

Environment Risk Assessment in Petrochemical Industry And Safety Considerations

Mayank Saurabh¹, Mr. Praveen Kumar Badodiya²

^{1,2}Dept of Fire Technology & Safety Engineering

²Assistant Professor, Dept of Fire Technology & Safety Engineering

^{1,2} IPS Academy IES, Indore (M.P.)

Abstract- This research paper discuss about the environmental risk associated with the petrochemical industry. It describes about the environment risk assessment and safety consideration for the petrochemical industry. The environment risk affects to the human life as well as it also damage our environment. These hazards results human fatality, environmental damage and also causes a great economic loss for the industries. Bowtie analysis methodology is used to analyze and it is used for shorting the consequences and causes for different risk such as air pollution, water pollutions well as noise pollutions. Here the rate of emission of pollutant, effluents is compared with the permissible limit rate listed by GPCB. At OPaL, dahej site every norms and guidelines listed by GPCB are followed, which results in maintaining safe workplace for the employees and workers.

Keywords- Environment risk assessment, safety consideration, Bowtie analysis, Gujarat pollution control board,

mitigation measures are also discussed. In the modern era with the increase of population the use of petrochemical products are increasing. As the demand of petrochemical products is in different manufacturing industries and different sectors the petrochemical plays vital role. Some of the major petrochemicals are methane, ethane, propane, hydrogen, acetylene, ethylene and benzene which are used for deriving a lot of chemicals. They are used as feedstock in the form of fibers, elastomers, plasticizers and solvents for the production of others products.

For the fulfillment of all the needs of the petrochemicals, the petrochemical industry needs to operate. During their operation these industries releases pollutants, effluents in the form of air pollutants, water pollutants. These industries also causes noise pollution and land pollution. These pollutants causes harm to environment as well as human being if exposed.

I. INTRODUCTION

Environment can be defined as the surroundings in which an organization operates including air, land, water and their inter relations. Environment comprises of both biotic and abiotic factors. The word “environment” is derived from the French word “environ” meaning “surrounding” Risk assessment is process of evaluating risks to workers safety and health from workplace hazards. It is systematic examination of all aspects of work that considers:-

- what could cause injury or harm,
- whether the hazards could be eliminated or couldn't,
- If eliminated, what is its process,
- If not what protective or preventive measures are, or should be in workplace to control the risks.

Environment risk assessment in petrochemical industries is defined as an identification or recognition and evaluation of potential impacts or effects to the total environment and their mitigation. By carrying out the environment risk assessment approach the impact and the potential harm to the environment are dealt as well as their

In this paper there is discussion about the environment risk assessment associated with the petrochemical industry and its safety consideration. The study for environment risk assessment has been done for the Dual Feed Cracker Unit (DFCU) of ONGC Petro addition Limited (OPaL), dahej site. The DFCU is the heart of this industry. There are 8 cracking units in DFCU. The environment risk assessment study is done for Air Environment, Water Environment and Noise. Bow Tie Analysis is used to find the hazard/cause and the consequence of the risk.

II. METHODOLOGY

2.1 Bow-Tie Analysis

Bowties are risk assessment diagrams that provides a qualitative visual diagram to increase understanding of a risk. It is a risk evaluation method that can be used to analyse and demonstrate the relationship between risk with its cause and consequence. Bowtie analysis for the environmental risk is done which shows the causes and consequences associated with these environmental risk. A Bowtie diagram shows two things. First, it shows the visual summary of all reasonable

accident scenarios that could exist due to the hazard. Secondly, it displays the control or mitigation measures that the particular firm or industry has in place. For finding the cause and the consequence; aspects, impacts and mitigation measures for different industrial activities are determined. These help in the formation of Bowtie diagram.

2.2 Online Monitoring

Online Monitoring of every stack and furnace are done. Different sensors are attached which monitor the rate of effluents or emissions. These sensors help in monitoring as well as recording the discharge rate of the effluents. Online monitoring helps in keeping the effluents and emission rate under control. Every state has their own pollution control board which governs the pollutants as well as has set particular limit for the discharge rate of the pollutants. Like other pollution control board GPCB (Gujarat Pollution Control Board) has also set the permissible limit for the discharge of the pollutants or effluents. GPCB monitors the rate in the real time. GPCB has also set the height for the stacks for industries.

2.3 Safety Considerations

OPaL dahej has include various steps for decreasing as well as controlling the damage done to the environment. The emission of the flue gases which consists of NO_x , SO_x , CO and other various gases are emitted in the atmosphere in a controlled way by

- Online emission monitoring system is embedded.
- Various sensors are attached in the stacks.
- Tall stacks are used for emissions.
- Clean sulfur free fuel is used.
- Low NO_x burners are placed.
- SO_x control technology is used.
- NO_x control technology is used.
- Particulate matter control technology is used.
- Green belt is developed across the plant wherever possible.

The waste water is treated in Effluent Collection and Treatment System (ECTS) before discharging it. The various section of the ECTS are-

- Oil water separator system (OWS) treatment system.
- RO based tertiary treatment system.
- Sanitary effluents system.
- Contaminated rain water separator treatment system.
- Spent caustic treatment system.

The noise level of various machinery and equipment are maintained by the using damping material and sound absorbing material.

III. RESULT

Through the bow tie analysis the threat and consequence is searched and the controlling measures or the mitigation measure is discussed. In case of air environment the exposure value of the 8 cracking unit is collected for 10 days.

- Air Environment-

The exposure value of the flue gas emitted through cracker unit is collected and analysis is done. The average data of 8 cracker unit is shown below-

Cracker no.	NO_x ($\mu\text{g}/\text{Nm}^3$)	CO ($\mu\text{g}/\text{Nm}^3$)	SO ($\mu\text{g}/\text{Nm}^3$)
1	26	11.4	1.21
2	28.3	8.78	1.17
3	28.5	8	1.34
4	33.9	6.04	1.57
5	26	6.07	1.34
6	32.4	6.74	1.85
7	31.6	9.17	1.57
8	27.3	7	1.35

The permissible limit of exposure value of the flue gas are-

For NO_x - 250 $\mu\text{g}/\text{Nm}^3$

For CO- 100 $\mu\text{g}/\text{Nm}^3$

For SO_x - 50 $\mu\text{g}/\text{Nm}^3$

- Water Environment-

Before discharging the waste water from the industry the waste water is treated in the ECTS made sure that the water discharged falls under the permissible limit of GIDC.

For pH

Permissible limit of pH	Original value
6.5-8	7.8

For total suspended solids (TSS)

Permissible limit of TSS	Original value
100 mg/L	78 mg/L

Before discharging the waste water the COD is maintained below 250 mg/L.

- Noise Environment-

The noise level along the periphery of the industry is maintained which is shown below-

Category of Area	Day time limit dB(A)	Night time limit dB(A)
Industrial Area	75	70

IV. CONCLUSION

In general the data collected and their analysis shows that the rate of discharge of of pollutant In this study of environmental risk assessment of petrochemical industry and safety consideration has been proposed. The exposure limit of the flue gases, effluents and the noise exposure are under control. These values are below the permissible limit of GIDC. Even after the exposure limits are under control safety consideration is always kept in mind to maintain the safe workplace for the employees working here. For maintaining safety every possible steps is considered.

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