.

- **Dealers complain of receiving short from Oil Companies**

  Dealers generally complain that Oil companies dispatch product by measuring quantities by Flow meters but product is not delivered at ROs through flow meters but by using dip stick. As there can be difference in calibration of flow meter and the dip stick, they end up getting short.

- ***Lack of effective Monitoring during night:***

  It is commonly believed that manipulation in the dispensing units is done during night time because of lack of supervision during that time and chances of getting caught are remote,

- **Vehicle Tracking system (VTS) is installed on every tank truck but it is bye passed to avoid detection of diversion from the specified route:**

  VTS is bye passed to avoid tracking of the vehicle.

- **Road transportation of products from supply point to RO is most vulnerable and unguarded:**

  As stated earlier, there are three stages in which products (MS & HSD) are mainly handled:

  a. In Oil company installations
  b. During transportation from Installation to Retail outs
  c. At Retail Outlets

  The Oil company officials run their depots and terminals and hence monitoring of quality and quantity at storage points is completely guarded. Since inspections are also carried out at retail outlets by various agencies, product handling at ROs is also under check all the time. However, product handling during its transportation from storage point to RO is unguarded as no checking is done when it is in transit. Therefore, transportation becomes the most vulnerable in the entire chain of activities.

- **Non-visibility of product to customers at the time of purchase:**

  Since customers are not able to see the products (MS & HSD) at the time of purchase as the hose pipes through which products are delivered are opaque, manipulation is generally perceived by public.

- **Non-Availability of appropriate platform for "gauging" and "rating" services at Retail outlets:**

  Though "citizen charter" is introduced by the Government to spell out customers` rights, there is no platform on the lines of Food Industry which enables fuel buyers to gauge and rate the services offered at various retail outlets within the same or of different oil companies.

- ***Alliance with OEM vendors:***

  Irregularities by OEMs in collusion with dealers are not covered under MDG:

- ***Fear among honest officers due to non-availability of mechanism for their protection:***

  The group concluded that whenever dealers or their representatives are caught, most often they tend to make allegations against inspecting officers and then instead of initiating action against the erring dealers, inquiry gets started against the officers concerned. As is generally believed, dealers are from powerful lobby and hence they are able to shift attention from their own wrong deeds to trivial procedural mistakes of concerned officers causing fear among the officer community.

Informal Interview with Transporters:

Transporters are actually the main link between Oil Companies and the dealers, who carry the products from supply points to end-user point. Most of the times, dealers are themselves are the transporters for their own supplies but there are few dealers who are wholly dependent on tank trucks of other transporters (who may or may not be dealers). Hence transporters are being seen as an important stakeholders and as a different entity for the purpose of this research. An FGD was conducted with Transporters on 7/2/2018 in which 45 transporters participated. Following insight/discussion points emerged:

- ***Fictitious Short Delivery to Dealers***:

  The transporters are of the view that full quantity as received from Oil companies is delivered at RO premises. The transporters rather complained that dealers tend to delay decantation of tank trucks so that temperature rises and they take the advantage of temperature gains.

- ***Bulk sales to direct customers:***

Few transporters shared that dealers also sell to direct (large volume) customers without making deliveries through nozzle. It forces them to do manipulation in the totalizer reading and then it becomes a habit and they get used to allurement for doing this kind of manipulation.

- ***Action as Transporter vs action as dealer***

  It is a known fact that most of the dealers are transporters for their own supplies. It is alleged by transporters that if dealers do adulteration en-route in their own TTs and if they are caught, action is taken against their transport entity and not against the dealership because punishment for adulteration for a dealership is immediate Termination whereas punishment for the same lapse against transporter is banning of concerned Tank Truck. Hence dealers prefer action against transport entity in extreme circumstances and therefore get the undue leeway.

- ***Very low payments or no payments to Tank Truck Crew***:

  The transporters confided that dealers do not pay or pay very little to their staff (because of manipulation) and it forces other transporters also to replicate to follow the industry practice and then it becomes a vicious circle, giving rise to pilferage or other unscrupulous activities by the staff which ultimately causes financial loss to customers.

- ***Ghost tank within the premises***:

  In some cases, additional tanks were found within the premises to store un accounted adulterant from where adulteration was carried out as & when the dealer got the chance to do it.

- ***Un-authorised Tank outside the premises***:

  It was deliberated that in few cases it was found that unauthorized tank was installed outside the premises to avoid detection and it was used to transfer the unauthorized product into the RO tanks through underground pipeline.

- ***Conventional cases of adulteration and short delivery***

  Conventional cases of adulteration and short delivery were also discussed.

Interaction with Customer attendants at Retail Outlets:

Following insights emerged during the process of interaction with customer attendants and delivery boys:

- ***Emptying out the nozzle pipe and delivering short to the customer:***

  If time gap between two arrivals (customers) is large especially in rural areas, there is a possibility of emptying of nozzle pipe after the exit of first arrival and before the next arrival with the result product is delivered short to the 2nd customer as significant quantity is used to re-fill the empty pipe. This manipulation is very common and unless customer is alert, there are fairly good chances of getting cheated.

- ***Diverting the attention of the buyers and then indulging in short delivery:***

  In this type of cheating, customers are tricked by engaging into discussion by an accomplice and then meter reading is manipulated swiftly by the person who is re-fuelling, to show that ordered quantity has been delivered but actually it is not. Hence quantity delivered is much less than the ordered one.

- ***Not resetting the "Zero" on dispensing units before commencing the fuelling:***

  By not resetting the "zero", quantity sold to previous customer is counted as delivered and hence there is short delivery.

- ***Manipulation in pulsar by fitting an extra chip in the Electronic circuits of the dispensing pumps.***

  The extra chip helps in altering the quantity delivered and hence there can be huge short delivery to customers without their coming to know about it. The biggest danger is that these chips can be remotely controlled so as to set them right in case of inspection by authorities.

- ***Over-charging by not changing the daily pricing:***
  As price of MS/HSD is changing daily, there can be downward revision on few days. But dealer may not change and continues to overcharge.

- ***Over-charging by charging the price of premium products for supply of normal product:***
  In this case, customer is delivered normal product but is charged as if premium product is supplied to him/her. Since premium product is costlier, this is one of the methods employed for over-charging.

- ***En-route adulteration to escape detection in automation processes:***
  Product is adulterated en-route before it arrives at the Retail outlet. This may result in escaping the automation process.

- ***En-route adulteration by manipulating Vehicle Tracking system to escape tracking.***
  VTS system is manipulated en-route avoid detection unscheduled halts or traversing unspecified routes.

5.6.3.2 FGD (Phase 2):

All the above points were subsequently sent to next level of Industry Experts drawn from PSU oil companies namely Indian Oil Corporation (IOCL), Hindustan Petroleum (HPCL) and Bharat Petroleum Corporation Ltd (BPCL) through a questionnaire. The responses received are discussed in Chapter 6.

5.6.3.2.1 Preparation of questionnaire and pilot study:

Questionnaire was prepared for taking responses from customers, at Retail outlets. And pilot study was carried out after taking 50 responses. However soon after it was felt in the pilot study that questions were not being correctly followed by the respondents and hence questionnaire was simplified and had to be

modified to get desired results. Main difficulty was felt in explaining the meaning of Always, Frequent, Reasonably possible, Occasional, Remote and Unlikely and so was with terms like Catastrophic, Critical, Major effect, Minor effect and No effect. Hence these terms were simplified.

5.6.3.2.2 Further, customers were not at ease to answer, "What action they propose against different types of irregularities" and hence these questions were removed from the questionnaire.

The details of survey are as under:

No. of respondents: 504.
ROs covered: 84 (>10%).
Type of respondents: Fuel Buyers
Coverage: NCR.
Method: Manual
Survey period: 03/01/2018 to 09/01/2018 and from 01/6/2018 to 03/06/2018
Survey Timings: Day time (08 am to 08pm)

Table 5.3: Questionnaire for customer survey

Question	**1**	**2**	**3**	**4**
Gender	**Male**	**Female**		
Age				
Occupation	**Self OCC**	**Govt Service**	**Pvt service**	**Student/Retd.**
Whether Own a Luxury car	**Yes**	**No**		
Whether use Credit card	**Yes**	**No**		
Whether Love Adventure Sports	**Yes**	**No**		
Whether having	**Yes**	**No**		

Question	1	2	3	4
any club membership				
Have you ever Visited Retail Outlet	**Yes**	**No**		
Type of Vehicle Driven/Owned	**2 /3 Wheeler**	**4 Wheeler (Car, Jeep etc.)**	**Others (commercial)**	
Frequency of visit to Retail Outlet	**Frequent**	**Consistent**	**Occasional**	**Rarely**
Products taken	**Petrol**	**Diesel**	**Both**	
Average Single Transaction Quantity	**< 10 Litres**	**> 10 Litres**	**> 30 Litres**	
Have you ever been cheated in a RO	**Yes**	**No**		
How Cheated - incident in Text				
Likelihood of Pump Attendant delivering short by diverting attention	**Always**	**Frequent**	**Occasional**	**Unlikely**
Possibility of Additional Pulsar and fittings in DU for manipulation	**Always**	**Frequent**	**Occasional**	**Unlikely**
Possibility of Additional Software chips in controller card for	**Always**	**Frequent**	**Occasional**	**Unlikely**

Question	1	2	3	4
manipulation				
Possibility of emptying nozzle hose before delivery	**Always**	**Frequent**	**Occasional**	**Unlikely**
Possibility of overcharging by not changing price	**Always**	**Frequent**	**Occasional**	**Unlikely**
Overcharging by other methods	**Always**	**Frequent**	**Occasional**	**Unlikely**
Any other manipulation affecting Quality/Quantity	**No**	**Yes**		
Your Opinion – Whether fuel quality affects mileage	**Yes**	**No**		
Your Opinion – whether mileage is also dependent on engine conditions	**Yes**	**No**		
Most preferred Oil Company	**IOC**	**BPC**	**HPC**	**Others**
Why do you prefer an oil Company - Reason Text				
Suggestions for mitigating the risk of cheating – Text				
Financial loss of	**< 5% of**	**>5% and**	**More than**	**No financial**

Question	1	2	3	4
customers due to cheating	**Product Cost**	**<10%**	**10%**	**Loss**

Some Interesting Insights from Customer Survey:

All types of customers visit ROs, majority being 2 and 4 Wheeler owners/riders with a significant number of commercial vehicles as well. At certain times, a certain section of the society dominated their presence at ROs, sometimes its dominated by 2 wheelers and at different times by 4 wheelers or commercial vehicles or it could be combination of these types of vehicles. The customers at ROs in an area like NCR are following major types of riders:

a) Morning Office Goers: Evenly distributed into 4 and 2-wheeler segments, this class was more concerned with the availability of fuel on their way to the office and normally do not have a preference for choosing an RO as they are either pre-determined to go to a particular RO or they just go and buy fuel from any RO on their route. They spend minimum of their time at RO.

b) Mid-Day wanderers: These included mostly two where segment dominated by Youngsters going to college or housewives going to market or going out for picking up their kids. Mid-Day customers also included people who had their offices near to their homes and would do a refill to avoid the morning rush.

c) Evening Returners: The time after 5:30 p.m. attracted the major of the customers to the ROs. They were people returning from the offices and people going out on some occasions.

d) Commercial Vehicles: Taxis and other commercial vehicles preferred filling at the night. They filled for complete tanks. The idea of refilling at night was favourable in two ways. First, it offered them mobility throughout the day and second because they are able to avoid crowds in refuelling.

In response to the question that "Have you ever been cheated?" responses indicated that idea of being cheated at a retail outlet is very common. To an astonishing number that nearly all people who visited an RO said that they felt cheated when they visited an RO of any such company. Some respondents put ROs with Tags like "the place with most cheatings" etc. On the contrary, however, a very few number of people actually realized that they were cheated because when asked to recall any specific instance as to when and where that had been cheated they said that they weren't but the perception that they could be cheated on an RO and they could do nothing about it or realize it later made them feel vulnerable and hence made them feel cheated. Mostly, the feeling of being cheated was like a communicable disease that spread with the defamed name of the RO, even if they never actually experienced it.

Adulteration or cheating at a petrol pump is a word of mouth factor. People visiting the RO have a near to no knowledge of how to test the adulteration or fuel type. They just believe in the reputation of the RO. With the existing technology and the updated customer base, the customer likely believes that at a COCO pump, the chances of being cheated because of an unfair means of likely to be very less

5.7 Methodology for Objective 2

Fraud and the related risks will be estimated using multinomial logit model, because both fraud and related risks are unordered categorical variables. This is done with the help of following:

The equation:

$$ln \frac{\Pr(F_i=K-1)}{\Pr(F_i=K)} = \beta_{k-1}.X_i \quad \ldots (1)$$

$$n \frac{\Pr(R_i=K-1)}{\Pr(R_i=K)} = \beta_{k-1}.X_i \quad \ldots (2)$$

Where, F and R are Fraud and related Risks to be taken as dependent variable in the Equations 1 & 2. Xi for i= 1 to n are factors affecting frauds and related risks.

In this study results have been obtained for 2 dependent variables - 1) adulteration and 2) short-delivery. In this case RRR or relative risk ratio which is the exponentiated value of the multinomial logit coefficient will be found out whether this is significant for certain impacting variables or not.

5.8 Methodology for Objective 3:

Document analysis has been done for each of the identified variables with Marketing Discipline Guidelines (MDG) through a systematic of reviewing or evaluating documents. Document analysis is commonly used for qualitative research as it helps in examination and interpretation of documents to understand and develop empirical knowledge.

In this process, documents are examined and interpreted by the researcher to point out reasoning around an assessment topic (*Bowen, 2009*) and to draw meaningful assessment and interpretation of certain basic themes. There are three primary types of documents (*O'Leary, 2014*):

Public Records: The official, ongoing records of an organization's activities which are available in public domain.

Personal Documents: This includes individual's actions, experiences, and beliefs.

Physical Evidence: Physical objects found within the study area like flyers, posters, pamphlets etc.

As outlined by *O'Leary (2014*), following steps were taken to do document Analysis in this study:

a. ***Creating a list of texts to explore***: Since document analysis is being done in this study with Marketing Discipline Guidelines, following list of texts was prepared, based on factors emerged in FGD process and arranging them in alphabetical order:

1. additional chips
2. adulteration
3. alliance with OEM vendors
4. Awareness
5. branded
6. CCTV
7. chips
8. civil supplies
9. dealers
10. emptying
11. fittings
12. fuel
13. gauging and rating of Retail outlets
14. hose
15. inter connections
16. lack
17. Malpractices,
18. overcharging,
19. pulsar
20. purchase
21. reseller
22. short deliver

23. sale

24. seals

25. selling normal fuel as branded

26. surveillance

27. tamper

28. Tanks

29. transporter

30. unauthorized

31. Vehicle tracking system

32. unauthorized tanks

33. weights & measures or W&M

34. Wages

b. ***Accessing Texts:*** Marketing Discipline Guidelines were thoroughly analysed and it was observed that MDG contains 5 chapters as per following details:

Chapter 1: covers the procedure for handling of products by dealers at Retail Outlets

Chapter 2: covers Guidelines for collection of sample and testing

Chapter 3: covers handling of products such as MS / HSD / SKO at Company's storage points and Duties of Oil Companies

Chapter 4: covers Maintenance aspects of Company's equipment at Retail Outlets

Chapter 5: covers various types of Irregularities at Retail Outlets (MS / HSD) and SKO-LDO Dealerships

Chapter 6: covers Duties of SKO Dealers: Kerosene supplies under PDS

Chapter 7: covers issues relating to Mobile Laboratory

Chapter 8: covers the actions to be taken against erring dealers under MDG

As is observed from the above, Chapter 5 contains details of malpractices and irregularities, generally observed at ROs. Chapter 5 is covered from page number 30 to page 38 of MDG. Since primary objective is to identify factors leading to fraudulent activities, above chapter was subjected to 'search' using *Microsoft word*. The texts present in MDG were manually interpreted to segregate factors already covered in MDG with those which are not present in MDG.

Details of document subjected to search and how it looked like after the search is given as Appendix B.

c. Checking Biases: the documents were critically examined to check presence of bias if any. Since MDG is a regulatory document, chances of bias are very remote.

d. Skills required: since relevant portion of MDG is small document of about 8 pages, there is no special skill required for analysis of those 8 pages except knowledge of Microsoft word.

e. Credibility of document analysis: considering the small portion of MDG required to be analysed and that MDG being a regulatory document, findings of document analysis are considered to be trust worthy.

f. Specific Data required for research: it was clearly mentioned that data resulting from FGD and customer survey had to be analysed with MDG to identify those factors which are not covered under MDG so far.

g. Ethical issues: there are no ethical issues as MDG is available in public domain and can be accessed by just googling "Marketing Discipline Guidelines" for RO and SKO dealerships.

The above theory was mixed with "As is" and 'To be" Business Analysis process. As the name suggests, "As-is" is a strategy in which management identifies and evaluates a business's current processes. It can be applied on an

entire business organization or it can cover one or two departments or teams. While “As-is” analysis is to work out where improvements are needed, “To-be” process helps in solving problems and designing processes to achieve business outcomes.

There may be different reasons or motivations for implementing this methodology but most notable ones are:

- For increasing customer satisfaction
- For saving money
- For improving organizational responsiveness and business coordination
- For improving existing processes or creating new processes
- In case of mergers and acquisitions
- For complying with new regulatory standards

According to a survey conducted ***by*** *BPTrends in 2015*, process management system is mostly preferred for saving money and improving productivity by reducing costs, followed closely by need to remain competitive by improving customer satisfaction.

In this study, all the elements as explained above are key objectives and hence this methodology was combined with document analysis to achieve research objectives.

Further, “As-is” and “To-be” process analysis supplement each other in improving processes and in fact they go concurrently together while evaluating business processes. In other words, “As-is” process defines current status, whereas “To-be” process maps where it should be after the improvement.

This is exactly the reason that the factors which were found already covered in MDG as mentioned above, were listed under the category “As is” and the relevant factors emerging from FGD, which are not appearing in MDG, were listed as ‘To be”.

Table 5.4: Document analysis of identified Factors with Marketing Discipline Guidelines

SNo.	Irregularity emerging from FGD data	Existing Control Mechanism	
		As is	To be
1	Dispensing Units are tampered with/ manipulated to accommodate quantities arising out of adulteration and/or to give short delivery.	Covered in MDG under critical irregularities	Will continue to be part of MDG
2	Resellers take advantage of Customers lack awareness while buying fuel at ROs	Not covered in MDG	Awareness is to be increased. Stipulations to be made in MDG to make Dealers responsible for creating awareness through campaigns etc.
3	Non-payment by dealers to their staff, forcing them to do malpractices:	covered in MDG under Major Irregularities	Penalty is prescribed in MDG which leads to payment of fine to the tune of 20% of Dealers margin in first instance 30% in second instance and upto 40 % of Dealers margin in 3rd or subsequent instances.
4	Dealers complain of receiving short from Oil Companies	Not covered in MDG	Dealers satisfy themselves before unloading TTs.
5	Lack of effective Monitoring during night	Night vision cameras Not	night vision cameras to be covered in MDG

SNo.	Irregularity emerging from FGD data	Existing Control Mechanism	
		As is	To be
		covered in MDG	
6	Vehicle Tracking system (VTS) is installed on every tank truck but it is bye passed to avoid detection of diversion from the specified route	Not covered in MDG	Already covered in Transport Discipline Guidelines but may be covered under MDG for dealer cum transporters.
7.	Road transportation of products from supply point to RO is most vulnerable and unguarded	Road transportation is most vulnerable but not covered in MDG	Needs to be brought under the ambit of MDG particularly for Dealer cum transporters.
8.	Non-visibility of product to customers at the time of purchase	Not covered in MDG	Transparent hose pipes can be introduced on trial basis and depending upon success, final view can be taken. it can be a game changer as it will help in re-building trust amongst customers.
9.	Non-Availability of appropriate platform for “gauging” and “rating” services at Retail outlets	Not covered in MDG	A separate platform can be created by Oil Industry to gauge and rate performance of ROs in giving services to customers on the similar lines of Zomato and other agencies for food outlets & restaurants.

SNo.	Irregularity emerging from FGD data	Existing Control Mechanism	
		As is	To be
10.	Unholy Alliance with OEM vendors	This issue is not addressed in MDG	Stricter control for OEMs for DUs in view of gravity/potential of complications it can cause.
11	Fear among honest officers due to non-availability of mechanism for their protection	Not addressed in MDG.	This is an important parameter, which needs to be addressed.
12	Fictitious Short Delivery to Dealers	Not covered in MDG	Existing provisions to continue.
13	Bulk sales to direct customers	Not covered in MDG.	Existing provisions to continue.
14	Action as Transporter vs action as dealer	Not covered in MDG	To be covered for dealer cum transporters
15	Very low payments or no payments to Tank Truck Crew	MDG covers only payments to RO staff.	Existing provisions to continue.
16	Additional tank within the premises	Covered	Existing provision to continue
17	Un-authorized Tank outside the premises	Covered	Existing provision to continue

Using *lucid charts* application, “As-is” and “To-be” status is worked as under:

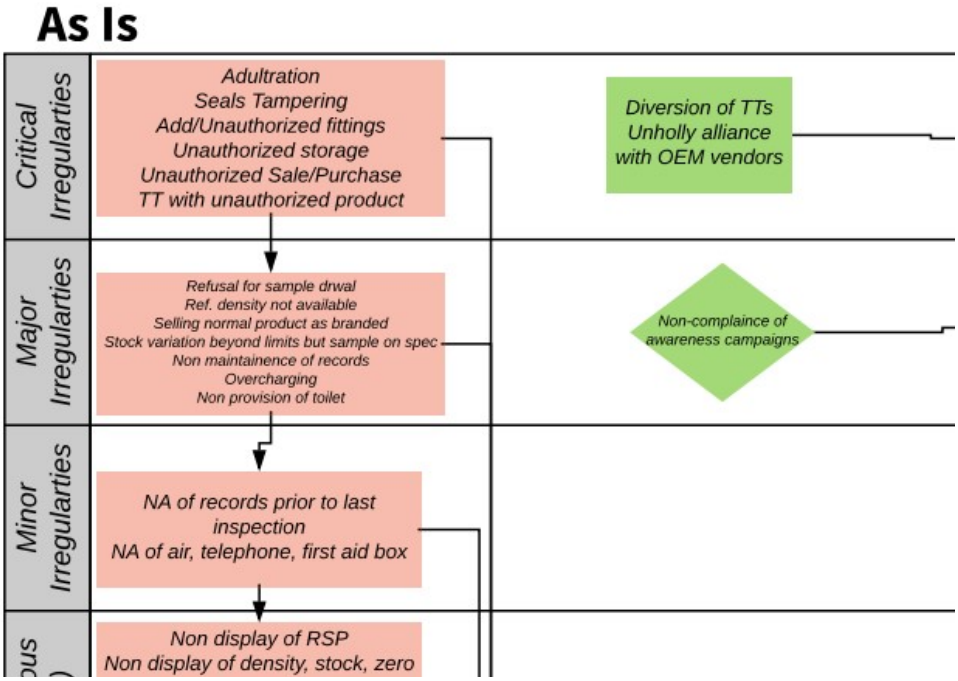

Fig. 5.3: "As is" and "To be" status – based on FGD
(Source: Generated from Lucidcharts application)

Having identified the fraudulent factors and gap analysis done with provisions of Marketing Discipline Guidelines in vogue, types of frauds are identified, which are not covered in control mechanism.

Since this research is customer-centric, deficiencies so observed will be identified for incorporating the same in MDG or otherwise.

5.8.1 Data Analysis Tools

Fraud and the related risks will be estimated using multinomial logit model, because both fraud and related risks are unordered categorical variables. This can be done using the following equation:

$$ln \frac{\Pr(F_i=K-1)}{\Pr(F_i=K)} = \beta_{k-1}.X_i \qquad \ldots(1)$$

$$n\frac{\Pr(R_i=K-1)}{\Pr(R_i=K)} = \beta_{k-1}.X_i \quad \ldots(2)$$

Where, F and R are Fraud and related Risks to be taken as dependent variable in the Equations 1 & 2. Xi for i= 1 to n are factors affecting frauds and related risks.

