

Executive Summary

Environmental
Design
Considerations
for

Petroleum

Refining
Crude
Processing
Units



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Health and Environmental Affairs Department

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Section 1: EXECUTIVE SUMMARY

1.1 Basis of Study

The Pollution Prevention Task Force (PPTF) of the American Petroleum Institute (API) has developed the following working definition of pollution prevention:

"Pollution prevention is a multi-media concept that reduces or eliminates pollutant discharges to air, water, or land and includes the development of more environmentally acceptable products, changes in processes and practices, source reduction, beneficial use and environmentally sound recycling."

The PPTF and the API Committee on Refinery Environmental Control (CREC) recognize the importance of developing pollution prevention strategies for refineries. This study was initiated to investigate how the crude unit in a typical refinery could be designed to minimize multi-media environmental releases while still efficiently performing the traditional functions of a crude unit.

This report presents the findings of the study. The report is intended to serve as a reference for refinery designers during the preliminary design phase of building a new crude unit or revamping an existing crude unit.

A generic methodology for conducting pollution prevention studies on process units was developed and was then applied to the refinery crude unit (refer to Section 4). This methodology approached pollution prevention from two perspectives, or cases:

- Case 1 - The design of a model new crude unit.
- Case 2 - The revamp of a conventional existing crude unit, applying the principles learned in Case 1.

A typical ten-year-old U.S. Gulf Coast crude unit of 175,000 BPSD capacity was chosen to serve as the reference point or Base Case.

The technical contents of this report include: crude charge and product slates, process flow diagrams, major equipment lists, raw material use, water use, energy, equipment costs, and multi-media releases. These releases include: point source air emissions, fugitive air emissions, solid and hazardous waste production, and wastewater inventory.

The study investigated in detail these specific methods of pollution prevention:

- modification of vacuum tower to dry operation and reduced flash zone pressure to minimize cracking of feed;
- dry operation to reduce the quantity of sour condensate;
- use of vacuum pumps to replace all or part of the steam jet ejector system to provide the vacuum for the vacuum tower;
- use of reboiled sidestrippers on the atmospheric tower rather than open steam stripping to reduce the quantity of sour condensate;
- replacement of first generation low NO_x burners with new generation low NO_x burners in furnaces;
- use of catalytic and non-catalytic processes for the selective reduction of NO_x;
- reuse of stripped sour water to replace clean process water as desalter water; and