

CH2356 Energy Engineering

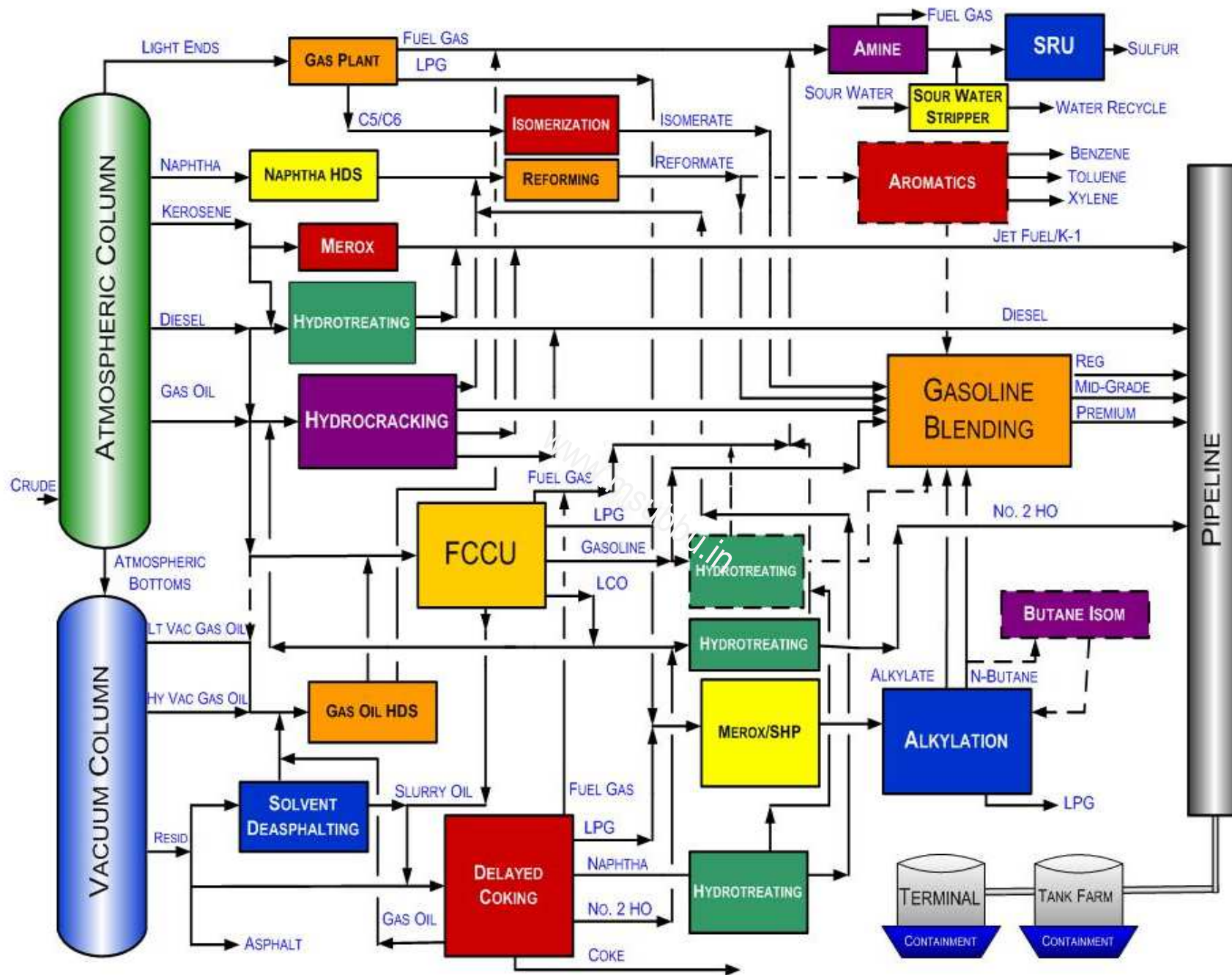
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Energy Saving Measures in Petroleum Refineries

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Introduction

- Approximately 50% of the production costs for petroleum products are energy costs.
- Since the price of feedstock is a function of the market conditions and is not controlled by the refineries, they can reduce their costs primarily by reducing the consumption or cost of energy carriers.

Saving from Furnace Operations

- The processing furnaces consume the highest amount of energy among refinery equipment. They are responsible for approximately 50% of the total thermal energy consumed. As a consequence, any possible increase in the efficiency of this equipment will cause significant savings of energy and, equally importantly, will reduce atmospheric pollution
- The heat from the gases going out of the furnaces at a high temperature (300 – 550°C) is usually not utilized. The efficiency of operation of the furnaces in these conditions is 58 – 69%.
- According to preliminary calculations, it would be possible to significantly — to 88% — increase the furnace efficiency by utilizing this heat.

Saving from Exhaust Hydrocarbon Gases

- All of the hydrocarbon gas in normal operation of a refinery (~100% load) is frequently used as fuel for the processing furnaces.
- The hydrogen-containing gas, production waste at some refineries, goes into the refinery circuit and is burned in the flare in the amount of 1.5 – 6 kg/sec. Its heat value is very high: 60 – 65 MJ/kg.
- According to calculations, 25 – 110 MW of electrical or 80 – 360 MW of thermal energy can be produced in this gas alone.

Using Membrane Separations in place of Distillation

- Within the refining industry, separation processes, primarily distillation, account for nearly 40% of the industry's energy use.
- Distillation entails heating the fluids (crude oil) until boiling, resulting in high energy costs. An alternative to distillation is the use of membranes which could potentially save 40% of the energy currently used in distillation separation.
- Membrane separation does not require heating and boiling off the fluids. Instead, it relies on differences in the rate at which components pass through the membrane material.