In this study results have been obtained for 2 dependent variables - 1) adulteration and 2) short-delivery. In this case RRR or relative risk ratio which is multinomial logit coefficient with the exponentiated value, is found to be significant for the following impacting variables:

- Transportation of Fuels from Supply Point to Retail Outlet
- Emptying of Hose Pipes
- Diversion of Tank Trucks by manipulating Vehicle Tracking System
- Taking advantage of Lack-of-Awareness of customers

Chapter 6
Interpretation and Data Analysis

6. Interpretation & data Analysis

6.1 Factors emerging from FGD (Phase 2):

As discussed earlier, variables emerging from various Phase 1 of FGD were sent to another set of 'senior to very senior' executives through emails – majority being those having more than 10 years' experience in petroleum Industry – through a questionnaire on Google forms. The executives were informed by sending emails to them. Responses received within a limited time (a week) were considered for analysis. This helped in two ways; firstly, the number of experts increased from whom insights were taken in phase 1 and secondly, larger groups from different oil companies participated in phase 2 of FGD. Total numbers of 137 experts participated in phase 2, in addition to 34 number of experts who participated in FGD phase 1.

Hence findings of FGD are on the basis of experience of 168 senior executives of Oil companies. Even on conservative estimates, combined average experience worked out to 1881 years in the Oil companies.

Based on responses received, factors emerged in phase 1 were found to be matching in phase 2 and hence were adopted as valid factors for the purpose of this study. Phase 2 details are as under:

FGD Factors

Survey size: 137 – Questionnaire through emails

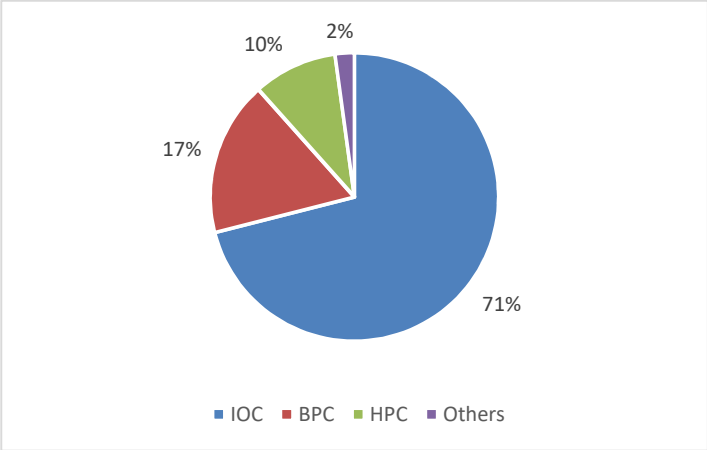

Fig. 6.1: FGD Factor- Oil Company

Fig. 6.2: FGD Factor - Experience

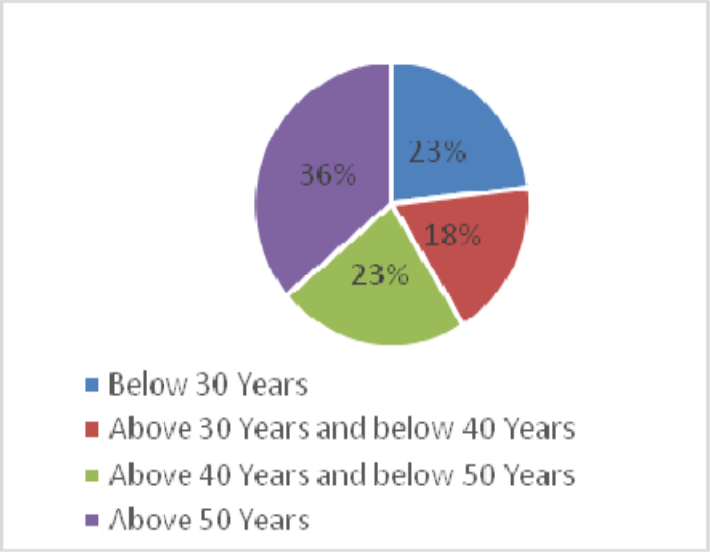

Fig. 6.3: FGD Factor-Age

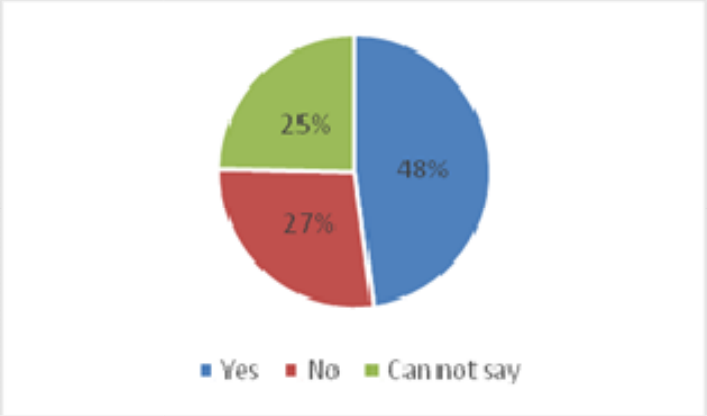

Fig. 6.4: FGD Factor – Adulteration

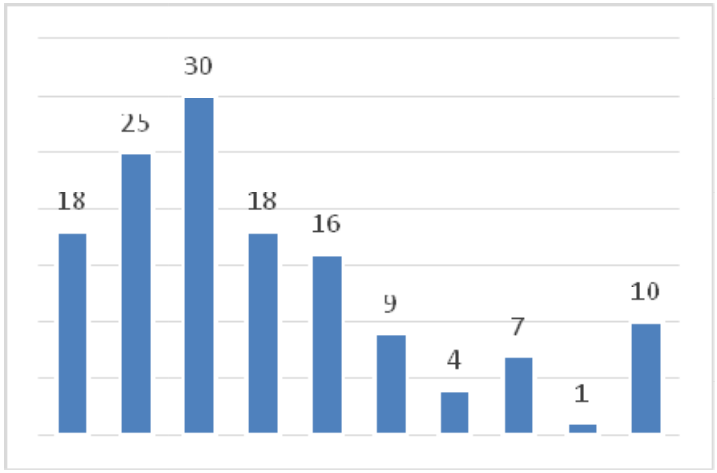

Fig. 6.5: FGD Factors – chances of adulteration (rating)

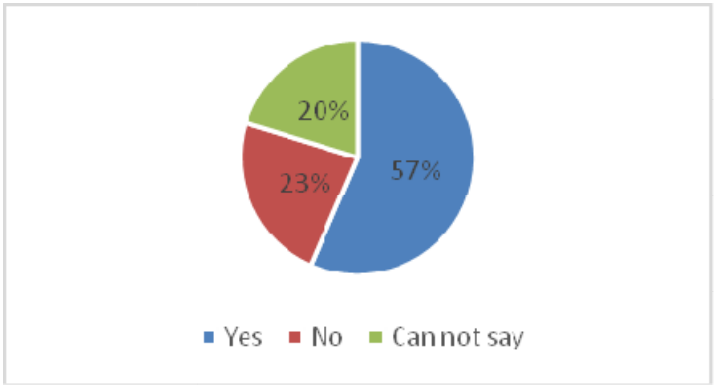

Fig. 6.6: FGD Factors-Short delivery

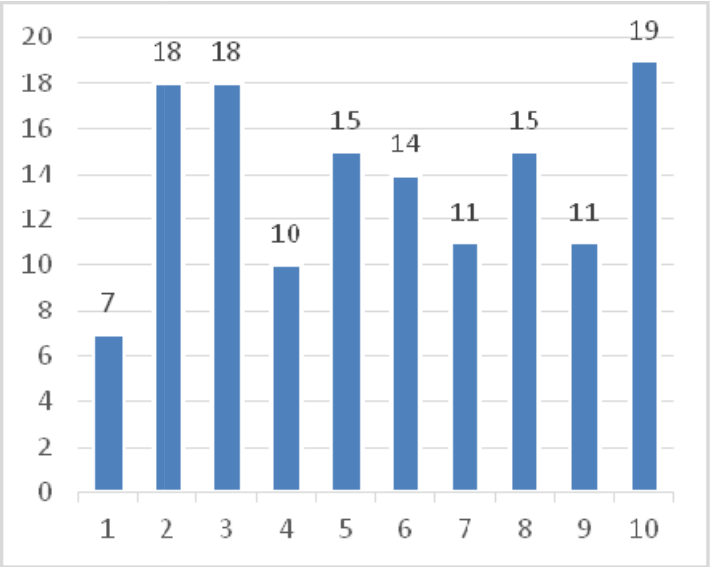

Fig. 6.7: FGD Factors – chances of Short delivery (rating)

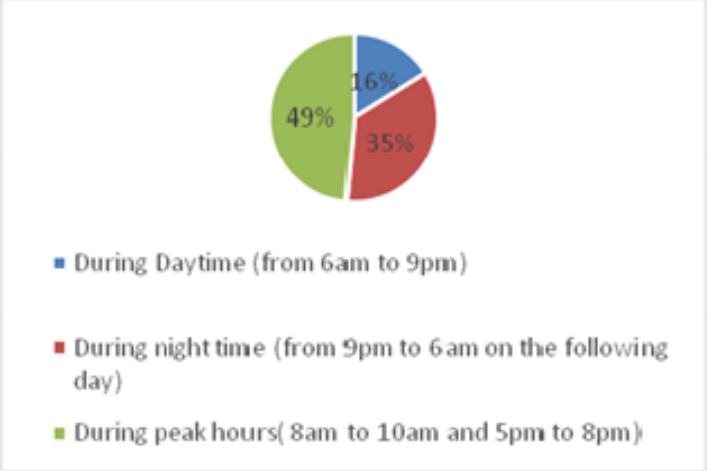

Fig. 6.8: FGD Factors- Vulnerability of time for doing malpractices

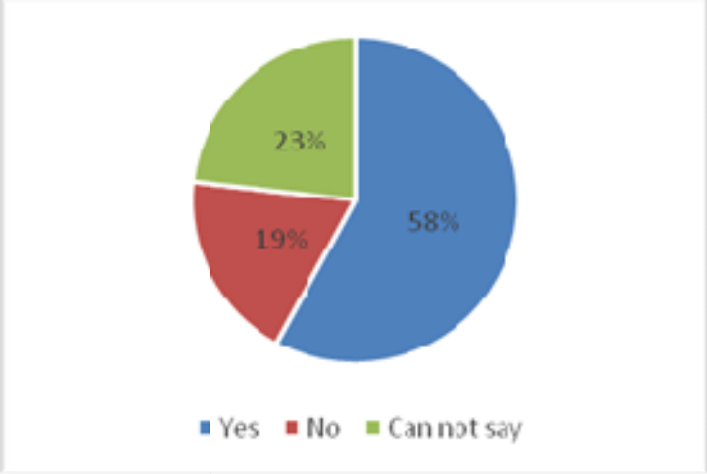

Fig. 6.9: FGD Factors-taking advantage of Lack of effective control mechanism for adulteration

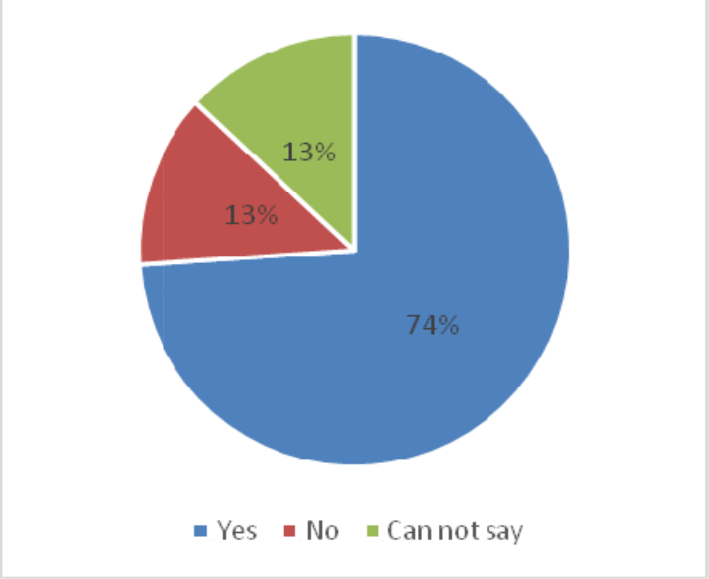

Fig. 6.10: FGD Factors-taking advantage of Lack of effective control mechanism for short delivery

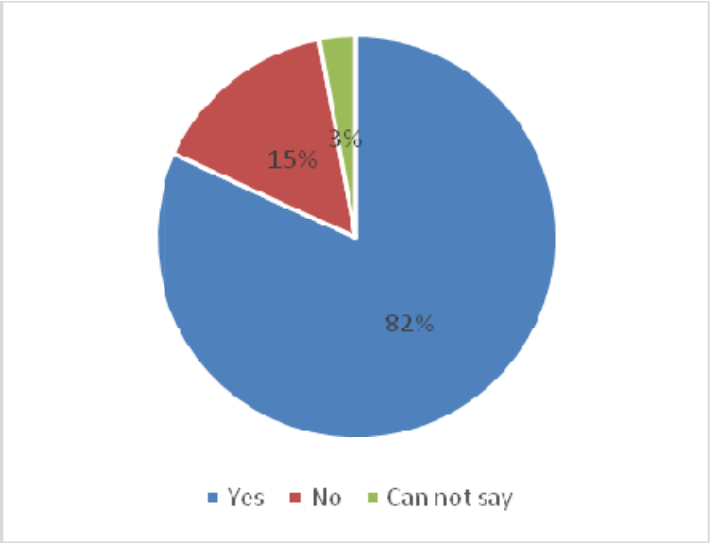

Fig. 6.11: FGD Factors-taking advantage of Lack of awareness

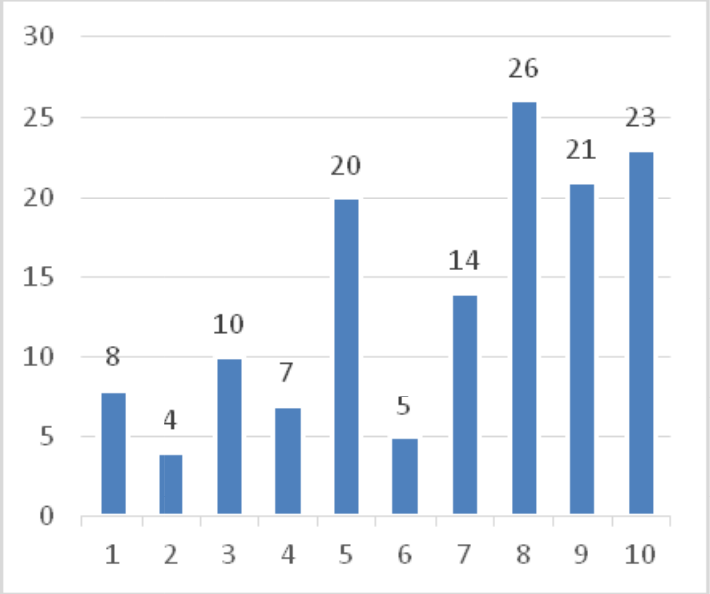

Fig. 6.12: FGD Factors-chances improving through awareness programs

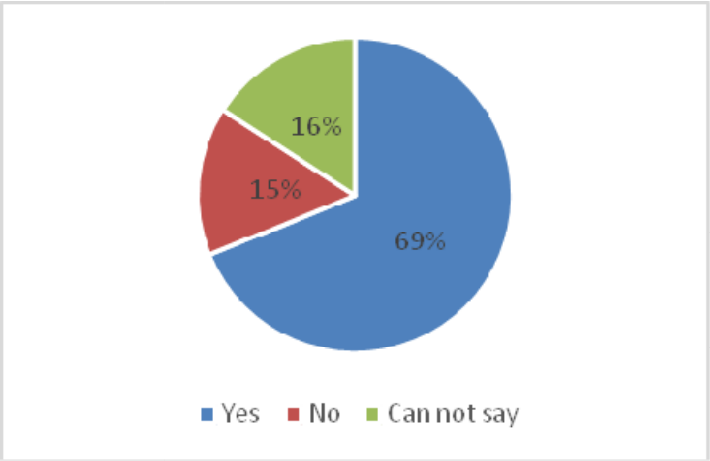

Fig. 6.13: FGD Factors- less payment to staff leading to manipulations

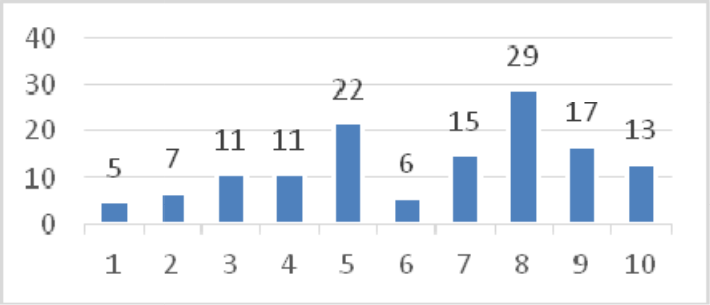

Fig. 6.14: FGD Factors-significance of less payment to staff in manipulations at ROs

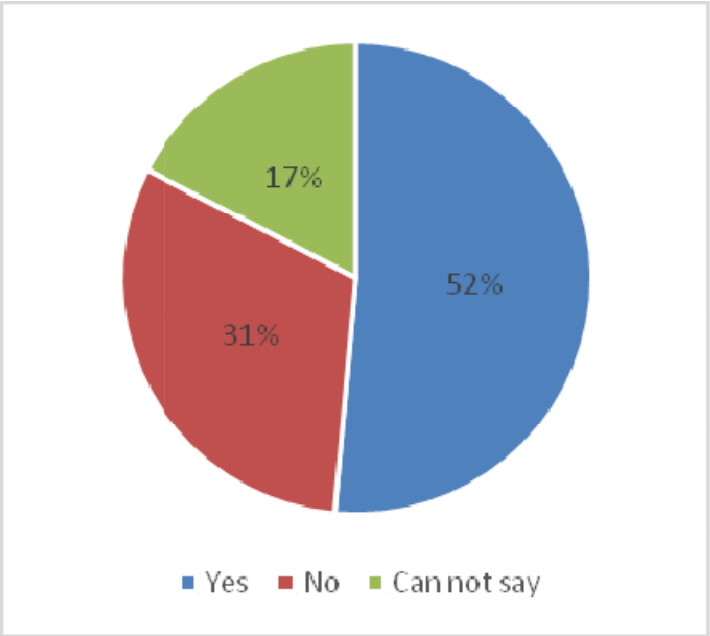

Fig. 6.15: FGD Factors-Dealers complain for short receipt from Oil Companies

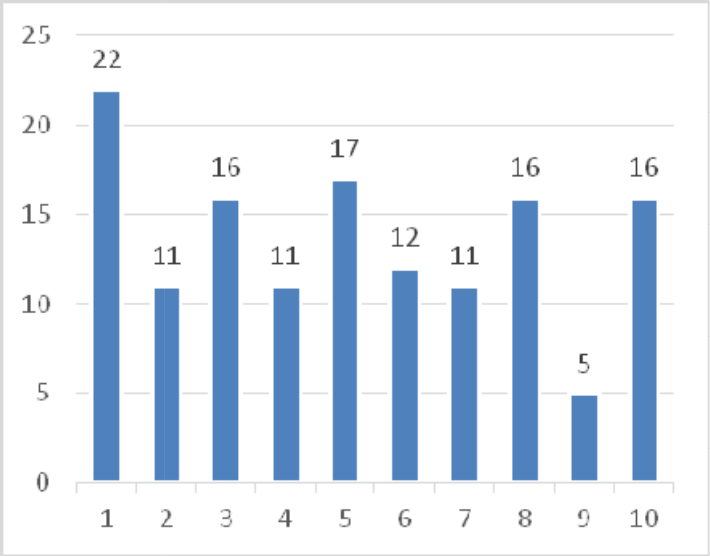

Fig. 6.16: FGD Factors-significance of short receipt by dealers

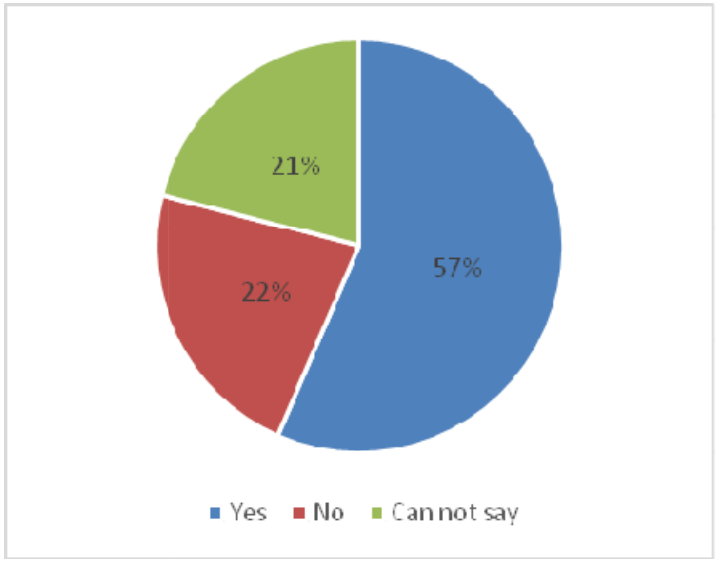

Fig. 6.17: FGD Factors-lack of monitoring during night time

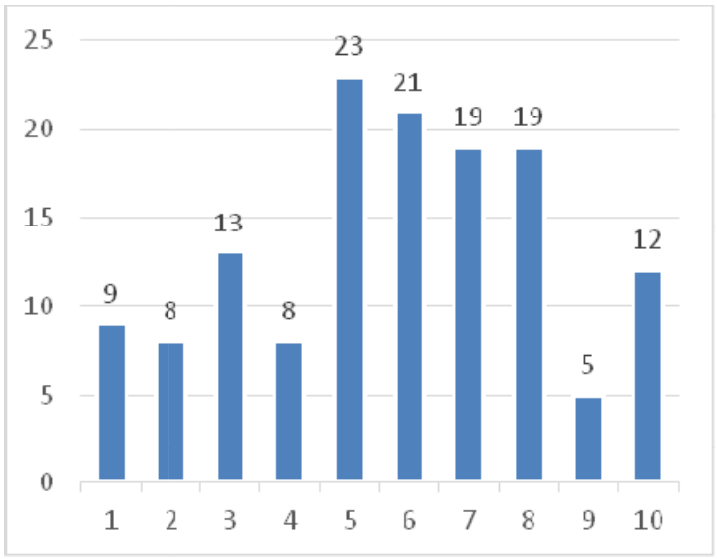

Fig. 6.18: FGD Factors-chances of improvements by effective monitoring during nights.

