University of Petroleum & Energy Studies
School of Business, Dehradun
MBA-OIL & GAS
END SEM EXAM-MAY 2019
HSE FOR PETROLEUM SECTOR
OGOG8002

TIME: 3 HRS **MAX MARKS; 100**

SECTION-A **(2x10=20 Marks)**

Q.1 Briefly write:

I. ISO --
II. HAZAN is ---
III. ALARP is ---
IV. EPA is---
V. TLV is ---
VI. BACT is ---
VII. BOD --
VIII. TSS is --
IX. OISD is ---
X. ERICPD --

(CO1-CO7)

SECTION–B, ATTEMPT ALL QUESTIONS **(4x5= 20 Marks)**

Q.2. Write Short Notes on:

- EIA
- SAFETY POLICY

(CO3)

Q.3 Discuss important points of Factories act related to safety and welfare of workers. (CO3)

Q.4 Noise is generally ignored in industrial activities. Discuss in brief how noise acts on human health and other living objects? (CO3)

Q.5 Safety audit play important role in reduction of accidents. Discuss in brief about safety audit. (CO3)

Q.6 List out various components of Process Safety Management. (CO3)

SECTION –C, ATTEMPT ANY TWO QUESTIONS (15x2= 30 Marks)

Q.7 Development without environmental consideration will invite our extinction only. Discuss key principles of EMS and advantages of adopting this standard. (CO3)

Q.8 Risk assessment at various stages of plant life can help in reduction of major accidents. Discuss objectives of risk assessment and components of risk assessment. (CO3)

Q.9 A well-written onsite & offsite emergency management plan can play crucial role in management of any types of disaster. What is disaster management plan? Write in detail about DMP for a petro-chemical plant? (CO3)

SECTION D – CASE STUDY (1x30= 30Marks)

Q.10a. Find out major causes of the disaster in current case study. (CO5)

Q.10.b What is your learning as safety officer from this accident? (CO5)

<u>BP Texas Refinery case study</u>

On March 23, 2005, a BP Texas City Refinery distillation tower experienced an overpressure event that caused a geyser-like release of highly flammable liquids and gases from a blow down vent stack. An explosion occurred when heavier than air hydrocarbon vapors combusted after coming into contact with an ignition source, probably a running vehicle engine. Vapour clouds ignited, killing 15 workers and injuring 170 others. The accident also resulted in significant economic losses and was one of the most serious workplace disasters in the past two decades. The total cost of deaths and injuries, damage to refinery equipment, and lost production was estimated to be over $2 billion.

Oil refineries vaporize crude oil in a furnace and then separate its various components in a distillation tower (sometimes called a raffinate splitter tower or a fractionating column) based on the different condensation points of the constituent gases. As the hot vapour rises in the tower, horizontal trays set at progressively lower temperatures collect the different components as they condense into liquids, which are then continuously drawn off into separate containers. A distillation tower can process (or separate) thousands of barrels per day of highly flammable crude oil into its constituent hydrocarbons for commercial consumption. When the tower is operating normally, overflow pipes drain the condensed liquids from each tray to the tray be- low, where the higher temperature causes re-evaporation. Uncondensed fixed gases at the top and heavy fuel oils at the bottom are also continuously drawn off and recycled through the tower.

In addition, normal operations would typically include a high and low level liquid detector in the distillation tower to indicate abnormal process conditions, activate alarms, and initiate programmed release of gas/fluid to the blow- down drum, which is usually equipped with a flare system to burn the vapours in a controlled setting.

Management decisions to continue operating with an atmospherically vented blow down stack in lieu of the widely available, and inherently safer, flare tower was an important factor. The distillation tower liquid level detection system was not designed to measure levels above a maximum height of ten feet, providing no insight into off nominal operational scenarios. The tower liquid level reached an estimated height of 138 feet immediately prior to the over- pressure event.

Subsequent investigative reports pointed to a strong cost- cutting focus by BP senior management that resulted in a lack of adequate training and supervision of filling and operating the distillation tower. Fundamental procedural errors led to overfilling the distillation tower, overheating, liquid release, and the subsequent explosion. Unit super- visors were absent during critical parts of the startup, and unit operators failed to take effective action to control deviation from the process or to sound evacuation alarms after the pressure relief valves opened.

The BP safety and quality assurance inspection and monitoring processes were absent and/or ineffective as a barrier to this failure chain. In addition, there was inadequate local, State, and Federal government safety over- sight.

The majority of 17 startups of the distillation tower from April 2000 to March 2005 had exhibited abnormally high internal pressures and liquid levels, including several occasions where pressure relief valves likely opened. How- ever, the abnormal startups were not investigated as “near-misses,” and the adequacy of the tower’s design, instrumentation, and process controls were not reevaluated.

The startup of the distillation tower on March 23 was authorized despite reported problems with the tower level detector/transmitter, the high-level alarms on the tower, and the blow down drum. For example, a work order dated on March 10 acknowledged with management approval that a level detector/transmitter needed repairs but indicated that these repairs would be deferred until after startup. A control valve associated with pressure relief was also reported to have malfunctions prior to the accident. These pre-existing conditions were confirmed by the U.S. Chemical Safety Board (CSB). This release valve mal-functioned and contributed to the accident by not relieving the overpressure in a controlled manner.

