

ENVIRONMENTAL POLLUTION CONTROL IN PETROLEUM REFINERIES

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INTRODUCTION

AIR POLLUTION:

Any process which adds to or subtracts from the usual constituents of air may alter its physical or chemical properties.

➤ **Classification of Pollutants:**

- Those emitted directly from identifiable sources
- Those produced in air by interaction between various primary pollutants or normal constituents of air

➤ **Effect of pollutant on environment ;**

- Reduction in visibility
- Damage to material
- Damage to vegetation
- Physiological effect on human being and animals
- Physiological effects

Air pollutants from refining operation

Sulphur compounds:

- Sulphur compounds means sulphur oxides –sulphur dioxide, sulphur trioxide.
- Main source is fuel combustion
- Amount of sulphur dioxide emission depends on type and amount of fuel burnt and its sulphur content
- In refineries oxides may released directly to the atmosphere by vents leakages.

OXIDES OF NITROGEN:

- Emission of oxides of nitrogen depends on fuel nitrogen content
- Emission will differ from furnace to furnace
- Nitrogen oxides emissions from refineries are generally low.

Particulates:

- Major sources of particulate are catalytic cracking regenerators
- Emission can be measured from daily catalyst loss data.
- Minor sources includes asphalt air blowing operations, fired heaters ,boilers, burners

- **Carbon monoxide:**

- The only source is catalytic cracking regenerator when there is no CO boilers
- Emission calculation is based on stack gas analysis for CO content and quantity of air used for regeneration

AIR POLLUTION CONTROL TECHNIQUES

1. CONTROL OF EMISSIONS FROM REFINERY PROCESS GASES :

- Gases generated contain- hydrogen sulphide and other low molecular weight sulphur compounds
- **Removal of H₂S and light mercaptans-**
 - by scrubbing the gases with an absorption solvent like amine solution
 - use of this process depends on quantity of gas and the sulphur content of the gas.

2. Control of emissions from fuel combustion:

- Combustion is significant source of sulphur dioxide, oxides of nitrogen etc.,

▪ Removal of sulphur content-

1. By changing fuel type-

- switching to cleaner type of fuel which contain less sulphur content

2. hydrodesulphurization-

- reduces sulphur and nitrogen
- expensive process

■ **Removal of oxides of nitrogen:**

- by improving combustion techniques
- proper burner maintainance
- correct stack temperature

Techniques involves-

- Staged combustion
- fluidized bed combustion
- Water steam injection

- **Removal of smoke**

- By injection of large quantities of steam into the combustion zone with uniquely designed flare tips

3. control of emissions from catalyst regeneration :

- Catalytic cracking is major source of particulate matter emission also sulphur, hydrocarbon and nitrogen oxides emission
- **Technique:**
 - Third external cyclone stage may be used in addition to the already located two stage cyclones for catalyst recovery
 - Electrostatic precipitator may be used before discharge of the flue gas to atmosphere
 - To remove hydrocarbon cracking units are equipped with CO boilers.

4.control of emission in storage:

- Emission from storage vessels caused by-evaporation of liquids or liquified gases.
- Control of these emission results in reduction of fire hazards
- Control can be done by using floating roof or pressure storage for light hydrocarbon

5.increased energy efficiency:

Increased recovery and integration help to:

- reduce fuel consumption
- Reducing pollution
- Reducing cost

Thanks