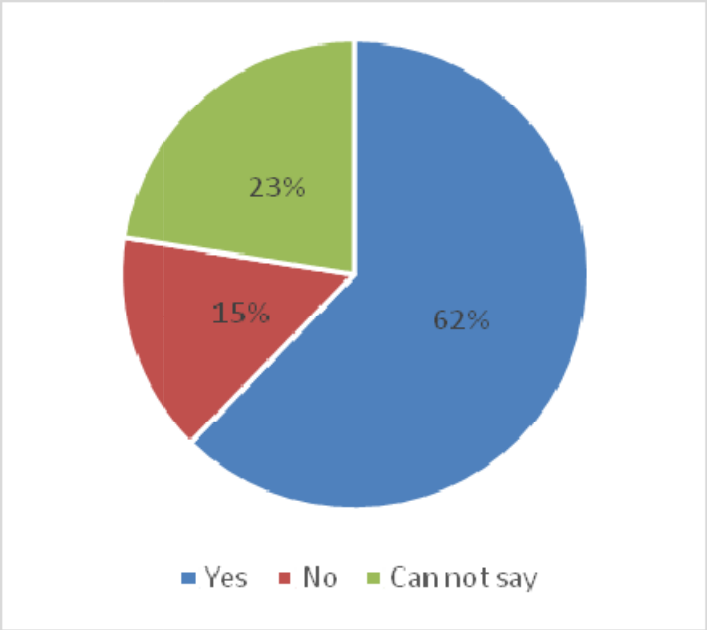

Fig. 6.19: FGD Factors-whether VTS is bye-passed

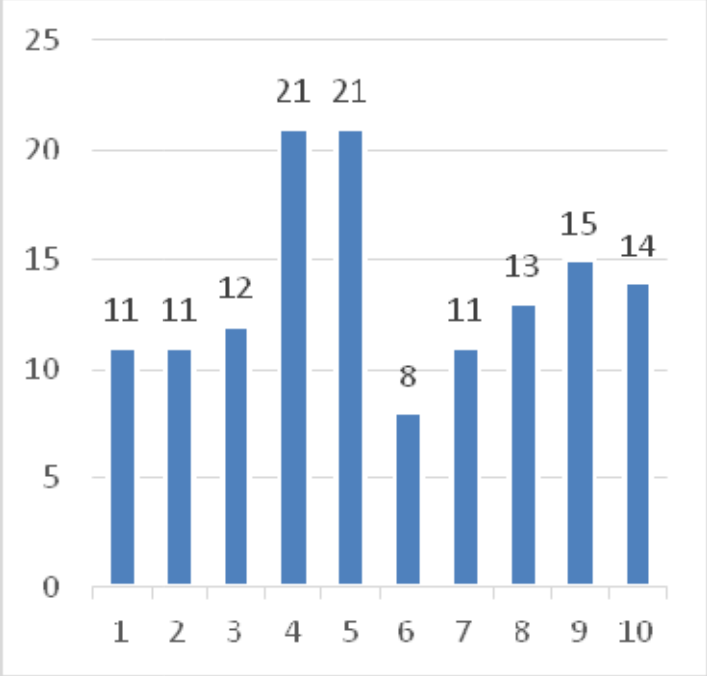

Fig. 6.20: FGD Factors-chances of VTS bye pass

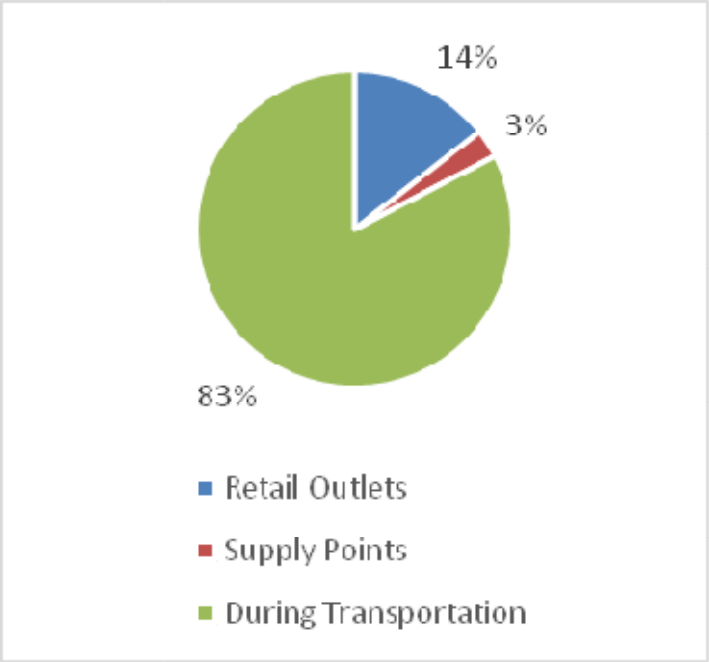

Fig. 6.21: FGD Factors-most vulnerable stage of product handling

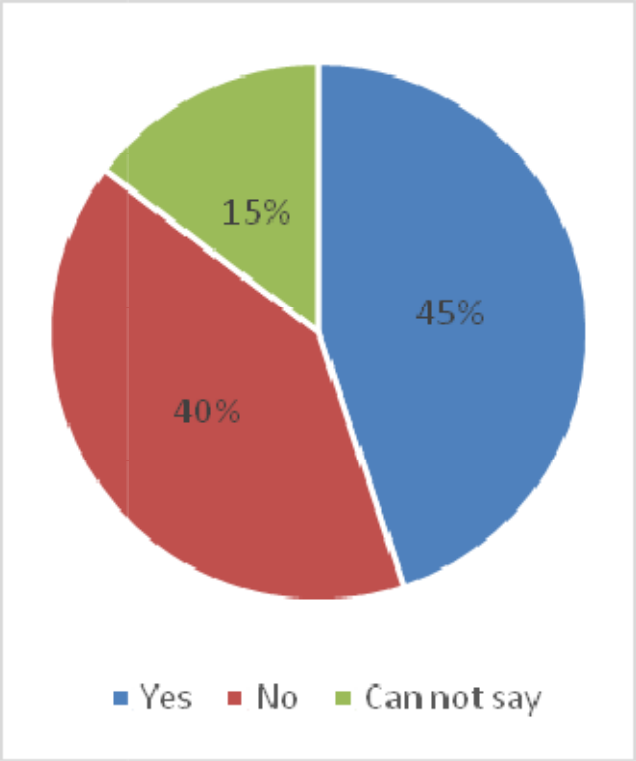

Fig. 6.22: FGD Factors-significance of opaque hose pipes to raise doubts in minds of buyers

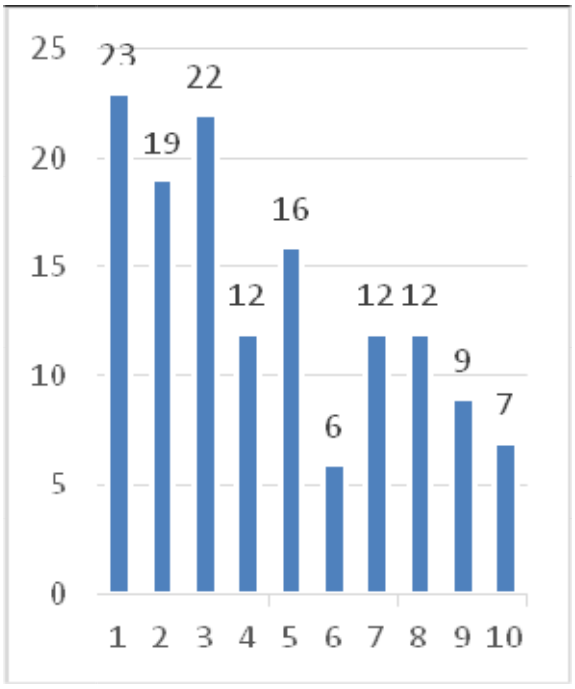

Fig. 6.23: FGD Factors-chances of curbing is hose pipes are made transparent

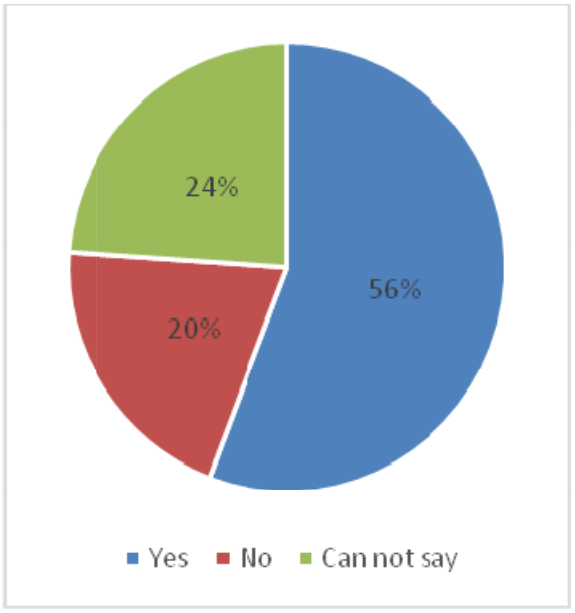

Fig. 6.24: FGD Factors: whether Zomato type rating platforms may help in improving services

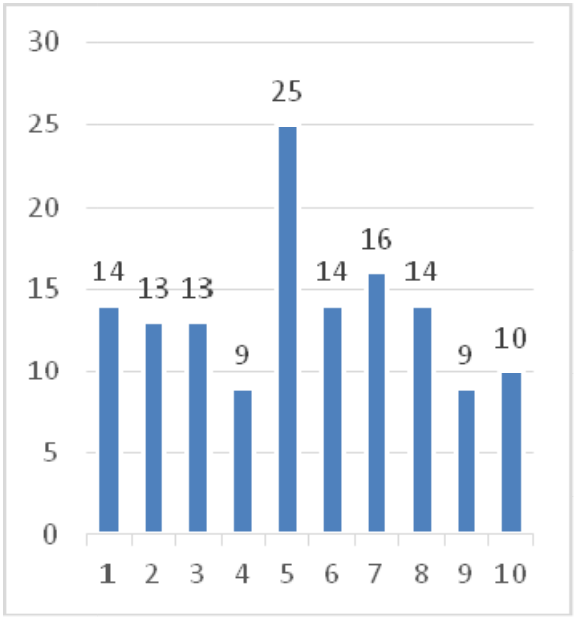

Fig. 6.25: FGD Factors: chances of improving through Zomato type rating platforms.

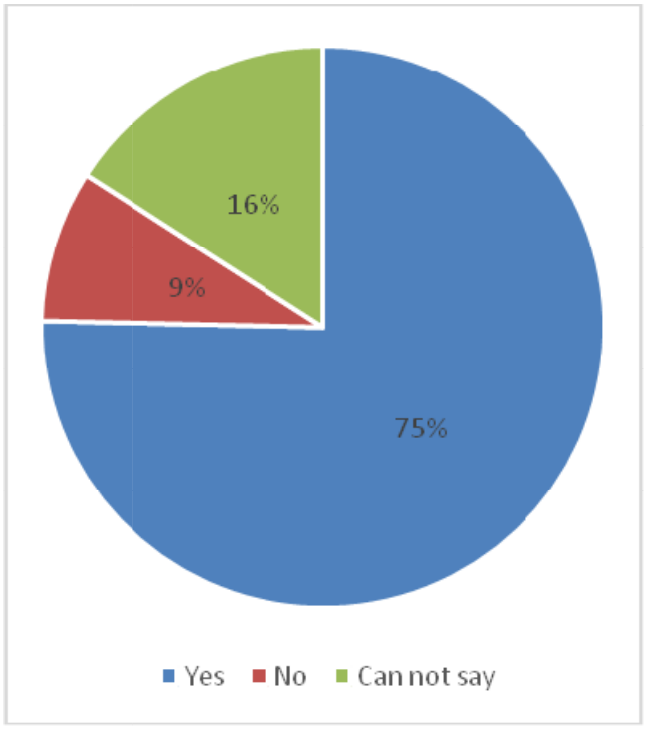

Fig. 6.26: FGD Factors: unholy alliance of Dispensing Pump vendors may cause short delivery manipulations.

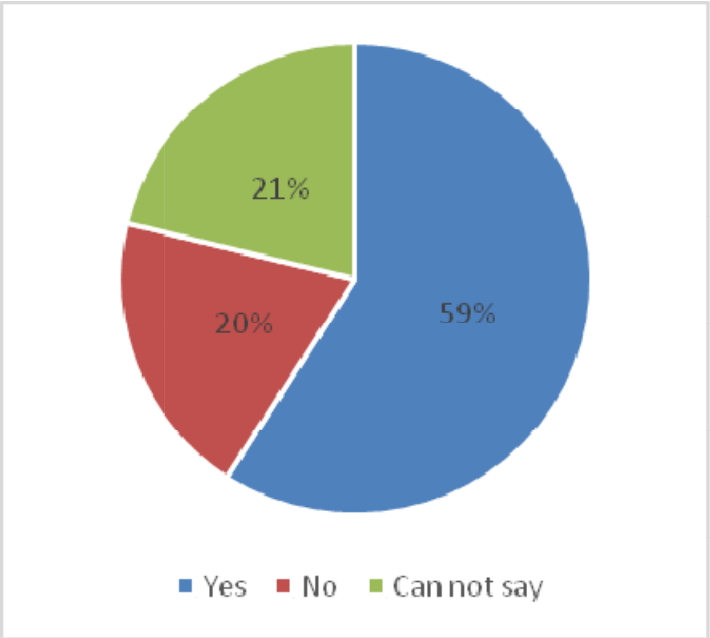

Fig. 6.27: FGD Factors: unholy alliance of Dispensing Pump vendors may cause adulteration manipulations

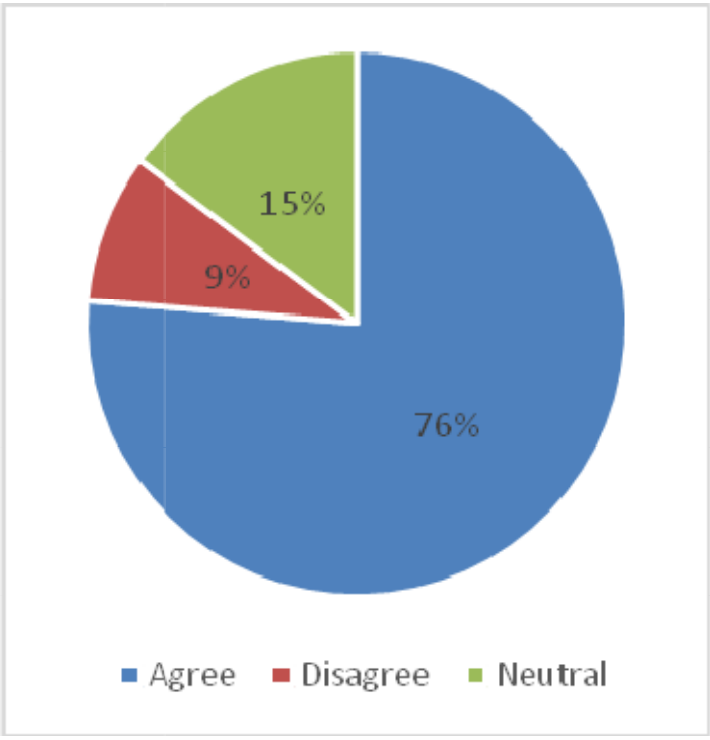

Fig. 6.28: FGD Factors lack of mechanism for protection of honest officers

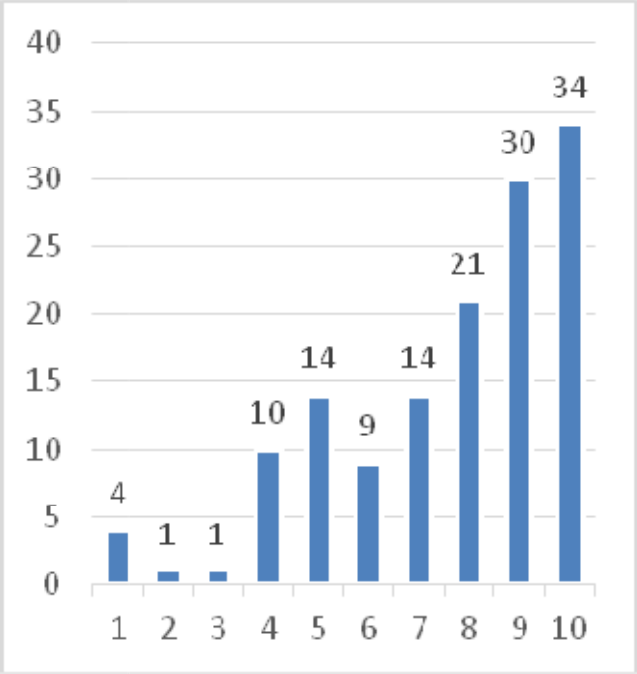

Fig. 6.29: FGD Factors-Rating for improvement in services if honest officers are protected

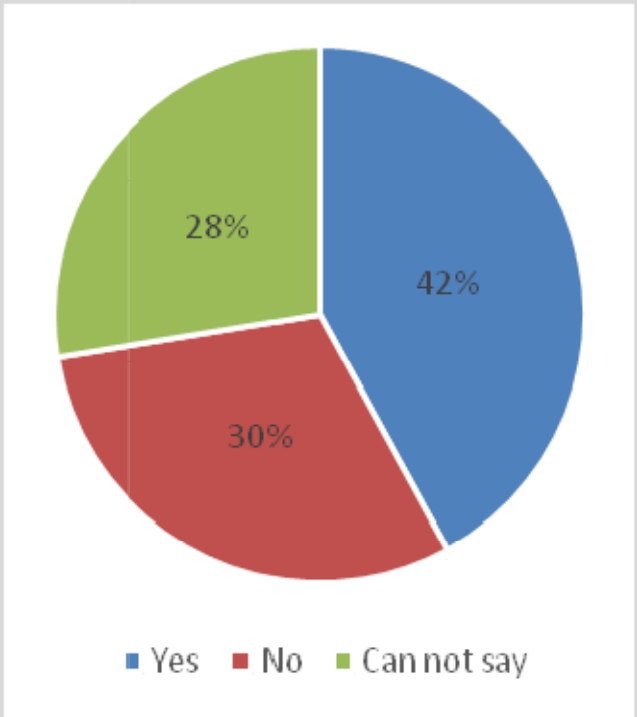

Fig. 6.30: FGD Factors: chances of Totalizer manipulations to adjust adulteration quantities

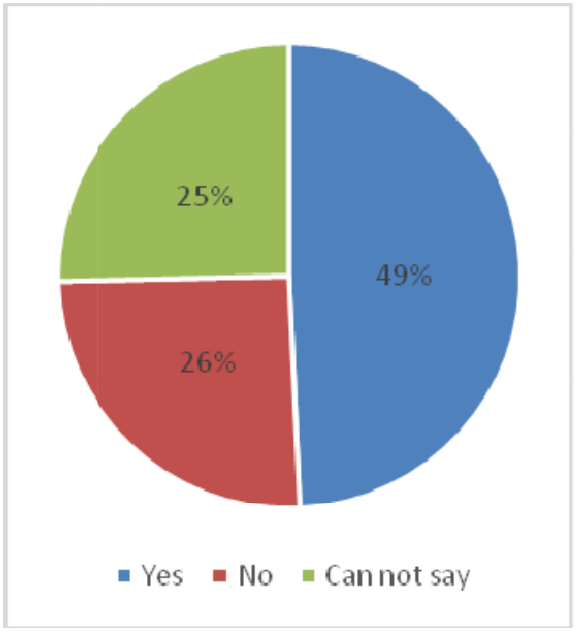

Fig. 6.31: FGD Factors: Chances of Totalizer manipulations to adjust short-delivery quantities

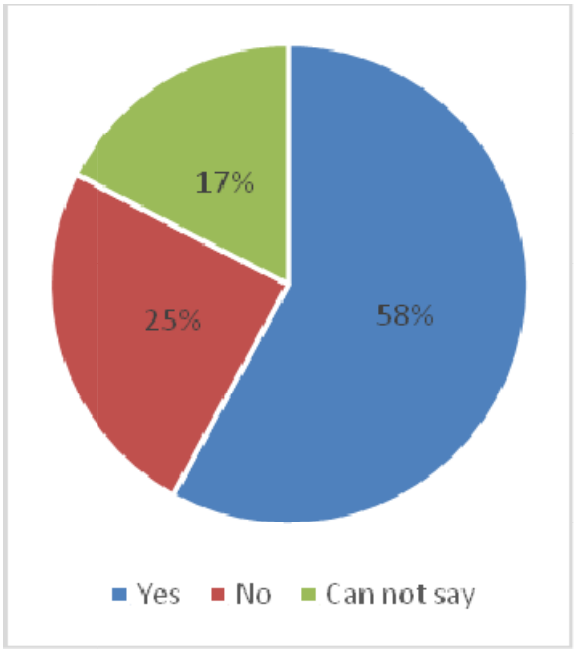

Fig. 6.32: FGD Factors: Chances of avoiding MDG by doing manipulations as transporters

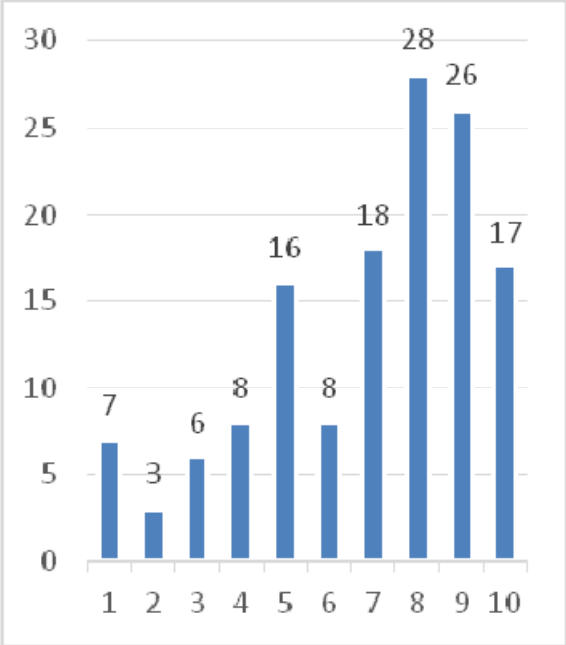

Fig. 6.33: FGD Factors: Chances of improvement if MDG is extended for transportation to Dealer cum transporters

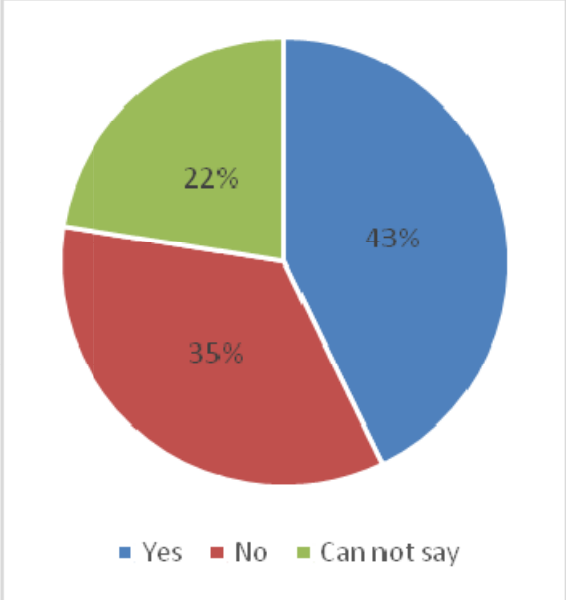

Fig. 6.34: FGD Factors: chances of additional tanks to store unaccounted adulterant

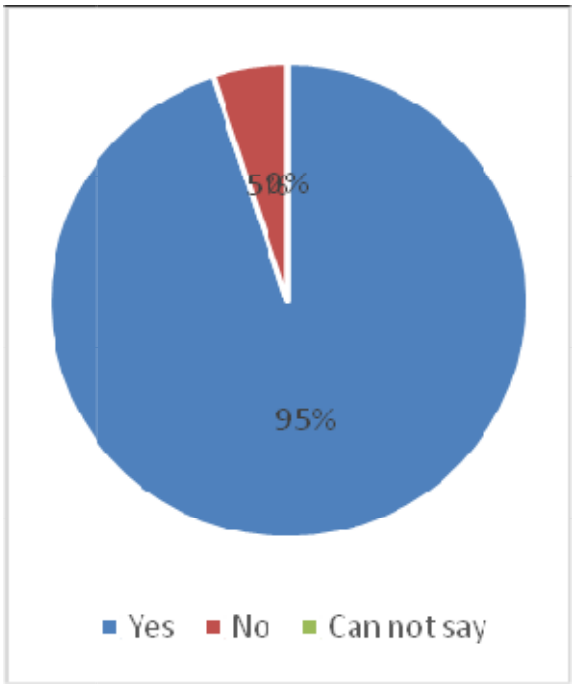

Fig. 6.35: FGD Factors: number and magnitude of adulteration has come down in recent time

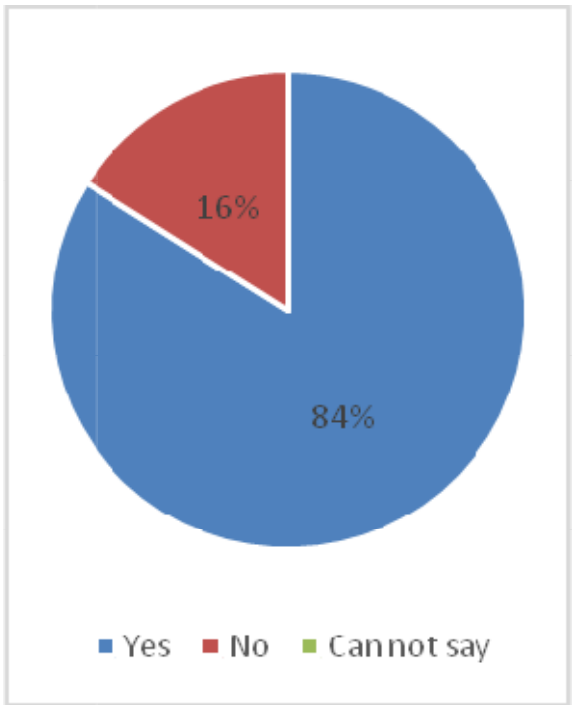

Fig. 6.36: FGD Factors: number and magnitude of short delivery has come down in recent times

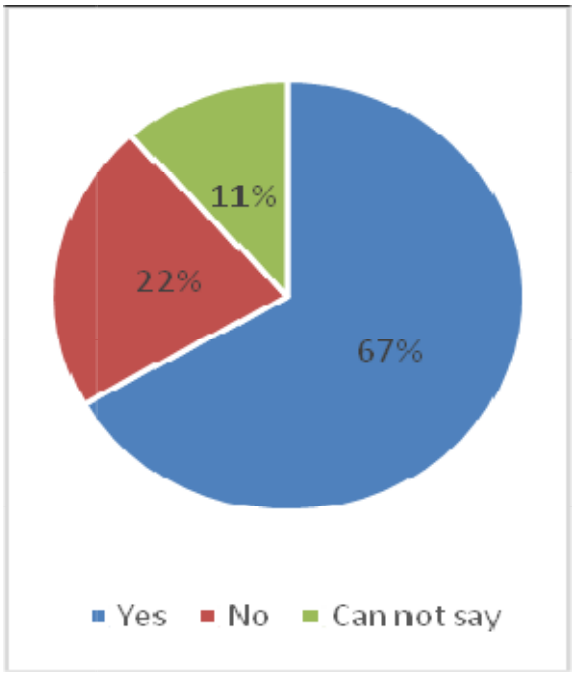

Fig. 6.37: FGD Factors: Behaviour of Customer attendants at RO is seldom unpleasant.