Additionally, a key alarm failed to operate properly and to warn operators of unsafe conditions within the tower and the blow down drum.

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SECTION-A **(2x10=20 Marks)**

Q.1 Briefly write:

I. ISO ---
II. HAZOP is ---
III. BACT is ---
IV. OSHA is---
V. TLV is --
VI. PPE is --
VII. COD --
VIII. TDS is ---
IX. OISD is ---
X. ERICPD ---
(CO1-CO7)

SECTION–B, ATTEMPT ALL QUESTIONS **(4x5= 20 Marks)**

Q.2. Write Short Notes on:

- SAFETY DISTRICT
- SAFETY POLICY

(CO1)

Q.3 Discuss important points of Factories act related to safety and welfare of workers. (CO3)

Q.4 Noise is generally ignored in industrial activities. Discuss in brief how noise acts on human health and other living objects? (CO2)

Q.5 Safety audit play important role in reduction of accidents. Discuss in brief about safety audit. (CO4)

Q.6 You are supposed to award some work to outside contractor. What will be your criteria to award that work being a Manager- HSE. (CO2)

SECTION –C, ATTEMPT ANY TWO QUESTIONS (15x2= 30 Marks)

Q.7 EMS is on top priority for all type of industries. What is Environmental Management Systems-ISO 14001? Highlight the benefits & Key principles of EMS. (CO4)

Q.8 Generation of solid waste depends upon life style of that particular region. What do you mean by solid waste? What are different techniques available to manage solid waste? (CO3)

Q.9 A well-written onsite & offsite emergency management plan can play crucial role in management of any types of disaster. What is disaster management plan? Write in detail about DMP for a petro-chemical plant? (CO5)

SECTION D – CASE STUDY (1x30= 30Marks)

Q.10a. Find out major causes of the disaster in current case study. (CO5)

Q.10.b What is your learning as safety officer from this accident? (CO5)

The **Fukushima Daiichi nuclear disaster** *Fukushima Daiichi* was a catastrophic failure at the Fukushima I Nuclear Power Plant on 11 March 2011, resulting in a meltdown of three of the plant's six nuclear reactors. The failure occurred when the plant was hit by the tsunami triggered by the Tōhoku earthquake. the plant began releasing substantial amounts of radioactive materials beginning on 12 March, becoming the largest nuclear incident since the 1986 Chernobyl disaster and the second (with Chernobyl) to measure Level 7 on the International Nuclear Event Scale initially releasing an estimated 10-30% of the earlier incident's radiation. In August 2013, it was stated that the massive amount of radioactive water is among the most pressing problems that are affecting the cleanup process, which is expected to take decades. There have been continued spills of contaminated water at the plant, and some into the sea. Plant workers are trying to lower the leaks using measures such as building chemical underground walls, but they have not improved substantially.

Although no short term radiation exposure fatalities were reported, some 300,000 people evacuated the area, approximately 18,500 people died due to the earthquake and tsunami, and as of August 2013 approximately 1,600 deaths were related to the evacuation conditions, such as living in temporary housing and hospital closures. The exact cause of the majority of these evacuation-related deaths were unspecified because that would hinder the deceased relatives' application for financial compensation.

The World Health Organization indicated that evacuees were exposed to so little radiation that radiation-induced health impacts are likely to be below detectable levels, and that any additional cancer risk from radiation was small—extremely small, for the most part—and chiefly limited to those living closest to the plant. A 2013 WHO report predicts that for populations living in the most affected areas there is a 70% higher risk of developing thyroid cancer for girls exposed as infants (but experts said the overall risk was small: the radiation exposure means about 1.25 out of every 100 girls in the area could develop thyroid cancer over their lifetime, instead of the natural rate of about 0.75 percent), a 7% higher risk of leukemia in males exposed as infants, a 6% higher risk of breast cancer in females exposed as infants and a 4% higher risk, overall, of developing solid cancers for females.

The World Health Organization stated that a 2013 thyroid ultrasound screening programme was, due to the screening effect, likely to lead to an increase in recorded thyroid cases due to early detection of non-symptomatic disease cases. This screening program found that more than a third (36%) of children in the Prefecture have abnormal growths in their thyroid glands, however whether these growths can be attributed to exposure to nuclear radiation has not yet been proven.

The Fukushima Nuclear Accident Independent Investigation Commission found the nuclear disaster was "manmade" and that its direct causes were all foreseeable. The report also found that the plant was incapable of withstanding the earthquake and 2sunami. TEPCO, regulators Nuclear and Industrial Safety Agency (NISA) and NSC and the government body promoting the nuclear power industry (METI), all failed to meet the most basic safety requirements, such as assessing the probability of damage, preparing for containing collateral damage from such a disaster, and developing evacuation plans. A separate study by Stanford researchers found that Japanese plants operated by the largest utility companies were particularly unprotected against potential tsunamis