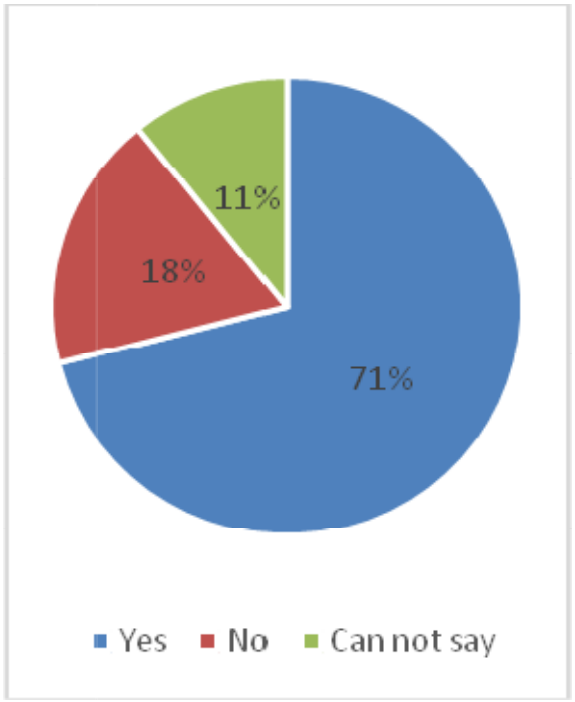

Fig. 6.38: FGD Factors-Customer attendants are seldom found to be lacking in general etiquettes

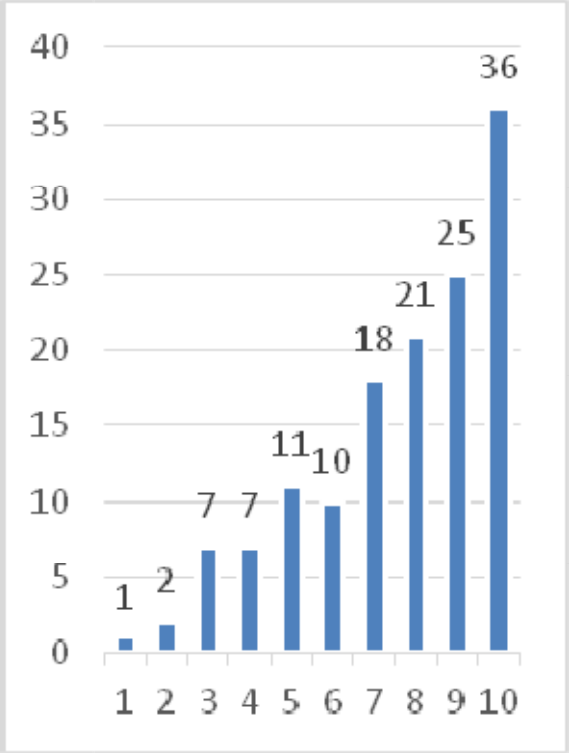

Fig. 6.39: Eigen Values

Table 6.1: FGD Phase 2: Factors emerging

SNo.	**Irregularity emerging from FGD Phase1**	**Results of Phase 2**	**Conclusion**
1	Dispensing Units are tampered with/manipulated to accommodate quantities of adulterants and/or to give short delivery.	57% respondents have said "yes", either to adulteration or to short delivery.	It may be concluded that resellers accommodate additional qty due to adulteration and/ or short delivery by tampering with Dispensing Units.
2	Resellers take advantage of Customers lack of awareness while buying fuel at ROs	82% respondents feel that it is true.	Customers' lack of awareness is getting established while buying fuel and resellers may take advantage of the same.

SNo.	Irregularity emerging from FGD Phase1	Results of Phase 2	Conclusion
3	Non-payment by dealers to their staff, forcing them to do malpractices:	69% respondents have said "yes".	This is also indicated as significant factor for committing fraud at ROs.
4	Dealers complain of receiving short from Oil Companies	52% respondents have responded by saying "yes" and 31% have disagreed by saying "no".	It may not be true that dealers get short receipts from Oil Companies and hence they indulge in malpractices while delivering to buyers.
5	Lack of effective Monitoring during night	57% respondents have responded by saying "yes" and 22% have said 'no" and balance 21% have said "can't say"	Lack of effective monitoring during night is said to be the cause of resellers getting engaged in wrong doings.
6	Vehicle Tracking system (VTS) is installed on every tank truck but it is bye passed to avoid detection of diversion from the specified route	63% population feels that "yes" VTS is bye passed.	Majority has stated that, VTS is bye passed to avoid detection of diversion. Hence it is considered as valid reason for committing malpractices.
7.	Road transportation of products from supply point to RO is most vulnerable and unguarded	83% of respondents have said that most vulnerable stage is "during	Hence it is considered as true.

SNo.	Irregularity emerging from FGD Phase1	Results of Phase 2	Conclusion
		transportation"	
8.	Non-visibility of product to customers at the time of purchase	40% respondents have answered in negative, while 45% have said yes	This is a significant factor.
9.	Non-Availability of appropriate platform for "gauging" and "rating" services at Retail outlets	Significant numbers of respondents (56%) have said that zomato type of platforms may help in exposing malpractices.	There is need to open platforms to gauge and rate services at ROs.
10.	Unholy Alliance with OEM vendors	75% population feels that there can be unholy alliance of OEM vendors with resellers which can affect services at ROs.	Unholy alliance is a significant factor to be reckoned with.
11	Fear among honest officers due to non-availability of mechanism for their protection	76% respondents feel that there is a need to protect honest officers.	Protection mechanism needs to be introduced.
12	Fictitious Short Delivery to Dealers	Could not be proved	Not proved
13	Bulk sales to direct	Could not be	Not proved

SNo.	Irregularity emerging from FGD Phase1	Results of Phase 2	Conclusion
	customers	proved	
14	Action as Transporter vs action as dealer	58% respondents have endorsed the view point.	There is a need to modify control system to address this anomaly.
15	Very low payments or no payments to Tank Truck Crew	Could not be proved	Not proved.
16	Ghost tank within the premises	43% have endorsed the view point.	Already covered.
17	Un-authorised Tank outside the premises	Same as above	Same as above

6.1.1 **Analysis of Customer Survey:**

Factor Analysis of data received through responses during survey carried out at Retail outlets.

Following reports were generated with the results as under:

1. Descriptive Statistics
2. Co-relation Matrix
3. KMO and Bartlett's Test
4. Communalities
5. Total Variance
6. Scree Plot
7. Component Matrix
8. Rotated Component Matrix
9. Component Transformation Matrix

Table 6.2: Factor Analysis: Descriptive Statistics

Factor Analysis

[DataSet2]

Descriptive Statistics

	Mean	Std. D
Whetheryouownaluxurycar	1.6111	
WhetheryouusecreditcardforsettlingFuelbills	1.6290	
WhetheryouloveadventuresportsincludingCarracing	1.4663	
Whetheryouareholdingany clubmembership	1.7480	
Haveyoueverexperienced anymalpracticeinaRO	1.7679	
Inyouropinionwhenmalpracticetakesplace	2.3194	
PumpAttendantdeliveringshort	3.0536	
Possibilityofadditionalpulsars	2.8710	1
AdditionSWChip	3.0020	
EmptyingFrequentnozzlehose	2.8810	1
Overchargingbydailypricin	3.0873	

Table 6.3: Factor Analysis: Co-relation Matrix

Correlation Matrix

		Whetheryouownaluxurycar	W se rs
Correlation	Whetheryouownaluxurycar	1.000	
	WhetheryouusecreditcardforsettlingFuelbills	.148	
	WhetheryouloveadventuresportsincludingCarracing	.035	
	Whetheryouareholdinganyclubmembership	.151	
	HaveyoueverexperiencedanymalpracticeinaRO	.005	
	Inyouropinionwhenmalpracticetakesplace	-.097	
	PumpAttendantdeliveringshort	.020	
	Possibilityofadditionalpulsars	-.019	
	AdditionSWChip	-.021	
	EmptyingFrequentnozzlehose	-.025	
	Overchargingbydailypricing	-.029	

Correlation Matrix

		Whetheryouareholdinganyclubmembership	Ha xp yn
Correlation	Whetheryouownaluxurycar	.151	
	WhetheryouusecreditcardforsettlingFuelbills	.089	
	WhetheryouloveadventuresportsincludingCarracing	.019	
	Whetheryouareholdinganyclubmembership	1.000	
	HaveyoueverexperiencedanymalpracticeinaRO	-.026	
	Inyouropinionwhenmalpracticetakesplace	.028	
	PumpAttendantdeliveringshort	.028	
	Possibilityofadditionalpulsars	.082	
	AdditionSWChip	.065	
	EmptyingFrequentnozzlehose	.060	
	Overchargingbydailypricing	-.009	

Correlation Matrix

		PumpAttendantdeliveringshort	Po diti
Correlation	Whetheryouownaluxurycar	.020	
	Whetheryouusecreditcardforsettling Fuelbills	.017	
	Whetheryouloveadventuresportsincluding Carracing	.027	
	Whetheryouareholdinganyclubmembership	.028	
	Haveyoueverexperiencedanymalpractice inaRO	.330	
	Inyouropinionwhenmalpracticetakesplace	-.032	
	PumpAttendantdeliveringshort	1.000	
	Possibilityofadditionalpulsars	.408	
	AdditionSWChip	.578	
	EmptyingFrequentnozzlehose	.560	
	Overchargingbydailypricing	.466	

Correlation Matrix

		EmptyingFrequentnozzlehose	C b
Correlation	Whetheryouownaluxurycar	-.025	
	WhetheryouusecreditcardforsettlingFuelbills	.018	
	WhetheryouloveadventuresportsincludingCarracing	-.015	
	Whetheryouareholdinganyclubmembership	.060	
	HaveyoueverexperiencedanymalpracticeinaRO	.319	
	Inyouropinionwhenmalpracticetakesplace	-.005	
	PumpAttendantdeliveringshort	.560	
	Possibilityofadditionalpulsars	.588	
	AdditionSWChip	.725	
	EmptyingFrequentnozzlehose	1.000	
	Overchargingbydailypricing	.414	

Correlation Matrix

		Anyothermanipulationaffetcing Quality	In or Qu
Correlation	Whetheryouownaluxurycar	.109	
	Whetheryouusecreditcardforsettling Fuelbills	-.063	
	Whetheryouloveadventuresportsincluding Carracing	.062	
	Whetheryouareholdinganyclubmembership	-.001	
	Haveyoueverexperiencedanymalpractice inaRO	.127	
	Inyouropinionwhenmalpracticetakesplace	.059	
	PumpAttendantdeliveringshort	.158	
	Possibilityofadditionalpulsars	.108	
	AdditionSWChip	.144	
	EmptyingFrequentnozzlehose	.143	
	Overchargingbydailypricing	.116	

Correlation Matrix

		Mostpreferedoilcompany	Why
Correlation	Whetheryouownaluxurycar	-.065	.011
	WhetheryouusecreditcardforsettlingFuelbills	.034	-.011
	WhetheryouloveadventuresportsincludingCarracing	-.003	-.088
	Whetheryouareholdinganyclubmembership	.002	-.006
	HaveyoueverexperiencedanymalpracticeinaRO	-.063	-.006
	InyouropinionwhenmalpracticetakesplaceIn	-.080	.048
	PumpAttendantdeliveringshort	-.029	.050
	Possibilityofadditionalpulsars	-.062	-.017
	AdditionSWChip	-.013	.015
	EmptyingFrequentnozzlehose	-.035	-.008
	Overchargingbydailypricing	-.099	.016

Table 6.4: Factor Analysis: KMO & Bartlett`s Test

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adec	
Bartlett's Test of Sphericity	Approx. Chi-Squ
	df

Table 6.5: Communalities

Communalities

	Initia
Whetheryouownaluxurycar	1.0
WhetheryouusecreditcardforsettlingFuelbills	1.0
WhetheryouloveadventuresportsincludingCarracing	1.0
Whetheryouareholdinganyclubmembership	1.0
HaveyoueverexperiencedanymalpracticeinaRO	1.0
Inyouropinionwhenmalpracticetakesplace	1.0
PumpAttendantdeliveringshort	1.0
Possibilityofadditionalpulsars	1.0
AdditionSWChip	1.0
EmptyingFrequentnozzlehose	1.0
Overchargingbydailypricing	1.0
overchargingbyothermeth	1.0

Table 6.6: Total Variance Explained

Total Varia

Component	Extraction ...	Rotation Sums c	
	Cumulative %	Total	% of V
1	21.506	4.043	
2	29.433	1.425	
3	36.473	1.251	
4	42.782	1.216	
5	48.838	1.196	
6	54.673	1.168	
7	60.084	1.117	
8			
9			
10			
11			
12			

Total Variance Expl

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	4.086	21.506	21.506
2	1.506	7.927	29.433
3	1.338	7.040	36.473
4	1.199	6.309	42.782
5	1.151	6.056	48.838
6	1.109	5.835	54.673
7	1.028	5.411	60.084
8	.956	5.031	65.115
9	.911	4.795	69.910
10	.885	4.657	74.567
11	.806	4.242	78.809
12	.729	3.838	82.647

Table 6.7: Scree Plot

Extraction Method: Principal Component Analysis.

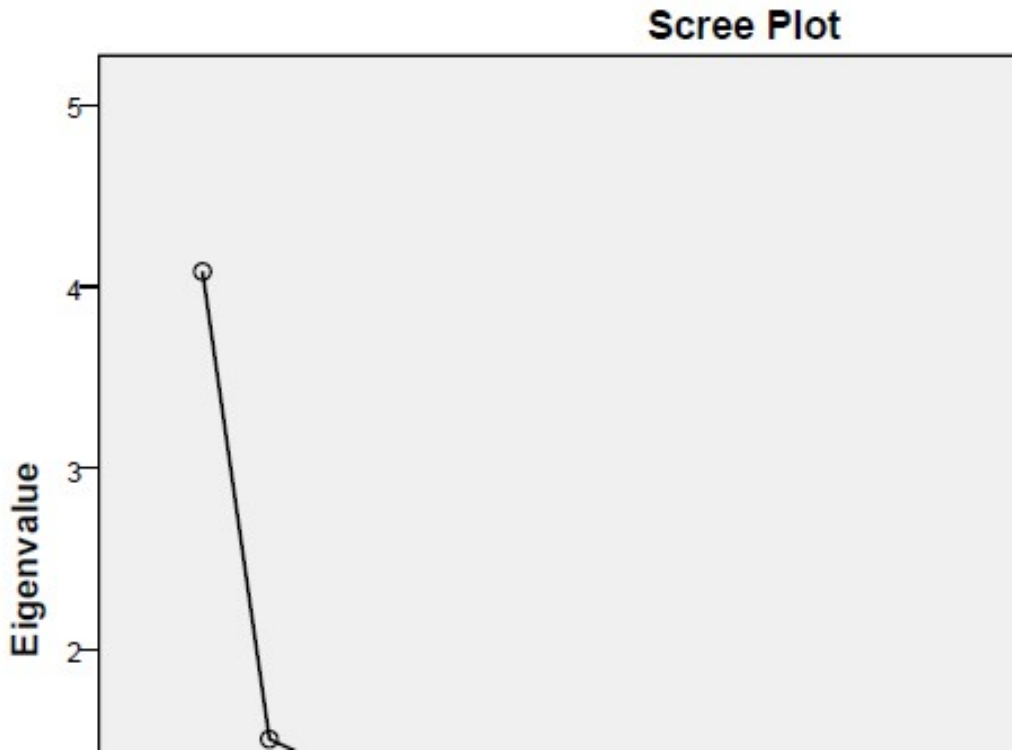

Table 6.8: Component Matrix

Component Matrix[a]

	Compor			
	1	2	3	
Whetheryouownaluxurycar	-.013	-.280	.564	
WhetheryouusecreditcardforsettlingFuelbills	.044	-.369	.234	
WhetheryouloveadventuresportsincludingCarracing	.004	.066	.271	
Whetheryouareholdinganyclubmembership	.072	-.151	.225	
HaveyoueverexperiencedanymalpracticeinaRO	.480	.111	-.019	
Inyouropinionwhenmalpracticetakesplace	-.035	.184	-.056	
PumpAttendantdeliveringshort	.737	.041	.000	
Possibilityofadditionalpulsars	.813	-.110	-.044	
AdditionSWChip	.838	-.039	-.043	
EmptyingFrequentnozzlehose	.800	-.056	-.037	
Overchargingbydailypricing	.751	-.053	-.044	

	Compone...
	7
Whetheryouownaluxurycar	-.355
WhetheryouusecreditcardforsettlingFuelbills	.410
WhetheryouloveadventuresportsincludingCarracing	-.121
Whetheryouareholdinganyclubmembership	-.080
HaveyoueverexperiencedanymalpracticeinaRO	-.296
Inyouropinionwhenmalpracticetakesplace	.239
PumpAttendantdeliveringshort	-.074
Possibilityofadditionalpulsars	.103
AdditionSWChip	.044
EmptyingFrequentnozzlehose	.034
Overchargingbydailypricing	.052
overchargingbyothermethods	.129

Table 6.9: Rotated Component Matrix

Rotated Component Matrix[a]

	Compon			
	1	2	3	
Whetheryouownaluxuryca r	-.061	.002	.733	
Whetheryouusecreditcardf orsettlingFuelbills	.077	.030	.362	
Whetheryouloveadventure sportsincludingCarracing	-.008	-.076	.198	
Whetheryouareholdingany clubmembership	.069	-.048	.686	
Haveyoueverexperienced anymalpracticeinaRO	.436	.132	-.077	
Inyouropinionwhenmalpra cticetakesplace	-.003	.044	-.036	
PumpAttendantdeliverings hort	.721	.084	.049	
Possibilityofadditionalpuls ars	.827	-.042	.007	
AdditionSWChip	.841	.012	.036	
EmptyingFrequentnozzleh ose	.804	-.019	.019	
Overchargingbydailypricin g	.755	.010	-.064	

Rotate

	Compone...
	7
Whetheryouownaluxurycar	-.288
WhetheryouusecreditcardforsettlingFuelbills	-.043
WhetheryouloveadventuresportsincludingCarracing	.128
Whetheryouareholdingany clubmembership	.232
HaveyoueverexperiencedanymalpracticeinaRO	-.402
Inyouropinionwhenmalpracticetakesplace	.839
PumpAttendantdeliveringshort	-.090
Possibilityofadditionalpulsars	.013
AdditionSWChip	-.025
EmptyingFrequentnozzlehose	-.006
Overchargingbydailypricing	-.049
overchargingbyothermethods	.108

Table 6.10: Component Transformation Matrix

Component Transformation Matri

Component	1	2	3	4
1	.992	.070	.034	-.011
2	-.070	.830	-.273	.239
3	-.052	.322	.579	-.439
4	-.018	.258	.649	.425
5	.017	-.233	.078	.753

Table 6.11: Summary of Factor Analysis

S No.	Factor	Extraction Reading	Comments
1.	Have you ever experienced manipulation/cheating at ROs	0.455	This is not a significant factor, extraction reading being <0.5. However, most of the times customer does not even realize that they have been cheated hence extraction value is less.
2.	In your opinion, when malpractice takes place, during daytime, during night or during peak hours	0.741	Extraction value being one of the highest, it shows that customer do believe that malpractices take place at ROs. This is perception of customers
3.	Pump attendants deliver short	0.553	It proves that customers perceive that pump attendants deliver short to buyers – an intentional manipulation by dealers or their representatives.
4.	Possibility of additional pulsars.	0.688	This is a malpractice related to Technology up gradation on which customers are not familiar with.
5.	Additional Software chips	0.716	This is a malpractice related to Technology up gradation on which customers are not familiar with.
6.	Emptying nozzle pipe for delivering short to customers	0.651	Taking advantage of lack of awareness of customers, this type of manipulation is done at ROs.
7.	Overcharging in Daily pricing mechanism	0.584	Intentional malpractice
8	Overcharging by other methods	0.684	Intentional malpractice

Since multiple factors are emerging out of factor analysis, an attempt was made to establish co-relationship between the factors so emerged by doing Chi Square Test:

Null Hypotheses1*: there is no relationship between* ***Gender and Pump Attendants delivering short***:

Since Chi Square value is > average expected value, null hypotheses **stands rejected and hence there is significant relationship** between these two factors, considering $\alpha = 0.05$ and degree of freedom being 3.

Null Hypotheses2*: there is no relationship between* ***Gender and Unethical/malpractice experience at a Retail Outlet.***

Since Chi Square value is < average expected value, null hypotheses prevails **and hence there is no significant relationship** between these two factors, considering $\alpha = 0.05$ and degree of freedom being 1.

Null Hypotheses3*: there is no relationship between* ***Gender and Time of malpractice***:

Since Chi Square value is < average expected value, null hypotheses prevails **and hence there is no significant relationship** between these two factors, considering $\alpha = 0.05$ and degree of freedom being 2.

Null Hypotheses4*: there is no relationship between* ***Occupation and any unethical /malpractice experienced at Retail Outlets:***

Since Chi Square value is < average expected value, **null hypotheses prevails** and hence there is s no significant relationship between these two factors, considering $\alpha = 0.05$ and degree of freedom being 1.

Null Hypotheses5: *there is no relationship in* ***Occupation Vs Time of Malpractice***

Since Chi Square value is < average expected value, **null hypotheses prevails** and hence there is s no significant relationship between these two factors, considering $\alpha = 0.05$ and degree of freedom being 2.

Null Hypotheses6*: there is no relationship* ***between Occupation Vs Overcharging*** *in daily pricing*

Since Chi Square value is > average expected value, null hypotheses **stands rejected and hence there is significant relationship** between these two factors, considering $\alpha = 0.05$ and degree of freedom being 3.

Null Hypotheses7*: There is no relationship between* ***Type of Vehicle and Emptying Nozzle pipe*** *before delivery*

Since Chi Square value is > average expected value, null hypotheses **stands rejected and hence there is significant relationship** between these two factors, considering $\alpha = 0.05$ and degree of freedom being 3.

Null Hypotheses8: There is no relationship between **Age and Unethical / malpractice** experience at a Retail Outlet

Since Chi Square value is < average expected value, **null hypotheses prevails** and hence there is s no significant relationship between these two factors, considering $\alpha = 0.05$ and degree of freedom being 2

Null Hypotheses9: There is no relationship between **Age and time of malpractice** at a Retail Outlet

Since Chi Square value is < average expected value, **null hypotheses prevails** and hence there is s no significant relationship between these two factors, considering $\alpha = 0.05$ and degree of freedom being 2

Null Hypotheses10: There is no relationship between **Most Preferred Brand and Unethical / malpractice** experience at a Retail Outlet

Since Chi Square value is < average expected value, **null hypotheses prevails** and hence there is s no significant relationship between these two factors, considering $\alpha = 0.05$ and degree of freedom being 1.

Null Hypotheses11: There is no relationship between **Most Preferred Brand and Time of malpractice** experience at a Retail Outlet

Since Chi Square value is < average expected value, **null hypotheses prevails** and hence there is s no significant relationship between these two factors, considering $\alpha = 0.05$ and degree of freedom being 2

Null Hypotheses12: There is no relationship between **Most Preferred Brand and Additional Software Chips** at a Retail Outlet

Since Chi Square value is > average expected value, **null hypotheses stands rejected** and hence there is a significant relationship between these two factors, considering $\alpha = 0.05$ and degree of freedom being 3.

Table 6.12: Summary of Chi Square Tests

Primary Axis		Secondary Axis	A	Degree of Freedom	Null Hypothesis	Alternate Hypothesis
Occupation	Vs	Unethical/ Malpractice Experience at an RO	0.05	1	Accepted	Rejected
Occupation	Vs	Time of Malpractice	0.05	2	Accepted	Rejected
Occupation	Vs	Overcharging by Daily Pricing	0.05	3	Rejected	Accepted
Type of Vehicle	Vs	Emptying Frequent Nozzle Hose	0.05	3	Rejected	Accepted
Age	Vs	Unethical/ Malpractice Experience at an RO	0.05	1	Accepted	Rejected
Age	Vs	Time of Malpractice	0.05	2	Accepted	Rejected
Most Preferred Brand	Vs	Unethical/ Malpractice Experience at an RO	0.05	1	Accepted	Rejected
Most Preferred Brand	Vs	Time of Malpractice	0.05	2	Accepted	Rejected
Most Preferred Brand	vs	Addition of S/W Chip	0.05	3	Rejected	Accepted
Gender	Vs	Pump attendants delivering short	0.05	3	Rejected	Accepted
Gender	Vs	Unethical/ Malpractice Experience at an RO	0.05	1	Accepted	Rejected
Gender	Vs	Time of Malpractice	0.05	2	Accepted	Rejected

Analysis of Customer Survey:

Detailed Analysis of Customer Responses through Questionnaire and summary of responses has been as under:

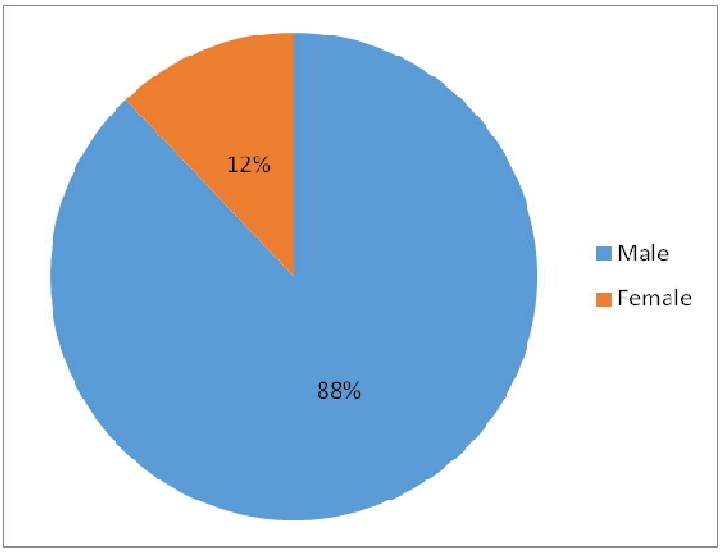

Fig 6.40: Customer Survey-Gender

88% of respondents were males, balance being females. Low percentage of females is also on account of reluctance of women to participate in such surveys specially ROs in NCR area.

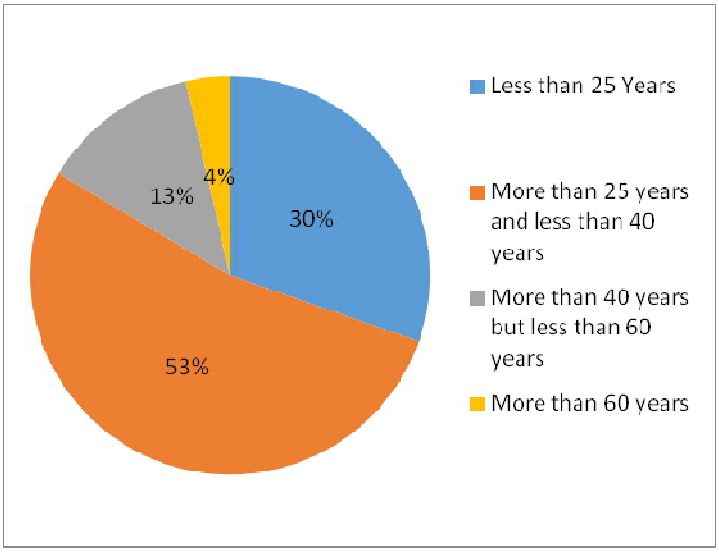

Fig 6.41: Customer Survey - Age

Majority of respondents have been young which means <40 years of age.

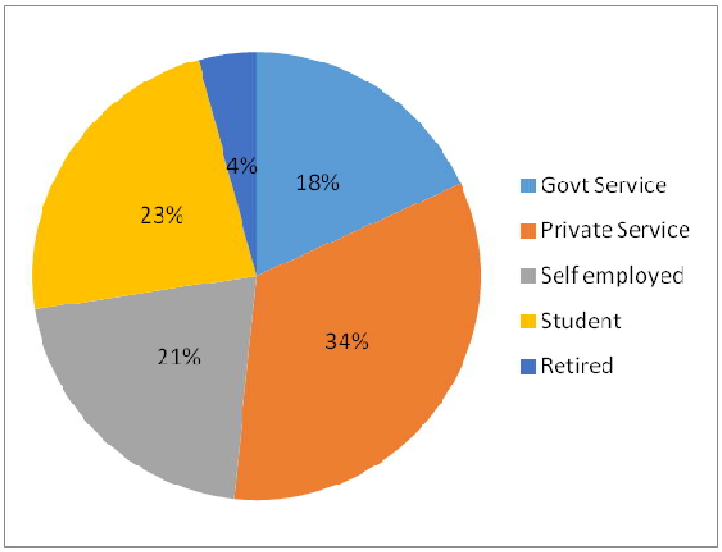

Fig 6.42: Customer Survey-Occupation

Majority of respondents (55%) are from Private service or self-employed.

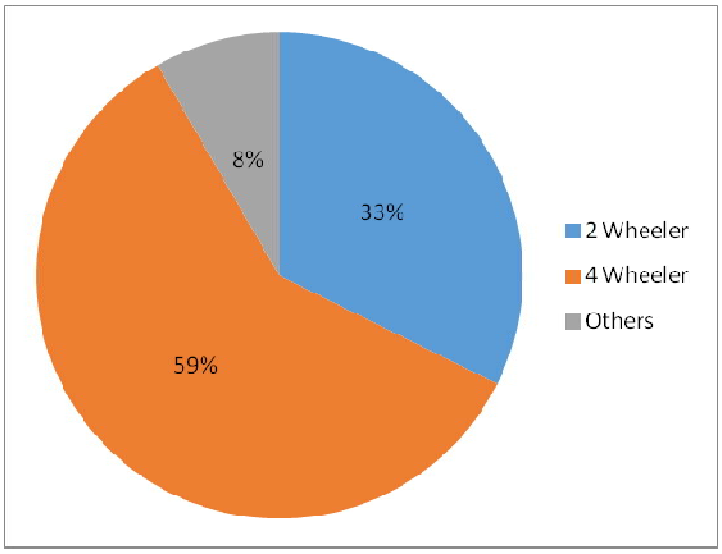

Fig 6.43: Customer Survey -Type of Vehicle owned

Four wheelers (59%)are major respondents. However, this may also be because of their willingness to participate in the survey.

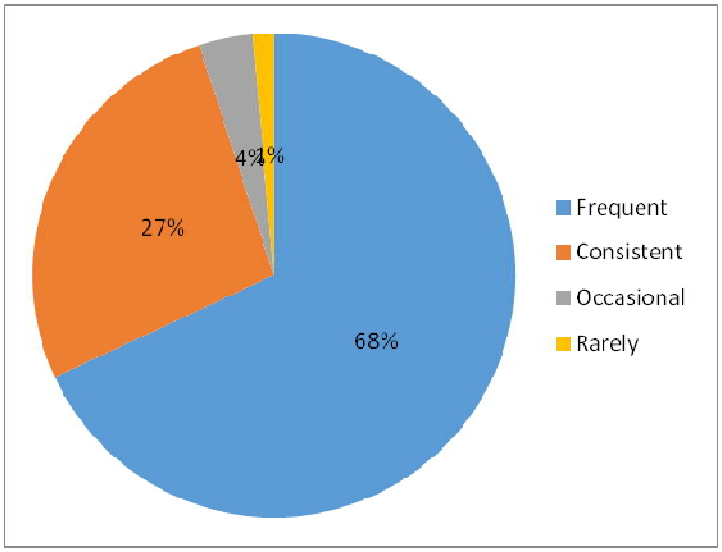

Fig 6.44: Customer survey - Frequency of visit to RO

Majority of respondents (68%) are frequent visitors to Retail outlets (once in a week or more)

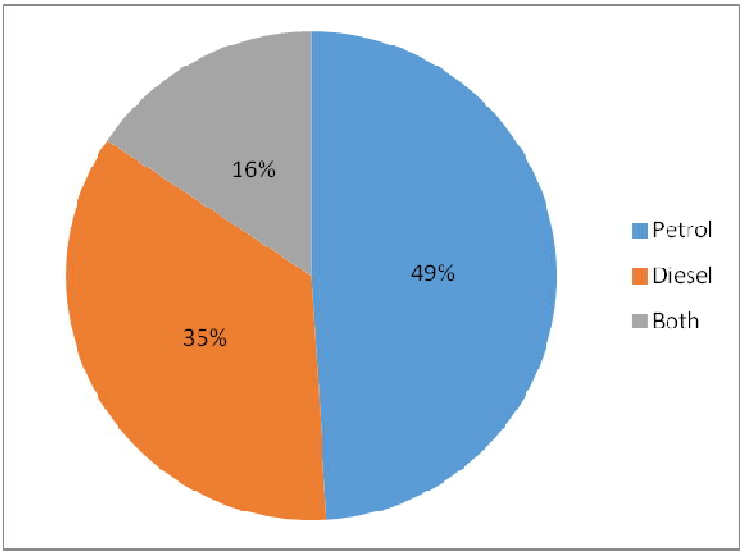

Fig 6.45: Customer Survey - Products Taken

There are more buyers of petrol who have participated in the survey.

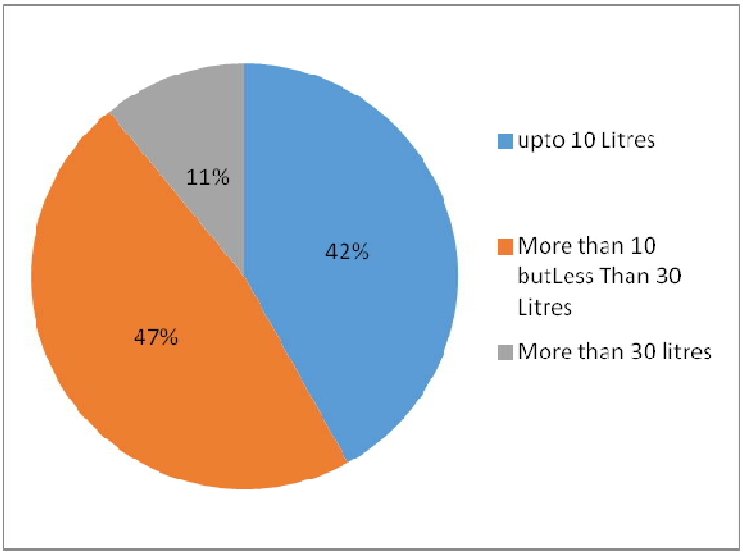

Fig 6.46: Customer Survey - Average Transaction Quantity

Majority of respondents are buying in the range of 10 to 30 litres in one transaction.

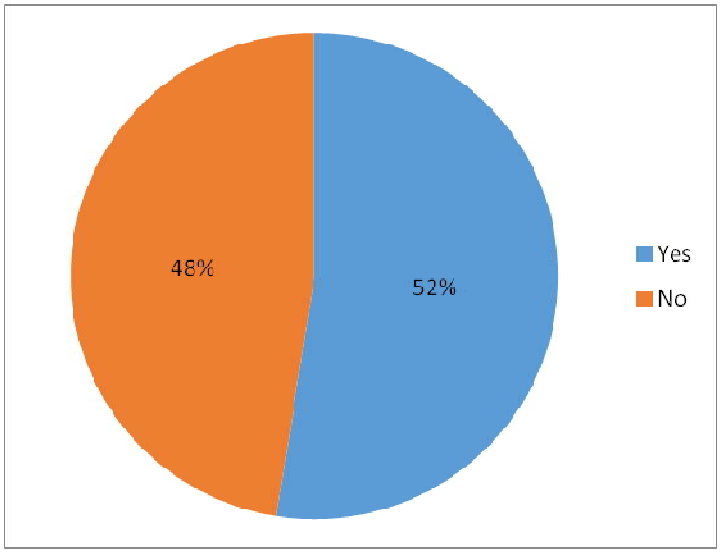

Fig 6.47: Customer Survey: love for adventure sports

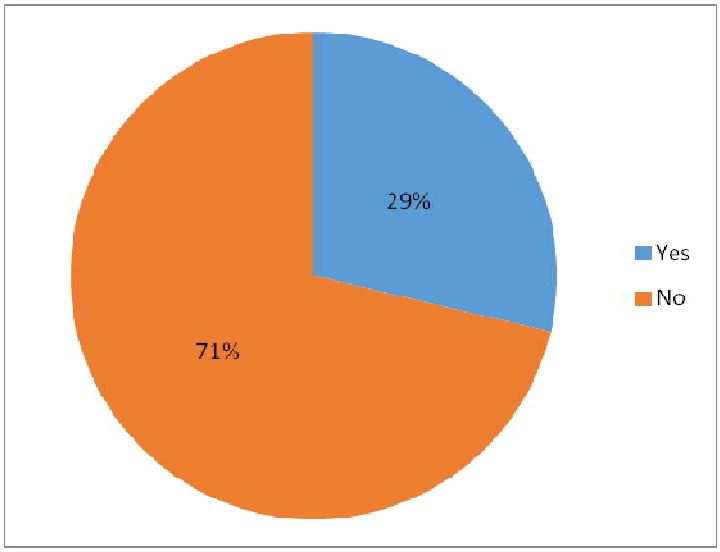

Fig 6.48: Customer Survey-whether experienced any unethical/ malpractice in a Retail Outlet

Though majority of respondents (71%)have replied in negative but balance 29% is a significant number. Actually high percentage of negative response also shows ignorance.

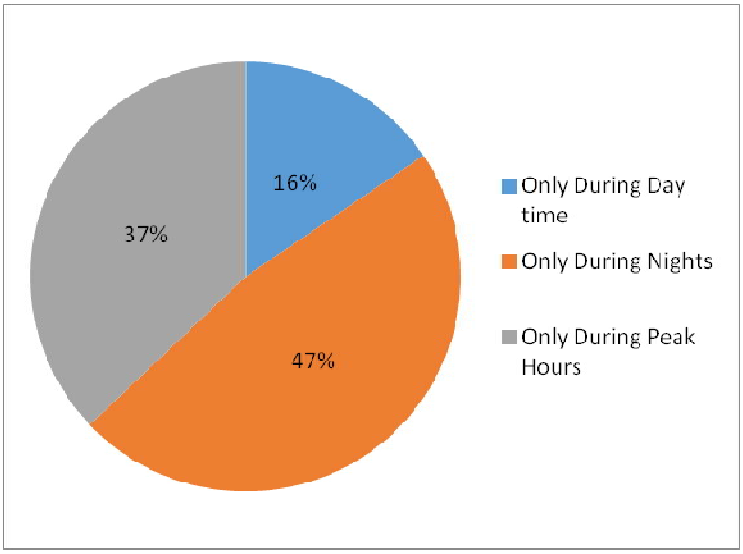

Fig 6.49: Customer Survey-when malpractice/unethical practice takes place

Majority (47%) feels that malpractice /unethical practices happen only during night whereas 37% respondents feel that peak hours are also vulnerable for doing malpractices at Retail outlets.

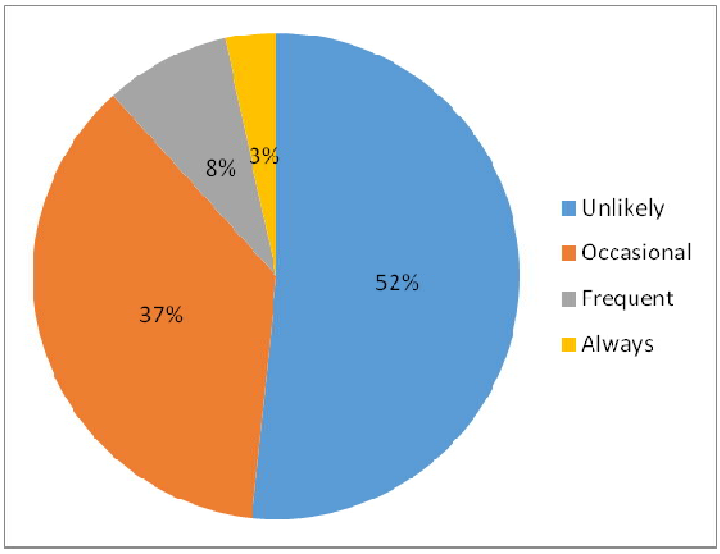

Fig 6.50: Customer Survey - Likelihood of Pump Attendant delivering short

48% (37+8+3) respondents feel that there is likelihood of Pump attendants delivering short which is a significant population.

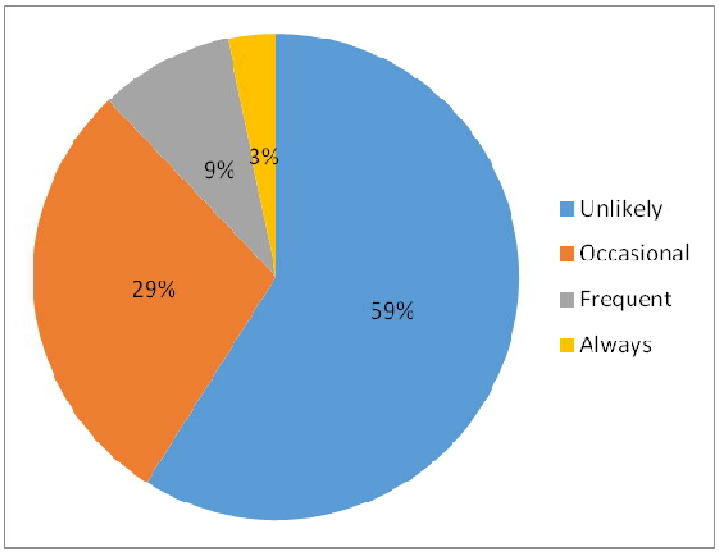

Fig 6.51: Customer Survey - Likelihood of Possibility of additional pulsars

41% respondents feel that additional pulsars are possibly installed in Dispensing Units.

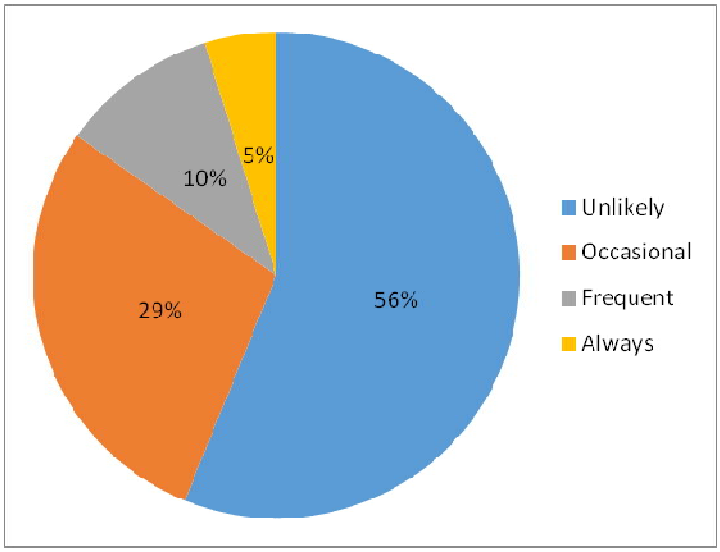

Fig 6.52: Customer Survey -Likelihood of Additional SW Chip for manipulation

44% people feel that RO dealers install additional software chips unauthorizedly.

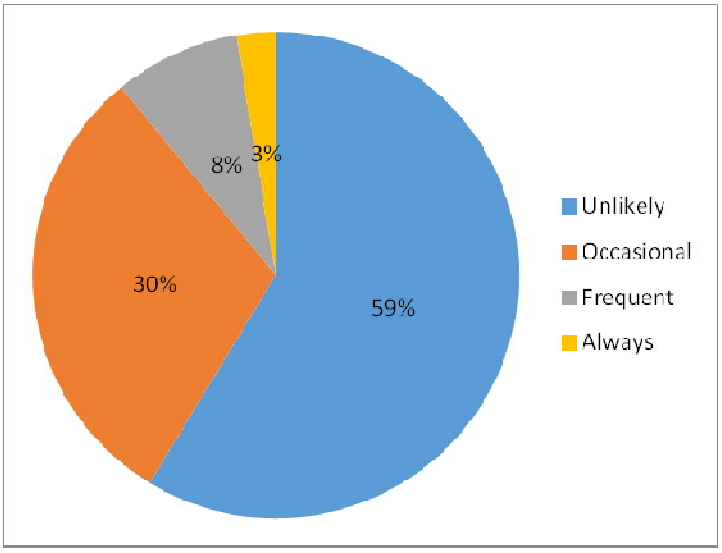

Fig 6.53: Customer Survey -Emptying nozzle hose

41% respondents feel that emptying nozzle hose pipes is a common phenomenon.

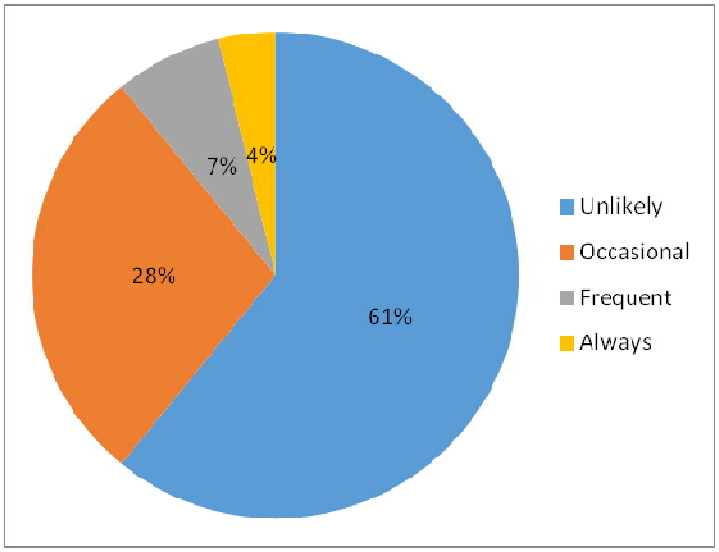

Fig 6.54: Customer Survey - Overcharging by daily pricing

39% which is a significant number, feel that overcharging takes place by daily pricing.

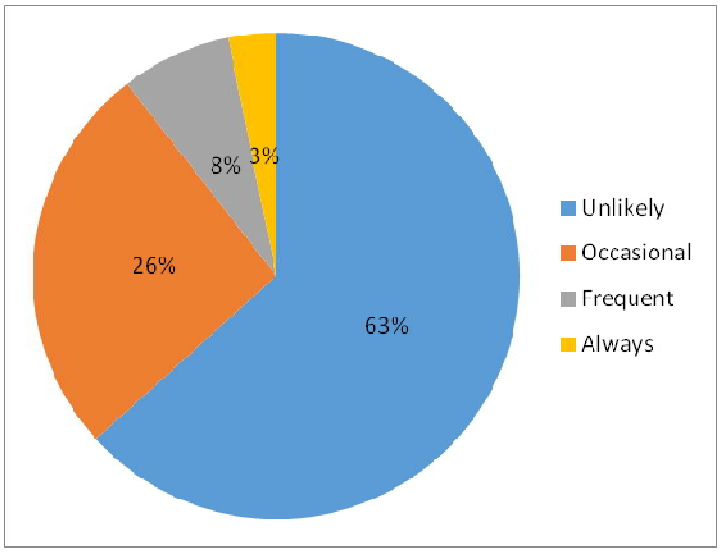

Fig 6.55: Customer survey - overcharging by other methods

37% also feel that overcharging by other methods takes place at ROs.

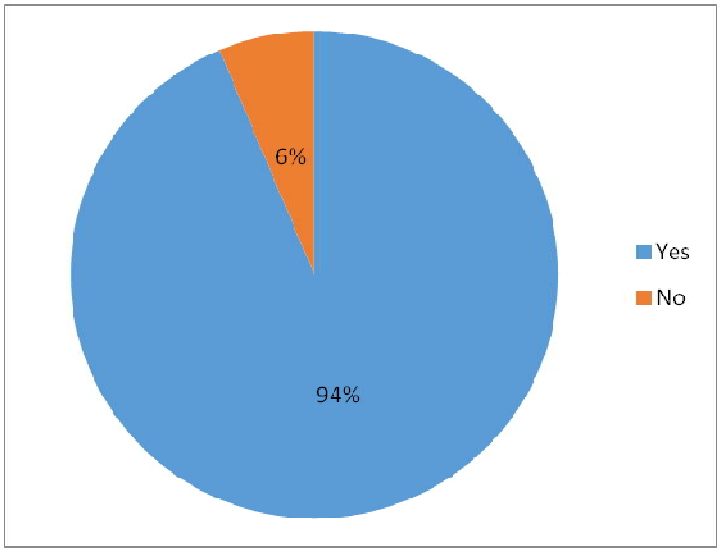

Fig 6.57: Customer Survey - Any other manipulation affecting Quality

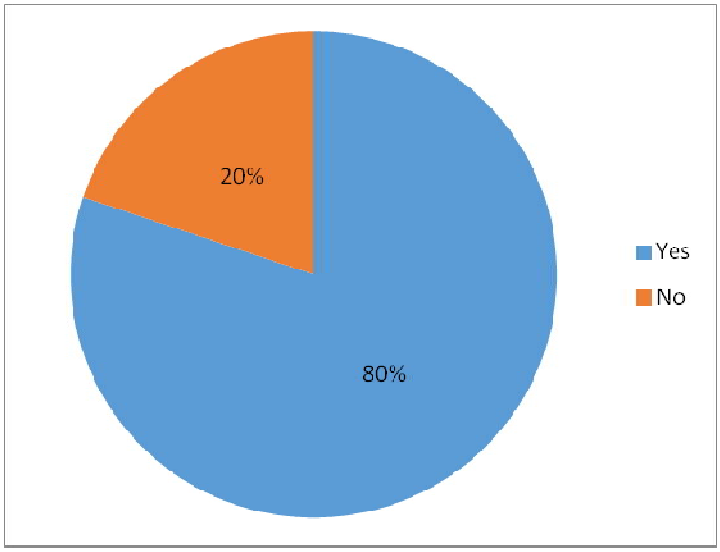

Fig 6.58: Customer Survey - whether fuel Quality affects mileage

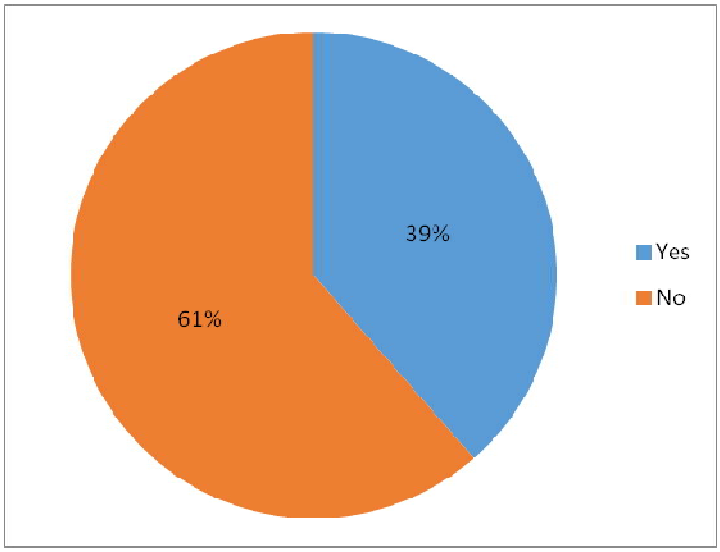

Fig 6.59: Customer Survey- whether mileage is dependent on engine condition

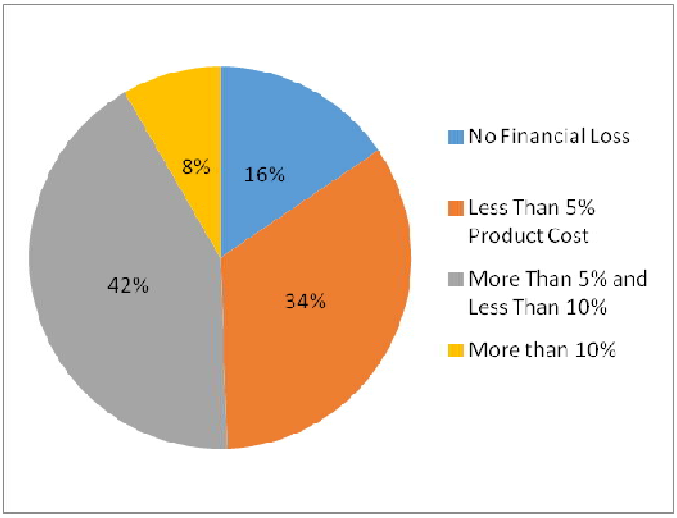

Fig 6.60: Customer Survey – whether malpractices lead to Financial Loss

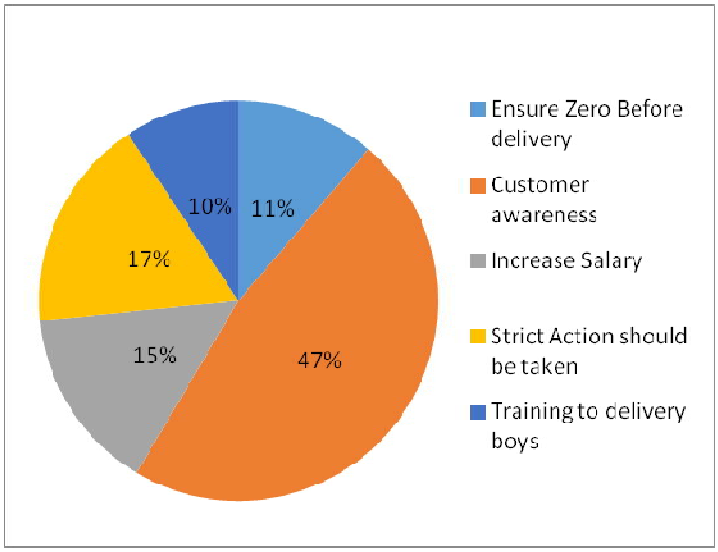

Fig 6.61: Customer Survey – steps for corrective action

6.2 Mapping with MDG

As explained earlier, factors emerging from above analysis were further processed through Document Analysis, considering "As is" and "To Be" methodology to be the most appropriate in this case for reasons already explained. The findings are summarized in Table 16 given below:

Table 6.13: "As is" and "To be" status of factors with respect to MDG

S No.	Irregularity emerging from FGD data	Existing Control Mechanism	
		As is	To be
1	Dispensing Units are tampered with/ manipulated to accommodate quantities arising out of adulteration and/or to give short delivery.	Covered in MDG under critical irregularities	Will continue to be part of MDG
2	Resellers take advantage of Customers lack awareness while buying fuel at ROs	Not covered in MDG	Awareness is to be increased. Stipulations to be made in MDG to make Dealers responsible for creating awareness through campaigns etc.

S No.	Irregularity emerging from FGD data	Existing Control Mechanism	
		As is	To be
3	Non-payment by dealers to their staff, forcing them to do malpractices:	covered in MDG under Major Irregularities	Penalty is prescribed in MDG which leads to payment of fine to the tune of 20% of Dealers margin in first instance 30% in second instance and upto 40 % of Dealers margin in 3rd or subsequent instances.
4	Dealers complain of receiving short from Oil Companies	Not covered in MDG	Dealers satisfy themselves before unloading TTs.
5	Lack of effective Monitoring during night	Night vision cameras Not covered in MDG	night vision cameras to be covered in MDG
6	Vehicle Tracking system (VTS) is installed on every tank truck but it is bye passed to avoid detection of diversion from the specified route	Not covered in MDG	Already covered in Transport Discipline Guidelines but may be covered under MDG for dealer cum transporters.
7.	Road transportation of products from supply point to RO is most vulnerable and unguarded	Road transportation is most vulnerable but not covered in MDG	Needs to be brought under the ambit of MDG particularly for Dealer cum transporters.
8.	Non-visibility of product to customers at the time of purchase	Not covered in MDG	Transparent hose pipes can be introduced on trial basis and depending upon success, final view can be taken. it can be a game changer as it will help in re-building trust

S No.	Irregularity emerging from FGD data	Existing Control Mechanism	
		As is	To be
			amongst customers.
9.	Non-Availability of appropriate platform for "gauging" and "rating" services at Retail outlets	Not covered in MDG	A separate platform can be created by Oil Industry to gauge and rate performance of ROs in giving services to customers on the similar lines of Zomato and other agencies for food outlets & restaurants.
10.	Unholy Alliance with OEM vendors	This issue is not addressed in MDG	Stricter control for OEMs for DUs in view of gravity/potential of complications it can cause.
11	Fear among honest officers due to non-availability of mechanism for their protection	Not addressed in MDG.	This is an important parameter, which needs to be addressed.
12	Fictitious Short Delivery to Dealers	Not covered in MDG	Existing provisions to continue.
13	Bulk sales to direct customers	Not covered in MDG.	Existing provisions to continue.
14	Action as Transporter vs action as dealer	Not covered in MDG	To be covered for dealer cum transporters
15	Very low payments or no payments to Tank Truck Crew	MDG covers only payments to RO staff.	Existing provisions to continue.
16	Additional tank within the premises	Covered	Existing provision to continue
17	Un-authorized Tank outside the premises	Covered	Existing provision to continue

Table 6.14: Dependent Variable=ADR						
Category	**I_Variable**	**RRR**	**Std Error**	**Co-Eff**	**Std Err**	**P>|z|**
ADR/NADR	ls_adr1	7.680181	6.14564	2.038643	0.800195	**0.010844**
ADR/NADR	ls_adr2	1.390979	1.271041	0.330008	0.913775	0.717989
ADR/NADR	lpsp1	4.074024	3.415359	1.404631	0.838326	**0.093832**
ADR/NADR	lpsp2	13.90367	15.27465	2.632153	1.098605	**0.016579**
ADR/NADR	lackofmech1	11.26696	10.11298	2.421875	0.897578	**0.006971**
ADR/NADR	lackofmech2	2.358762	2.620302	0.858137	1.11088	**0.439828**
ADR/NADR	var67	36.42199	56.65257	3.595173	1.55545	**0.020814**
ADR/NADR	var68	1.842011	2.971149	0.610858	1.612992	0.704903
ADR/NADR	manisd1	0.131291	0.196879	-2.03034	1.499564	0.175751
ADR/NADR	manisd2	1.379251	2.352283	0.321541	1.705478	0.850458
ADR/NADR	dealertrans1	0.414288	0.41709	-0.88119	1.006763	0.381425
ADR/NADR	dealertrans2	0.142173	0.155727	-1.95071	1.09533	**0.074924**
ADR/NADR	addtlanks1	1.115771	0.985319	0.109546	0.883084	0.901276
ADR/NADR	addtlanks2	0.407236	0.364958	-0.89836	0.896183	0.316135
ADR/NADR	_cons	0.032753	0.046974	-3.41877	1.434211	**0.017138**
NLADR/NADR	ls_adr1	0.534426	0.40826	-0.62656	0.763923	0.412108
NLADR/NADR	ls_adr2	0.258508	0.252675	-1.35283	0.977434	0.16634
NLADR/NADR	lpsp1	1.946369	1.540397	0.665965	0.791421	0.400079
NLADR/NADR	lpsp2	4.554094	5.497202	1.516027	1.20709	0.20914
NLADR/NADR	lackofmech1	3.55199	3.454853	1.267508	0.972653	0.192525
NLADR/NADR	lackofmech2	1.86161	2.83327	0.621442	1.521946	0.683039
NLADR/NADR	var67	5.psycho 376	7.163109	1.63186	1.400857	0.244059
NLADR/NADR	var68	1.96E-07	0.000299	-15.4432	1520.416	0.991896
NLADR/NADR	manisd1	0.057665	0.079881	-2.85311	1.385274	**0.039437**
NLADR/NADR	manisd2	2488266	3.78E+09	14.7271	1520.416	0.992272
NLADR/NADR	dealertrans1	0.559945	0.517817	-0.57992	0.924763	0.530596
NLADR/NADR	dealertrans2	0.060965	0.074393	-2.79746	1.220255	**0.021876**
NLADR/NADR	addtlanks1	0.462699	0.421366	-0.77068	0.910669	0.397398
NLADR/NADR	addtlanks2	0.116657	0.113797	-2.14852	0.975486	**0.027629**
NLADR/NADR	_cons	5.504169	5.460945	1.705506	0.992147	**0.085613**

Note:

Category	Code	Remarks
1	ADR	Manipulating Dispensing units by re-sellers for adjusting extra quantities arising due to adulteration
2	NADR	No Manipulation of Dispensing units by re-sellers for adjusting extra quantities arising due to Adulteration
3	NLADR	Can't Say if there is a manipulation of Dispensing units by re-sellers for adjusting extra quantities arising due to adulteration

Number of obs = 138; Log likelihood = -88.428504; LR chi2(28) = 113.78; Pseudo R2 = 0.3915
Prob > chi^2 = 0.0000

6.3 Impact of such identified factors on fraud risks

1. The relative risk of having adulteration relative to no adulteration is likely to increase statistically to 768.02% at 5% significance level when there is lack of effective control system relative to neutral control system

2. The relative risk of having adulteration relative to no adulteration is likely to increase statistically to 407.40% at 10% significance level when there is insufficient payment made by dealers to their staffs that engages them to irregular activities relative to sufficient wages and payments.

3. The relative risk of having adulteration relative to no adulteration is likely to increase statistically to 1390.37% at 5% significance level when there is Average payment made by dealers to their staffs that engages them to irregular activities relative to sufficient wages and payments.

4. The relative risk of having adulteration relative to negative category is likely to increase statistically to 1126.70% at 1% significance level when there is lack of mechanism to protect honest officers in the system relative to availability of mechanism to protect the same.

5. The relative risk of having adulteration relative to no adulteration is likely to increase statistically to 3642.20% at 5% significance level when there are extra volumes generated in the RO due to adulteration are adjusted by manipulating totalizer readings relative to no such activities done or no adjustment made.

6. The relative risk of having adulteration relative to negative category is likely to increase statistically to 14.22% at 10% significance level when there is neutral action taken against transporter cum dealer relative to no such strict actions taken against transporters as compared to dealer.

Table 6.15 : Dependent Variable =SDR						
Category	**I_Variables**	**Co-Eff**	**Std Error**	**RRR**	**Std Err**	**P>|z|**
SDR/NLSDR	ls_adr1	-1.31718	1.202367	0.267889	0.322101	0.273302
SDR/NLSDR	ls_adr2	-0.91277	1.305892	0.401411	0.524199	0.484575
SDR/NLSDR	ls_sdr1	3.437578	1.385864	31.11151	43.11632	**0.013121**
SDR/NLSDR	ls_sdr2	0.385197	1.483093	1.469903	2.180003	0.795076
SDR/NLSDR	sdr1_1	0.888225	0.825086	2.43081	2.005627	0.281693
SDR/NLSDR	sdr1_2	0.369548	0.875292	1.44708	1.266618	0.67288
SDR/NLSDR	manisd1	2.237341	0.674384	9.368388	6.317896	**0.000908**
SDR/NLSDR	manisd2	1.914894	0.824301	6.786218	5.593885	0.020176
SDR/NLSDR	behavrca1	2.29737	0.905969	9.947987	9.012566	**0.011219**
SDR/NLSDR	behavrca2	3.040706	1.130136	20.92	23.64244	**0.007133**
SDR/NLSDR	_cons	-4.56567	1.208699	0.010403	0.012574	**0.000159**
NSDR/NLSDR	ls_adr1	-2.51218	1.235281	0.081091	0.10017	**0.041983**
NSDR/NLSDR	ls_adr2	-1.34666	1.231673	0.260107	0.320367	0.274236
NSDR/NLSDR	ls_sdr1	2.220673	1.324054	9.21353	12.19921	**0.093508**
NSDR/NLSDR	ls_sdr2	0.996995	1.317527	2.710125	3.570663	0.44922
NSDR/NLSDR	sdr1_1	1.909298	0.976616	6.748347	6.590546	**0.050582**
NSDR/NLSDR	sdr1_2	2.24036	0.973127	9.396711	9.144191	**0.021322**
NSDR/NLSDR	manisd1	1.301729	0.755498	3.675646	2.776941	**0.084887**
NSDR/NLSDR	manisd2	2.42006	0.846605	11.24653	9.521371	**0.004256**
NSDR/NLSDR	behavrca1	1.666351	0.928581	5.292816	4.914811	**0.072731**
NSDR/NLSDR	behavrca2	1.359507	1.146361	3.894272	4.464243	0.235649
NSDR/NLSDR	_cons	-3.94057	1.20255	0.019437	0.023374	**0.00105**

Note:

Category	**Code**	**Remarks**
1	SDR	Manipulating Dispensing units by re-sellers for adjusting extra quantities arising due to short delivery
2	NSDR	No Manipulation of Dispensing units by re-sellers for adjusting extra quantities arising due to short delivery
3	NLSDR	Can't Say if there is a manipulation of Dispensing units by re-sellers for adjusting extra quantities arising due to short delivery

Number of obs. = 138
LR chi2(20) = 76.76
Prob > chi2 = 0.0000
Log likelihood = -97.550381
Pseudo R2 = 0.2824

1. The relative risk of having short delivery relative to neutral category is likely to increase statistically to 3111.15% at 5% significance level when there is lack of effective control system relative to neutral regulatory control system

2. The relative risk of having short delivery relative to neutral category is likely to increase statistically to 936.84% at 1% significance level when there is manipulation in totalizer readings relative to neutral manipulation.
3. The relative risk of having short delivery relative to neutral category is likely to increase statistically to 678.62% at 5% significance level when there is no manipulation relative to manipulations.
4. The relative risk of having short delivery relative to neutral category is likely to increase statistically to 994.79% at 5% significance level when there are unpleasant Behaviour of Customer attendants relative to neutral Behaviour of Customer attendants at RO.

6.4 Reliability:

Reliability is concerned with the question of whether or not a result is stable. The idea of reliability is important for measuring the correctness of data. The data for Objective 1 was generated through FGDs as the respondents were selected from Oil companies based on their positions of experience, their authority & responsibility, other stake holders such as transporters and most importantly the customers visiting Retail Outlets for fuel requirements for their vehicles through a questionnaire.

In both the cases (FGDs and Customer survey through the questionnaire) the respondents were given freedom to express without undue stress which otherwise would have had negative effects upon the reliability of this study

As regards variables emerged from FGDs, these were done in two phases and validity of factors emerged in phase1 automatically got checked in phase 2 by another set of experts.

For Customer survey, Cronbach alpha test was applied as basic Technique to check reliability and for improving the questionnaire. This test is generally used for measuring internal consistency and reliability as it quantifies/ proposes a coefficient which theoretically ranges from 0 to 1. If value of alpha is near 0 then

the results are not reliable, and if alpha is close to 1, the answers are quite reliable for results. In this study Cronbach alpha test has given the result of 0.652 which is acceptable.

Factor analysis is a method of data reduction. Since there are number of variables, main purpose is to identify most significant factors and hence factor Analysis was done using SPSS22 tool.

Before doing factor Analysis, sampling adequacy was checked by Kaiser Meyer method which signifies dependency of variables that they are dependent on each other and are correlated. This is a necessary condition to proceed with factor analysis. The sampling adequacy was found to be 0.796 which is acceptable. (below 0.50 it is unacceptable).

With the help of Factor analysis, 7 factors were found with cumulative percentage of total variance of 60.084%. In simple words it implies that the 60.084% of variance is covered and explained by these 7 factors.

Scree Plot

Scree Plot is a graphical way of extracting the number of factors and it is the plot between Eigen value and the number of factors in their order of extraction. In the figure, curve drops sharply at first and then it flattens after factor 7, which signifies that 7 factors are sufficient to explain the variance in the variables.

6.5 Validity:

As mentioned earlier, Factor analysis is a method of data reduction, factor Analysis was done using SPSS22 tool. By calculating bivariate correlation, significant values were obtained for each factor. It is found that all 7 factors are significant. The details are shown in table 6.16 below:

Table 6.16: Bivariate Correlation: Total score and Significant values of Factors

		Totalscore
HaveyoueverexperiencedanymalpracticeinaRO	Pearson Correlation	.425**
	Sig. (2-	0.000

	tailed)	
	N	504
Inyouropinionwhenmalpracticetakesplace	Pearson Correlation	.103*
	Sig. (2-tailed)	0.021
	N	504
PumpAttendantdeliveringshort	Pearson Correlation	.716**
	Sig. (2-tailed)	0.000
	N	504
Possibilityofadditionalpulsars	Pearson Correlation	.790**
	Sig. (2-tailed)	0.000
	N	504
AdditionSWChip	Pearson Correlation	.808**
	Sig. (2-tailed)	0.000
	N	504
Emptying2nozzlehose	Pearson Correlation	.778**
	Sig. (2-tailed)	0.000
	N	504
Overchargingbydailypricing	Pearson Correlation	.719**
	Sig. (2-tailed)	0.000
	N	504

overchargingbyothermethods	Pearson Correlation	.771**
	Sig. (2-tailed)	0.000
	N	504
AnyothermanipulationaffetcingQuality	Pearson Correlation	.219**
	Sig. (2-tailed)	0.000
	N	504
InyourperceptionwhethrfuelQualityaffectsmileage	Pearson Correlation	.167**
	Sig. (2-tailed)	0.000
	N	504
Inperceptionmilegeisdependentonenginecondition	Pearson Correlation	.120**
	Sig. (2-tailed)	0.007
	N	504
Mostpreferedoilcompany	Pearson Correlation	.125**
	Sig. (2-tailed)	0.005
	N	504
Totalscore	Pearson Correlation	1
	Sig. (2-tailed)	
	N	504

*. Correlation is significant at the 0.05 level (2-
tailed).
**. Correlation is significant at the 0.01 level (2-
tailed).
Based on above, it is concluded that all factors are significant and valid.

In case of Objective 2 & 3, validity is in built in the research tool and hence does not require any separate validation.

6.6 Scope of Study:

The study has been made keeping in view the difficulties being experienced by public at large. The products like MS and HSD are used as liquid fuels all over the country for travelling and hence scope of study extends to entire length and breadth of the country. As far as fraudulent activities are concerned, these may be happening in all states though degree of menace may vary from state to state. For the purpose of study, customer's feedback has been taken in NCR area only and hence has been assumed to represent all states and UTs.

6.7 Limitation of Study:

There are certain limitations of the study:

- Only PSU Retail outlets have been covered as about 77% of MS/HSD retail sales on all India basis are taking place at PSU ROs only.
- Study has been conducted in NCR area at 84 number of Retail outlets (51IOC, 17 BPC, 16HPC) representing 10.9% of PSU ROs and 10.5% total number of Retail outlets including those of private oil companies.
- The survey was done only during daytime.
- Survey has been confined to 504 respondents.
- Control mechanism can be altered on Industry basis involving all oil marketing companies and hence process of bringing change may be longer and time consuming.

Chapter 7
Conclusion & Recommendations

7. Conclusion & Recommendations

7.1 Conclusion:

The Table 7.1 given below depicts application of fraud theories in Retail Petroleum Business in India:

Table 7.1: Application of Fraud Theories in retail Petroleum Business

S.No.	Fraud Factors	Related Component(s) of Fraud Diamond Theory
1	Dispensing Units are tampered with/manipulated to accommodate quantities of adulterants and/or to give short delivery.	Opportunity
2	The Customers lack awareness while buying fuel at ROs	Rationalization
3	Non-payment by dealers to their staff, forcing them to do malpractices	Pressure
4	Dealers complain of receiving short from Oil Companies	Rationalization
5	Lack of effective Monitoring during night	Opportunity
6	Vehicle Tracking system (VTS) is installed on every tank truck but it is bye passed to avoid detection of diversion from the specified route	Opportunity
7	Road transportation of products from supply point to RO is most vulnerable and unguarded	Opportunity

S.No.	Fraud Factors	Related Component(s) of Fraud Diamond Theory
8	Non-visibility of product to customers at the time of purchase	Opportunity
9	Non-Availability of appropriate platform for "gauging" and "rating" services at Retail outlets	Opportunity
10	Alliance with OEM vendors	Opportunity
11	Fear among honest officers due to non-availability of mechanism for their protection	Opportunity, Rationalization

7.2 Recommendations:

7.2.1 Perceived problem: **Dispensing Units are tampered with/manipulated to accommodate quantities of adulterants and/or to give short delivery.**

Solution: DUs to be made tampering proof with central coding system: Dispensing Units can be programmed through a central coding system in such a way that these units will come to a complete halt if tampered with. The pulsar Unit which is perhaps the most important part of a nozzle delivery system, sends appropriate signals if any person tries to fiddle with it and therefore central coding system completely stops the machine.

7.2.2 Perceived problem: **The Customers lack awareness while buying fuel at ROs**

Solution: Customer Awareness programs to be run extensively along with Check list for customers to be displayed at ROs. Hence Check list

giving complete details like “see zero” and / or “see today`s price” & so on and so forth may help in bringing awareness among the customers.

7.2.3 Perceived problem: **Non-payment by dealers to their staff, forcing them to do malpractices.**

Solution: Payment to RO customer attendants to be ensured by dealers. Since small time manipulation takes place because customer attendants are not sufficiently paid by the respective dealers and that they are not the employees of Oil companies, a proper mechanism needs to be devised for ensuring payments to such customer attendants in the interest of buyers even though it is included in MDG.

7.2.4 Perceived problem: **Lack of effective Monitoring during nights**

Solution*:* CCTV with night vision camera may be installed in DUs.

7.2.5 Perceived problem: **Vehicle Tracking system (VTS) is installed on every tank truck but it is bye passed to avoid detection of diversion from the specified route.**

Solution: VTS to be made compulsory and bye-pass-free in TTs.

7.2.6 Perceived problem: **Road transportation of products from supply point to RO is most vulnerable and unguarded.**

Solution: Abolishing Road Transport system as products (MS & HSD) are mainly handled in three stages as depicted below:

a. In Oil company installations
b. During transportation from Installation to Retail outs
c. At Retail Outlets

As has been said earlier, there are enough controls available to maintain quality and quantity at storage points of oil companies. However, product handling during transportation and at Retail Outlets is not done by the employees of oil companies and is therefore handled mostly by private

transporters and dealers respectively and their representatives. Since ROs are liable to be inspected by oil company officials and other Government Agencies periodically, product handling at their sites is not completely unguarded. However, product handling during transportation is rarely inspected en-route and therefore is the most vulnerable in the entire chain of supply management.

Since Road transport system is vulnerable, it needs to be abolished. PNG type pipelines may be laid instead from supply points to Retail outlets. However, it may not work out for far off/ upcountry Retail outlets.

7.2.7 Perceived problem: **Non-visibility of product to customers at the time of purchase.**

Solution*:* Improving visibility through transparent hose pipes

7.2.8 Perceived problem: **Non-Availability of appropriate platform for "gauging" and "rating" services at Retail outlets.**

Solution*:* Zomato type platform for MS & HSD. This will help in getting the feedback about retail outlets, which will help, in identifying retail outlets/areas in which adulteration/malpractices are higher.

7.2.9 Perceived problem: **Alliance with OEM vendors.**

Solution: Needs to be addressed through MDG

7.2.10 Perceived problem: **Fear among honest officers due to non-availability of mechanism for their protection.**

Solution: Protecting honest officers.

The Network diagram in the new scenario (if recommendations are accepted) will look like this:

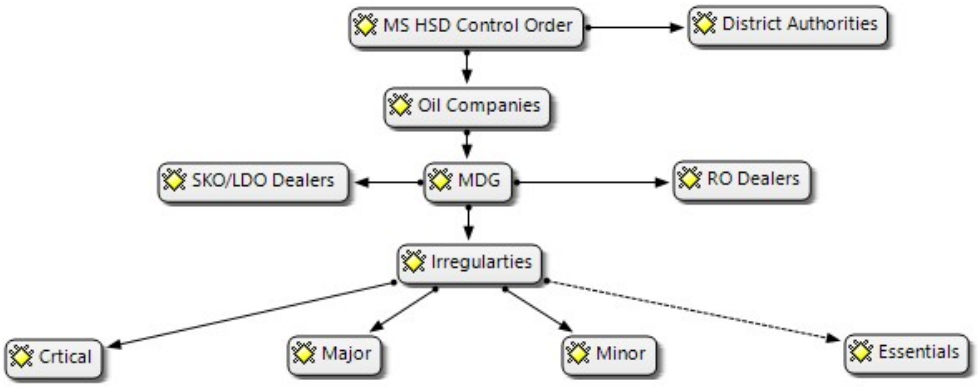

Fig. 7.1: Network Diagram

Based on this network diagram, critical, major, minor penalties may not undergo considerable change, but there are significant changes which may be required to be brought in, as part of "Essentials".

The items which are proposed to be kept under "Essentials" are being practised even today but sporadically and not uniformly.

In the proposed network diagram following major points among others, have been considered for implementation uniformly in all oil companies and in all retail outlets:

1. To run customer awareness programs to bring alertness among the customers.
2. To ensure regular and timely payment to retail outlet staff by the respective dealers, service provider or companies (in case of company run COCOs)
3. To maintain surveillance through CCTV especially during nights to keep a control on movements when there is no other method of supervision is available
4. Monitoring of vehicle movement through VTS.

In view of the above network Diagram, the control mechanism may work out as under:

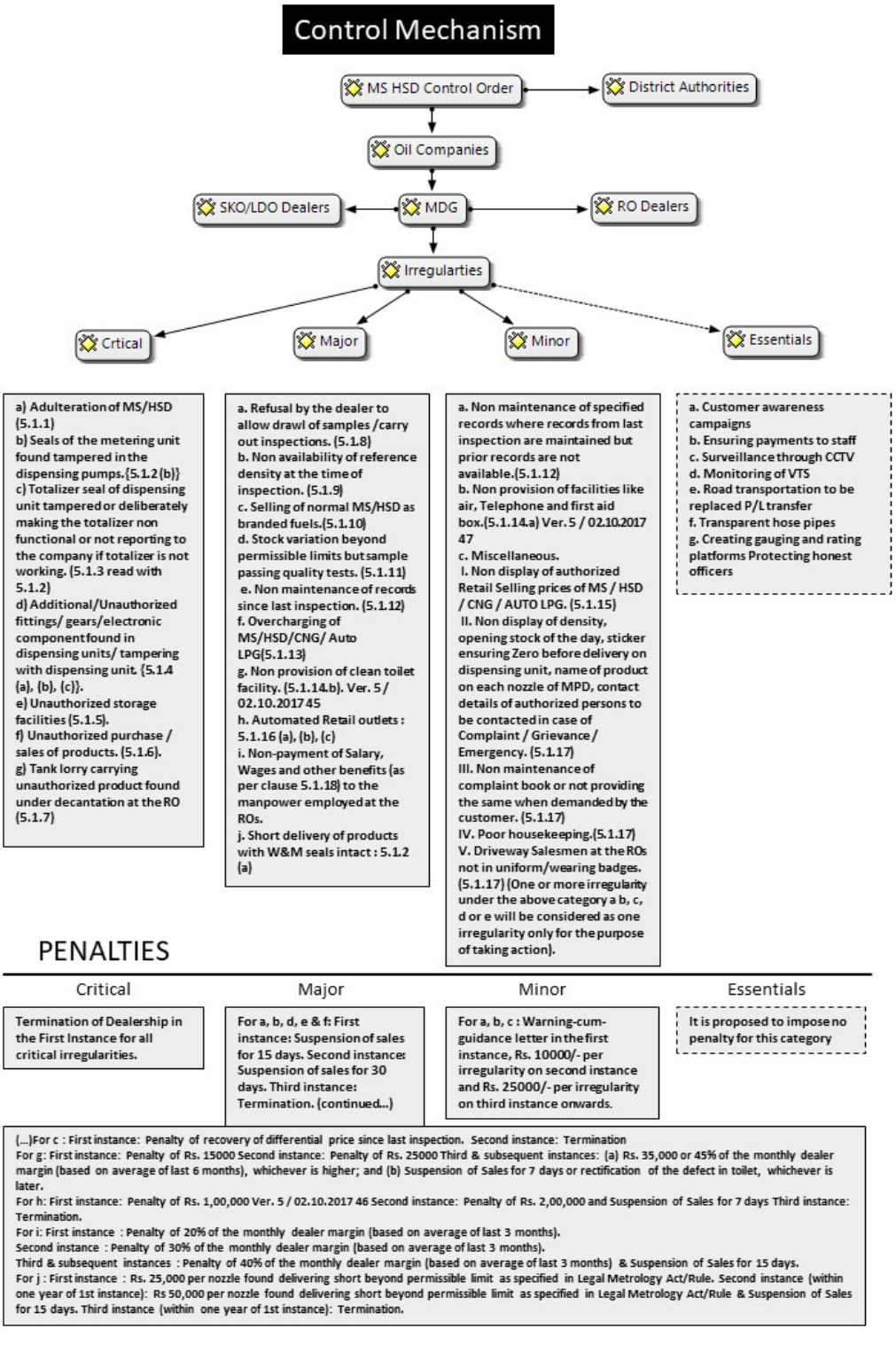

Fig. 7.2: Proposed Control Mechanism

7.3. Supplementing the existing Literature:

This research focuses on identifying factors which may lead to fraudulent activities at ROs due to which buyers of auto liquid fuels may be inconvenienced and may face financial loss or even suffer physical difficulties in terms of break down /major repairs of vehicles, due to quality issues (if any). The study has also attempted to assess impact of such identified factors on fraud risks for developing a control mechanism, which is aimed at curbing such fraudulent activities at ROs. This has been done after a comprehensive review of literature which has been rearranged in theme-wise manner.

Hence, contribution of this research is summarized as under:

a. Literature on the subject has been converted to a theme-wise structure, making it easier for researchers in future to pick up relevant theme, if they so desire instead of reading the full material again.
b. Fraud Diamond theory has been empirically tested in Oil & gas sector specially in Retail Outlet business, as there are few factors identified in this research, which have found applications of Fraud theory.
c. More than theoretical aspects, this research will have contribution in practical aspects, as it will help in re-defining policies and also for designing the implementation of such policies.
d. This kind of scientific study has never been done before and this work will come handy for doing further studies, if required, for modifications in policy structure in future, because frauds are dynamic in nature and therefore need will always be arising for strengthening the control mechanism from time to time.

Chapter 8
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Appendix A

Proceedings of Focused Group Discussion – New Delhi – 25/11/2017

The experts were invited to assemble at 11 am on 25/11/2017. Upon arrival, they were welcomed and greeted properly. After brief exchange of pleasantries, researcher explained the purpose of their visit and the process. A small presentation was also given by Researcher in each of the FGDs to explain details of study and also the FGD process to be followed

All the participants participated with keenness and committed to contribute in pursuit to giving excellent services to customers at Retail Outlets. They also felt that if this exercise is successful, it would help in restoring reputation and pride to the Organization and also to Oil Industry per se.

Researcher: Whenever we are going to Retail outlets as customers (and not as officers of oil companies), we are coming across different kinds of experience, sometimes experience is good that we take the fuel and return from RO. But on some other occasions, experience may not be that good, when people face sense of being cheated by way of short delivery or have a doubt regarding quality of product being taken with possibility of adulteration. On few other occasions we may not be happy about the behavior of customer attendants (CAs) as we may be asked to wait for a longer time for re-fueling or customer attendants may not be cordial in his dealings and there can be multiple numbers of other factors which may upset us as fuel buyers. This may happen with anybody going to RO for taking fuel. During our visits to ROs we have also come across discussions among customers that apart from behavioral part of CAs, there are perceptions in public that this is the product which cannot is seen, cannot be touched but is still bought in good faith. Do you think it is true? Because keeping in view opportunities available, it is difficult to imagine that dealers may not be doing malpractices or fraudulent activities. In view of many news items appearing in print and electronic media, it is important to gather information as to how many types of fraudulent activities that can take

place at ROs and how these malpractices can be curbed? or whether these malpractices are covered in the existing control mechanism and if not, how these issues can be brought under control mechanism?

It was further explained to the group of experts that review of past literature has not revealed types of factors which actually lead to fraudulent activities at ROs and therefore an exploratory research will have to be done to identify such factors for saving "customers" from these risk factors. One of the methods to do exploratory research is Focus Group discussion (FGD) for which we are here and hence support from all of them is solicited. All participants expressed their concern on the prevailing situation of having sense of being cheated at ROs and vowed to extend full support for the research work. Some of them even expressed that if this study results in identification of key factors and fraudulent activities are stopped at ROs by changing the control mechanism that will be a great service to customers in this country.

With this background, process of FGD was started. There were 6 cards each having a topic of discussion written on it. The topics were:

a. What are the additional factors or frauds over & above what is mentioned in Marketing Discipline Guidelines or in MS/HSD control Order.
b. How dealers or their respective representatives can be brought on board to cooperate and share some insights regarding cause and methods used for doing frauds at ROs.
c. How transporters or their respective representatives can be brought on board to cooperate and share some insights regarding cause and methods used for doing frauds at ROs.
d. Who are other stake holders for the purpose of this study.
e. After identification of such factors, job is to ascertain whether these are covered in MDG or any other control mechanism.
f. What can be policy of Oil companies to curb such malpractices.

It was further explained to experts that this will be a Group Exercise. Accordingly, they were divided into groups and they picked up cards, one by one. They started discussions around 1138 am. One group was discussing only on one issue as per their card topic. They were aware that each group works on a single topic initially and then all groups will join collectively to discuss, as a whole. Each topic is a question to which the group members following discussion must come up with a common answer/answers and that Topics are inter-related and inter-linked.

Group formation emerged as under:

Table A-1: Grouping of Experts for FGD Phase 1

Sno.	Topic	Respondent numbers
1	A	1,2,4,7,15,26,28,33
2	B	5,6,8,17,19,21,24,
3	C	11,16,18,22,27,32
4	D	3, 10,12,13,23,25,30
5	E	20,29,31
6	F	9,14,34

Group a:

Respondent1: Friends, this is an important issue whereby all of us are also affected as customers. Though Oil companies and Govt of India are doing their best to control the situation but things do not seem to be satisfactory or rosy in the market. Every day we hear or read in newspapers that some thing or the other wrong is happening at ROs. Though all ROs are not involved but it can be found happening at any RO and hence it cannot be said that these fraudulent activities happen only at select ROs. I feel that technology is only answer as no amount of supervision can control the fraudulent behavior of

dealers. By Technology what I mean is that dispensing units should be such that any fiddling with machine should cause it to stop dispensing fuel and in case of genuine repairs, there should be provision of getting authorization from manufacturer which too should be recorded. Dispensing pumps can also be made tampering proof or central coding system can be put in place so that fiddling is stopped.

Respondent 2: intervened by saying that while technology up gradation may take some time, customer education may be the answer in the interim period because if customer himself is aware then these activities can stop automatically. For doing this, campaigns will have to be run on a large scale that RO dealers are covered in large number and proper awareness reaches the ultimate beneficiary which is "customer".

Respondent 4 : I think that there should be technology up-gradation that customer himself or herself is allowed to take delivery without Customer attendants because if this happens, question of cheating by customer attendants will not arise.

Respondent 7: No, no…there is no doubt that if customers themselves are allowed to take delivery, even space-less dispensing units can be put in service resulting in lesser requirement of land space which otherwise is wasted but provision of self service will invite another problem that people will be jobless, thereby creating another set of civil issues and therefore self-service should not be considered for a country like ours.

Researcher: We are discussing identification of factors which lead to frauds and therefore we need to focus on point of discussion. We must remember that we also need to remain focused on causes of adulteration, short delivery, additional pulsars and additional fittings in dispensing units, likely hood of customer attendant delivering short or over charging at ROs etc.

Respondent15 : On the basis of press reports, it can be said that adulteration may be happening at Retail outlets and also the short delivery. Though methods of cheating may be different but ultimately cheating at ROs results in either in quality or quantity issues of products due to which customers suffer. Another thing is that there may not be adulteration or short delivery at all ROs but society at large feels that these malpractices are happening everywhere and are in real at all places. If this actually happens, it happens by tampering of dispensing units to adjust quantities emerging from adulteration or from the short delivery.

Respondent 26: Actually if you see, Dispensing Units are tampered with/manipulated to accommodate quantities of adulterants and/or to give short delivery because unless that is done, no malpractice can take place.

Respondent1: yes this is correct and all of should agree on this point as the most critical issue appears to be tampering of Dispensing units and their seals.

Respondent 26: most of the times manipulation for short delivery takes place by taking advantage of customers` lack of awareness and they being not so alert at the time of re-fuelling. Hence lack customer awareness is one of the primary reasons and dealers may take advantage of the same.
Respondent: Yes I agree but there may be another factor that manipulation in dispensing unit happens because of lack of proper supervision particularly during nights.

Respondent 28: Yes this can be a point. Supervision not only during night but also during day time, as no officer can supervise all the time. But yes, there is Possibility of malpractice due to perceived Lack of effective Monitoring particularly during nights. It is commonly understood that manipulation in the dispensing units is done because of lack of supervision particularly during night time as chances of getting caught are remote.

Group b:

Respondent6: As far as bringing dealers on board, it may be difficult because if they themselves are involved, they may not share anything with us.

Respondent24: It may not be true because there are few good dealers who do not want to do any malpractice.

Respondent5: what about their staff?
Respondent 8: Staff in any case is under-paid. They are the real culprits. If they are paid properly, things may become easier for dealers to operate.

Respondent 19: Yes I agree, Less payment of salary to staff may be one of the reasons for malpractices happening at ROs.

Respondent 17: But few dealers also talk of less delivery from oil companies. I wonder whether this is true.

Respondent21 : Yes, I have the experience of working in field and dealers usually talked about less deliveries from oil companies. Though this may not be true but this used to be point of discussion among dealers.

Group C

Respondent 18: Transporters play a major role in propoagating malpractices but bringing them on board to control, may be difficult.

Respondent 11: Some time back I was talking to a transporter, he was telling me that transporters bye-pass VTS which avoids detection of vehicles.

Respondent 18: what will happen if VTS is byepassed and vehicle movement is not monitored?

Respondent 16 : It may result in carrying adulterated product to ROs after doing adulteration enroute.

Respondent 11: Yes I agree that this may be a major factor resulting in malpractices at ROs as Vehicle Tracking system (VTS) is installed on every tank truck but it is bye passed to avoid detection of diversion from the specified route

Respondent 27: As we know that products (MS & HSD) are mainly handled in three stages i.e In Oil company installations, during transportation from Installation to Retail outs and at Retail Outlets. At storage points there are enough controls available to maintain quality and quantity, as handling at this stage is in the hands of Oil company officials. However, product handling is not done by Oil company officials during transportation and at Retail Outlets. We also know that Oil Company officials and other Government Agencies have the responsibility of doing regular inspections of Retail Outlets to maintain quantity and quality standards and hence it can be inferred that product handling at Retail Outlet stage is not completely unguarded. However, product handling during transportation is seldom-checked en-route and therefore becomes the most vulnerable in the entire chain of activities. Another dilemma is that dealers are most of the times transporters as well. Hence there is a need for Treating Dealer Transporters as common entity with dealerships: for making dealers more responsible for transportation as well. There is no doubt that Road transportation of products from supply point to RO remains the most vulnerable and unguarded.

Researcher: You mean to say that road transportation from supply point to retail out can be source of breeding fraudulent activities.

Respondent 22: exactly, because if road transportation is not monitored properly, entire product is in the hands of transporters and is vulnerable to fraudulent activities.

Group d:

Respondent 3: while we are discussing stake holders, these can be our dealers, transporters, officers from Civil supplies department or from weights & measure department or any body who is directly or indirectly involved in dispensing of fuel at ROs or supervising such operations. Hence Customer attendants and the customer themselves can be a good source of information. If we go and ask customer attendants or the customers. I am sure they will come out with some insights into the whole affair and we can get good inputs.

Respondent 13: Since customers are not able to see the products (MS & HSD) because hose pipes areopaque, manipulation is generally perceived by public but it may not be happening in real. Non-visibility of product to customers at the time of purchase.

Researcher: We are discussing the issues involved in malpractices.

Respondent 13: That is right, but what I am saying is that in some cases it may happen that problem of cheating may not be there but still public perceives it to be happening because they are not able to see the product nor are they able to feel it. Now with this, one more idea is coming to mind that there is no rating platform like we have zomato for food restaurants, like wise there can be separate platform for rating of retail outlets as well, then automatically maplpractices will reduce happening.

Respondent 10: yes this is a good idea and hence may be mentioned in the report that Non-Availability of appropriate platform for "gauging" and "rating" services at Retail outlets is one of the vulnerable reasons**.**

Group e:

Respondent 20: there can be possibility of Alliance with OEM vendors and with the help of these vendors, dealers do malpractices.

Respondent 31 : yes, there may be unholy alliance between dispensing units` original equipment manufacturers and the resellers for doing Irregularities at ROs. Such collusions are not covered under MDG. So it can be an important factor to reckon with.

Respondent 29: It is also felt in the officers community that there may be Fear among honest officers due to non-availability of mechanism for their protection. Because whenever dealers or their representatives are caught, they may also tend to make allegations against inspecting officers. There can be situations wherein instead of initiating action against the erring dealers, inquiry may get started against the officers concerned. So, dealers may end up shifting attention from their own wrong deeds to possibility of trivial procedural mistakes of concerned officers causing fear among the honest. This issue also needs to be covered under MDG.

Group f:

Respondent 14 : company may work out strategies to provide the facility of unloading of product in dealers tanks through flow meters using automation and they can also increase surveillance through CCTV cameras whether during the day or night.

Respondent 34: The officers handling Retail must also be having knowledge of Dispensing unit operation so that they can cathch malpractices if any and VTS to be made bye-pass free.

Respondent 9 : I think we should agree on these points.

After a pause of few minutes as ‘break’, all groups/participants re-assembled and discussed the issues collectively.

Appendix B

Document Analysis of Marketing Discipline Guidelines for RO / SKO Dealerships of Public Sector Marketing Companies, Effective 8th January 2013 (Amended on 02.10.2017)

Chapter 5

TYPE OF IRREGULARITIES AT RETAIL OUTLETS (MS / HSD) AND SKO / LDO DEALERSHIPS

5.1 MS/HSD

5.1.1 ADULTERATION OF PRODUCT

Definition : "Adulteration" means the introduction of any foreign substance into Motor Spirit / High Speed Diesel illegally or unauthorizedly with the result that the product does not conform to the requirements of Bureau of Indian Standards specification number IS:2796 and IS:1460 for Motor Spirit and High Speed Diesel respectively and amendments thereon, and / or If the observations on the sample under scrutiny and the reference sample do no fall within reproducibility / permissible limits of the test method for which the samples are examined, and / or Any other requirement for the purpose to identify adulteration, issued by the Competent Authority from time to time. Handling of adulterated product In case of proven adulteration, the product (MS/HSD) will be sent to the nearest refinery. In case of proven adulteration at the RO, the entire expenses towards transportation, pumping of product, tank cleaning, incidental charges, local levies, etc. will be recovered from the dealer. The dealer will be paid an amount equivalent to the cost of Furnace Oil and for the actual quantity received at the Refinery end. In case of proven

adulteration by the transport contractor / crew, in addition to the action as per the TDG, all the expenses would be recovered from the transport contractor. The loss on account of product down gradation and transit loss, if any would also be recovered from the transport contractor. The dealer will receive full value of the product.

5.1.2 SHORT DELIVERY OF PRODUCTS

a) With Weights & Measures Department Seals intact Sales through the concerned dispensing unit to be suspended forthwith and recalibration and re-stamping to be done before recommencement of sales. (Even if short/excess delivery is found within permissible limit, recalibration and re-stamping to be done before recommencement of sales).

b) With Weights & Measures department Seals tampered W&M department seals are put on Metering unit and Totaliser unit with the help of a sealing wire and a lead seal which is embossed by W&M inspector. The seal would be deemed tampered in the following cases also: 1. Seal itself is missing 2. Different seal has been put other than embossed by W&M inspector 3. Sealing wire is broken and not in one piece. In addition other situations which can lead to manipulation of delivery/quantity / totaliser may also be treated as tampering. In such cases, views and opinion of W & M authorities would be obtained and the opinion rendered by the W&M department should be final. Based on the opinion of the W & M authorities, Penal action to be taken even if the delivery is found to be correct or excess. In case of this irregularity, sales from the concerned dispensing unit to be suspended, DU sealed. Samples to be drawn of all the products and sent to lab for testing.

5.1.3 TOTALISER SEALS FOUND TAMPERED WITH Totaliser seals will also be construed as tampered if it allows manipulation of

Totaliser reading; deliberately making the totaliser non functional or not reporting to fthe OMC if totaliser is not working. In such cases, views and opinion of W & M authorities would be obtained and the opinion rendered by the W&M department should be final. In case of this irregularity, sales from the concerned dispensing unit to be suspended & DU sealed. Samples to be drawn of all the products and sent to lab for testing.

5.1.4 ADDITIONAL / UNAUTHORISED FITTINGS / GEARS FOUND IN DISPENSING UNITS /TAMPERING WITH DISPENSING UNIT Any mechanism / fittings / gear found fitted in the dispensing unit which is likely to manipulate the delivery. Addition, Removal, replacement or manipulation of any part of the Dispensing Unit including any mechanism, gear, microprocessor chip / electronic parts/ OEM software will be deemed as tampering of the dispensing unit. In such cases, views and independent opinion of the original equipment manufacturer would be obtained and suitable decision taken. In case of this irregularity, sales from the concerned dispensing unit to be suspended, DU sealed. Samples to be drawn of all the products and sent to lab for testing.

5.1.5 UNAUTHORISED STORAGE FACILITIES/ INTER CONNECTION A storage facility within the licensed area of the retail outlet not approved by the Company and / or a storage facility outside the licensed premises with interconnection in to the retail outlet premises. Interconnection means unauthorized connection between tanks within the licensed premises.

5.1.6 UNAUTHORISED PURCHASES / SALES OF MS/ HSD OR ANY OTHER PRODUCT WHICH COULD BE USED AS A SUBSTITUTE FOR THESE PRODUCTS Dealers should purchase only those petroleum products authorized by the principal Oil Company for sale from the Retail Outlet. Purchase of the products from sources other

than those authorized by the oil company would be treated as unauthorized purchase. Any sales of MS / HSD other than through the dispensing units of that RO would be treated as unauthorized sales.

5.1.7 TANK LORRY CARRYING UNAUTHORISED PRODUCT FOUND DECANTING PRODUCT INTO THE RETAIL OUTLET TANKS Tank lorry carrying unauthorized product found decanting product into the Retail Outlet tank.

5.1.8 REFUSAL BY THE DEALER TO ALLOW DRAWAL OF SAMPLE OR CARRY OUT INSPECTION. Refusal / obstruction / creating circumstances disabling the process of drawl of samples / carrying out inspections.

5.1.9 NON-AVAILABILITY OF REFERENCE DENSITY AT THE TIME OF INSPECTION The dealer is required to check and record morning density on daily basis. This has to be carried out latest by 10 AM every day. Similarly whenever fresh loads are received the dealer is expected to check and record density of composite product in the RO tank after decantation. Therefore non availability of the following density at the time of inspection would be treated as "non-availability of reference density": (a) If inspection is carried out before 10 AM, density as recorded of the previous morning or density of composite product if load was received the previous day. (b) If inspection is carried out after 10 AM, but before receipt of any load on that date, the density as recorded on the morning of that day. (c) If inspection is carried out after 10 AM, but after receipt of any load on that date, the density as recorded of the composite product after unloading. In case of non-availability of reference density at the time of inspection, sales and supplies of all the products to be suspended immediately. Samples of all products to be drawn and sent to lab for testing. If the sample passes then penal action specified for this irregularity to be taken. If

sample fails, penal action in line with the irregularity of adulteration to be taken.

5.1.10 SELLING OF NORMAL MS/HSD AS BRANDED FUEL Intentional sales of Normal MS/HSD as Branded fuel.

5.1.11 STOCK VARIATION OF MS/HSD (Beyond Permissible limits) FUEL Stock reconciliation should be carried out and variation, if any, established after taking into account the normal operational variation of 4 % of tank stock and after considering the following factors : i) Evaporation/handling losses in MS as follows: 0.75% on quantity sold upto an annual average of 600 KLs 0.60% on additional quantity beyond an annual average of 600 KLs. ii) Handling losses in HSD as follows : 0.25% on quantity sold upto an annual average of 600 KLs 0.20% on additional quantity beyond an annual average of 600 KLs iii) Shrinkage losses and Temperature variation losses on MS and HSD to be taken into account (only in those cases/locations where and when the Shrinkage Allowance / TVA is applicable) (Annexure – 8, 9, 10) In case of positive stock variation beyond permissible limits, samples will be drawn and sent to laboratory for testing. Sales and supplies tothe retail outlet will continue during the investigation period. Explanation of the dealer to be called. Supply to be immediatelysuspended in case explanation of the dealer not found satisfactory.

5.1.12 NON-MAINTENANCE OF SPECIFIED RECORDS

Dealers are required to maintain various records including the following.

Non-maintenance of below mentioned records will be treated as an irregularity.

i. Daily sales register of OMC & Density register for current and previous financial years.

ii. Pump maintenance records for current and previous financial years.

iii. Inspection record for previous five years

iv. Purchase Invoices & sales bills for the current and previous financial years

v. Selling license, Explosives License and such other licenses which

vi. Any other record as specified by OMCs in writing.

5.1.13 OVERCHARGING IN AUTHORISED SELLING PRICES OF MS/HSD/CNG/AUTO LPG. Overcharging in authorized selling prices of MS/HSD/CNG/AUTO LPG.

5.1.14(a) NON PROVISION OF FACILITIES Like Air with calibrated Air Gauge, Telephone, First-Aid BOX with medicines not beyond expiry dates at RO premises. (b) NON PROVISION OF CLEAN TOILET FACILITY Dealers should check daily and ensure the following:- i. Toilets are clean all the time. ii. Proper lighting is available. iii. Flush (wherever provided) is working properly. iv. Water is available. v. Working latch is available on the toilet door. vi. Signage is available. vii. Toilet door is not kept locked The above protocol is to be prominently displayed near the toilet. Maintenance sheet is to be maintained and displayed. If OMC officials observe during the inspection that (a) Toilet is found to be not clean or (b) Water is not available or (c) Latch on the toilet door is not available/not working or (d) Toilet door found to be locked at any outlet, a photograph of the toilet shall be taken and letter shall be issued instantly listing the penalty as per MDG.

5.1.15 NON DISPLAY OF AUTHORISED RETAIL SELLING PRICES OF MS / HSD / CNG / AUTO LPG Dealers are required to exhibit at the retail outlet the retail selling prices of petroleum products sold from the RO.

5.1.16 AUTOMATED RETAIL OUTLETS (a) Dealer Operating the automated RO in Manual mode without authorization Where automation has been completed at a Retail outlet and if any dispensing unit/MPD is found to be operating in manual mode without proper authorization from the competent authority, it will be treated under this irregularity. (b) In case ATG is switched off / non-operational without authorization from the competent authority. (c) Any deliberate action on the part of Dealership or their staff or any other agency to make any component of automation system (excluding MPDs / Dispensing Units / ATGs) dysfunctional, partly or fully, without authorization from competent authority. (Authorization through e-mail or signed letter from Company official will only be admissible.)

5.1.17 MISCELLANEOUS Non display of density, opening stock of the day, sticker ensuring Zero before delivery on dispensing unit, name of product on each nozzle of MPD, contact details of authorized persons to be contacted in case of Complaint / Grievance / Emergency. Ver. 5 / 02.10.2017 38 ♣ Non maintenance of complaint book or not providing the same when demanded by the customer. ♣ Poor housekeeping. Driveway Salesmen at the ROs not in uniform/wearing badges.

5.1.18 PAYMENT OF WAGES Dealers shall make payment of minimum wages as notified by Oil Marketing Companies (OMCs) from time to time or statutory minimum wages as notified by the respective State Government, whichever is higher, to the manpower employed at ROs. Other benefits viz. PF, ESIC, Bonus, Earned/Annual Leave and Gratuity as notified by OMCs/Statute shall also be paid. Dealers to ensure that: a) Salaries & wages are paid through e-Payment. b) PF, ESIC, Bonus, Annual Leave and Gratuity are paid as notified by OMCs /Statute. c) All Employees are covered under: i. Pradhan Mantri Suraksha Bima Yojana (PMSBY) ii. Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY) Dealers are required to maintain

records and the records should be made available at the retail outlet for inspection, at all times. NOTES: i) Dealer is required to retain Tank Lorry samples of last two loads as per 3-tier sampling procedure. In case such Tank Lorry retention samples are found not available at the time of inspection, the dealer has to be instructed to follow the procedure as the same practice is suggested to safeguard the interests of innocent dealers. ii) While drawing samples from a MS tank through the nozzle of the dispensing unit connected to that tank, it should be ensured that the MS sample is drawn only through the nozzle delivering non-2T premixed MS. In case, all nozzles connected to a MS tank are delivering only 2T-premixed MS, then in such case necessary precaution is to be taken to ensure that the MS sample drawn is free from 2T Oil.

Appendix C
Customer Survey Questionnaire

Retail Outlet Survey

*Required

Email address *

Your email address

This is a required question

1. Gender

- Male
- Female

2. Age

- < 25 Years
- > 25 but < 40 Years
- > 40 but < 60 Years
- > 60 Years

3. Occupation

- Self employed
- Govt Service
- Private Service
- Student
- Retired

4. Whether you own a luxury car

- Yes
- No

5. If Yes, Please specify brand of the car(Optional)

Your answer

6. Whether you use credit card for settling Fuel bills

- Yes
- No

7. Whether you love adventure sports including Car racing

- Yes
- No

8. Whether you are holding any club membership

- Yes
- No

9. Have you ever visited an Oil Company's Retail Outlet(Petrol Pump)

- Yes
- No

10. Type of Vehicle you own/drive

- 2 or 3 Wheeler
- 4-Wheeler including luxury cars/SUVs/Jeeps
- Commercial Vehicle

11. Frequency of visit to a Retail Outlet

- Frequent - Once in a week or More
- Consistent - Once in two weeks
- Occasional - Once in a month or so
- Rarely - Once in 2/3 months

12. Products taken by you

- ○ Petrol
- ○ Diesel
- ○ Both or more

13. Average Single Transaction Quantity

- ○ Less Than 10 Litres
- ○ More than 10 litres
- ○ More than 30 Litres

14. Have you ever experienced any unethical/ malpractice in a Retail Outlet

- ○ Yes
- ○ No

15. If Yes, details of the incident in brief

Your answer

16. In your opinion whether malpractice/unethical practice takes place

- ○ Only during Daytime
- ○ Only during peak hours(8 AM to 10AM and 5PM to 7PM)
- ○ Only during nights

17. Likelihood of pump attendant delivering short by diverting attention of customer

- ○ Always
- ○ Frequesnt
- ○ Occasional
- ○ Unlikely

18. Possibility of additional pulsars and fittings in dispensing units for manipulating delivery

- ○ Always
- ○ Frequent
- ○ Occasional
- ○ Unlikely

19. Possibility of additional Software chips in controller card of dispensing unit for manipulating delivery

- ○ Always
- ○ Frequent
- ○ Occasional
- ○ Unlikely

20. Possibility of emptying nozzle hose pipe before delivery, thus delivering short to the customer

- Always
- Frequent
- Occasional
- Unlikely

21. Possibility of overcharging by not changing daily pricing mechanism

- Always
- Frequent
- Occasional
- Unlikely

22. Possibility of overcharging by other methods

- Always
- Frequent
- Occasional
- Unlikely

23. Any other manipulation affecting quality and quantity of products to be delivered

- Yes
- No

24. If Yes, then details

Your answer

25. In your perception whether fuel quality being delivered at Retail Outlets affects mileage of vehicles(Km/Litre)

- ○ Yes
- ○ No

26. In your perception whether mileage is also dependent on engine/vehicle condition

- ○ Yes
- ○ No

27. Which is the most preferred Oil company as per you

- ○ IOC
- ○ BPC
- ○ HPC
- ○ Others

28. Why do you prefer a particular oil Company

Your answer

29. In your opinion, malpractice/unethical practice at retail outlets results in financial loss to customers to the tune of

- ○ Less than 5% of product cost
- ○ More than 5% of product cost but less than 10%
- ○ More than 10%
- ○ No financial Loss

30. Your suggestions for mitigating the risks of malpractice/unethical practice at a Retail Outlet

Your answer

Appendix D
FGD Questionnaire

Survey - Oil Companies

This Questionnaire is for academic purposes, basically for a study on "improving services at Retail Outlets (of PSU Oil Marketing Companies)" . Kindly spare few minutes to complete and submit this survey which may result in protecting customers` interests at Retail Outlets.

1. Gender

- ○ Female
- ○ Male

2. Belong to which Oil Company

- ○ IOC
- ○ BPC
- ○ HPC
- ○ Others

3. Total experience in the oil Company

- ○ Below 10 Years
- ○ Above 10 years but below 20 years
- ○ Above 20 years but below 30 years
- ○ Above 30 years

4. Age

- ○ < 30 Years
- ○ > 30 Years and < 40 Years
- ○ > 40 Years and < 50 Years
- ○ > 50 years

5. Do you agree that manipulation in dispensing units (other than Totalizers) may be done by re-sellers for adjusting extra quantities arising out of adulteration, if any

- ○ Yes
- ○ No
- ○ Can`t say

6. Please rate chances of doing adulteration by resellers on scale from 1 to 10, 1 representing no chance and 10 representing 100% chance of adulteration.

1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○

7. Do you agree that manipulation in dispensing units (other than Totalizers) may be done by re-sellers for adjusting extra quantities arising out of short delivery, if any

- ○ Yes
- ○ No
- ○ Can`t say

8. Please rate chances of intentional short delivery in dispensing units on scale from 1 to 10, 1 representing no chance and 10 representing 100% chance of short delivery.

1 2 3 4 5 6 7 8 9 10

○ ○ ○ ○ ○ ○ ○ ○ ○ ○

9. Such irregularities mostly take place

- ○ During Daytime (from 6am to 9pm)
- ○ During night time (from 9pm to 6am on the following day)
- ○ During peak hours(8am to 10am and 5pm to 8pm)

10. In your opinion, whether re-sellers take advantage of lack of effective control system for doing adulteration.

- ○ Yes
- ○ No
- ○ Can't Say

11. In your opinion, whether re-sellers take advantage of lack of effective control system for doing short delivery.

- ○ Yes
- ○ No
- ○ Can`t say

12. In your opinion whether resellers take advantage of lack of awareness and whether customers' alertness can reduce incidents of manipulations/irregularities:.

- ○ Yes
- ○ No
- ○ Can`t say

13. Please rate chances of reducing manipulations by increasing customer awareness on a scale from 1 to 10. 1 representing no chance and 10 representing 100% chance of stopping manipulations through customer awareness.

1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○

14. In your opinion whether non payment or less payment by dealers to their staff is a significant factor for getting them engaged in irregular activities:

- ○ Yes
- ○ No
- ○ Can`t say

15. Please rate significance level of this parameter on a scale of 1 to 10. 1 representing "no significance" and 10 representing " highest significance" in curbing manipulations at ROs.

1 2 3 4 5 6 7 8 9 10

16. Dealers generally complain of short receipt from Oil companies, Do you agree.

- Yes
- No
- Can`t say

17. Please rate significance level of this parameter on a scale of 1 to 10, 1 representing "no significance" and 10 representing " highest significance" in curbing manipulations at ROs.

1 2 3 4 5 6 7 8 9 10

18. Lack of effective monitoring particularly during night time works as allurement to do irregularities, Do you agree.

- Yes
- No
- Can't say

19. Please rate chance of manipulations on scale 1 to 10. If there is proper monitoring even during nights, 1 representing "no improvement expected" and 10 representing " manipulations fully controlled".

1 2 3 4 5 6 7 8 9 10

○ ○ ○ ○ ○ ○ ○ ○ ○ ○

20. In your opinion, whether VTS(Vehicle Tracking System) installed on tank trucks is bye-passed to avoid detection of diversion from the specified route which may lead to manipulations in quality and quantity.

- ○ Yes
- ○ No
- ○ Can`t say

21. What are the chances of bye passing VTS on scale of 1 to 10, 1 being"no chance" and 10 being "100% chance of diversion"

1 2 3 4 5 6 7 8 9 10

○ ○ ○ ○ ○ ○ ○ ○ ○ ○

22. Before making deliveries through nozzle, MS/HSD are handled at three stages viz (i) at Supply point (ii) in Tank Trucks (TTs) during transportation (iii) at Retail Outlets. In your opinion, most vulnerable stage which has least control on product by Oil Companies is :

- ○ Supply Points
- ○ During Transportation
- ○ Retail Outlets

23. In your opinion, whether non visibility of the product (Delivery Hose pipe being opaque) is a significant factor to raise doubt in the minds of buyers regarding quality and quantity being delivered.

- ○ Yes
- ○ No
- ○ Can't say

24. What are the chances of curbing manipulations at ROs if hose pipes are made transparent, on a scale of 1 to 10, 1 being no chance and 10 being 100% possibility

1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○

25. In your opinion, whether service rating of dealers on review platforms like Zomato etc may help in exposing malpractices by erring dealers

- ○ Yes
- ○ No
- ○ Can't say

26. What are the chances of curbing manipulations at ROs if this type of rating platforms are created. Please give your views on significance level of creating such forums and platforms on a scale of 1 to 10, 1 being no chance and 10 being 100% possibility.

1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○

27. Do you agree, whether there can be unholy alliance of DU's OEM vendors (or their representatives) with re-sellers to manipulate Dispensing Units for doing short delivery

- ○ Yes
- ○ No
- ○ Can't say

28. Do you agree, whether there can be unholy alliance of DU's OEM vendors (or their representatives) with re-sellers to manipulate Dispensing Units for doing adulteration

- ○ Yes
- ○ No
- ○ Can't say

29. Do you agree that there is lack of mechanism for their protection of honest officers in the system

- ○ Agree
- ○ Disagree
- ○ Neutral

30. Please rate improvement in services at ROs if proper mechanism is created to protect honest officers. Rating can be given in a scale of 1 to 10, 1 being no improvement and 10 refers to highest improvement.

1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○

31. Do you agree that extra volumes generated in the RO due to adulteration are adjusted by manipulating totalizer readings.

- ○ Yes
- ○ No
- ○ Can't say

32. Do you agree that extra volumes generated in the RO due to short deliveries are adjusted by manipulating totalizer readings.

- ○ Yes
- ○ No
- ○ Can't say

33. Its understood that most of the dealers are also transporters for their own supplies. If they do adulteration en route and they are caught, action is taken against their transport contract and not on their dealership. Since punishment against transporter is lighter than punishment against dealership (which is immediate termination), it encourages dealer cum transporters to do quality manipulations en-route than doing at ROs. Do you agree.

- ○ Yes
- ○ No
- ○ Can't say

34. Please rate chances of curbing manipulation if proper controls are implemented during transportation as well by linking it with dealership, in case of dealer cum transporter. Please give your views on a scale of 1 to 10, 1 being no chance and 10 being 100% chance of curbing manipulating.

1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○

35. In some of the case, additional tanks were found in dealers premises to store unaccounted adulterant from where adulteration can be carried out at Retail Outlets. Do you agree.

- ○ Yes
- ○ No
- ○ Can't say

36. Do you feel the number and magnitude of adulteration in ROs have come down in last few year

- ○ Yes
- ○ No

37. Do you feel the number and magnitude of short delivery cases at ROs have come down in last few years.

- ○ Yes
- ○ No

38. Behavior of Customer attendants at RO is seldom unpleasant. Do you Agree

- ○ Yes
- ○ No
- ○ Can't say

39. Customer attendants are seldom found to be lacking in general etiquette which leads to bad experience of Customers at RO. Do you agree.

- ○ Yes
- ○ No
- ○ Can't say

40. On a scale of 1 to 10, please indicate whether training of customer attendants on good behaviour and general etiquette can improve customers' experience at ROs. Please give your views on a scale of 1 to 10 where 1 refers to lowest improvement and 10 being the highest.

1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○

PHD Thesis Harsh Sachdev

ORIGINALITY REPORT

10%	6%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS

PRIMARY SOURCES

1	Submitted to Indian Institute of Manag Indore	Student Paper
2	Submitted to Institute of Technology, University	Student Paper

Author's Curriculum Vitae

a) **Name: Harsh Sachdev**

b) **Age/DOB**: 59 years (09.11.1960)

c) **Email**: hsachdev1960@gmail.com

d) **Contact no**.: 91-9873072360

e) **Educational Qualification**: Bachelor of Technology (B Tech) in Civil Engg.

Examination	Year of Passing	Division
X	1975	First
XII	1977	First
B Tech (Civil)	Feb 1982 (4½ year Course)	First - with Honors (84%)

Experience:

Total experience is 36 years, out of which:

- Leadership positions held for 17 years
  Support positions (Second in Command) held for 07 years
- Initial Grass root/Field assignments held for 12 years
  Retail sales has been main focus area right from beginning as I have remained involved in channel management in various districts of Uttar Pradesh, Uttrakhand & Gujarat.

International Exposure:

- Have been to Singapore & Malaysia for a 08 days training in Oct 2007.
- Have undergone a 2 weeks training on "Fraud Prevention" in London, UK in Mar 2010.

Hobbies:

- Watching Cricket, reading Newspapers
- Religious activities

Name of Supervisor	*Name of Scholar/ Status of PhD*	*Supervisor Allocation Month/ Year*	*Total No. of Publications*	*Details of Publication (Name of author, name of journal, volume, issue, page and year)*	*Indexing of Paper (Indexing of paper UGC / SCOPUS/ any other)*
Dr Neeraj Anand & Dr G K Sharma	Harsh Kumar Sachdev	Jul-12	1	**Title: Towards Effective Control Mechanism in Retail Petroleum Business in India**	UGC
	SAP : 500014106			Authors : 1.Harsh Kumar Sachdev, 2. Dr Neeraj Anand	
	Thesis Submitted in 2020: Energy Management (Oil & Gas)			Journal: International Journal of Research and Analytical Reviews (IJRAR) ; www.ijrar.org	
				IJRAR November 2018, Volume 5, Issue 4 www.ijrar.org	
				(E-ISSN 2348-1269, P- ISSN 2349-5138)	
			2	**Title: Fair Deal at Petroleum Outlets: Creating "VALUE FOR MONEY" For Customers in Marketing of Liquid Auto-Fuels in India**	UGC
				Authors : 1. Harsh Kumar Sachdev, 2. Dr Neeraj Anand	
				Journal: Journal of Current Science, https://journal.scienceacad.com	
				Vol 19, No 10, October 2018 ISSN No.- 9726-001X	
				ID – JCS-9726-001X-1136 6	