

# Physical and Thermal Processes in Oil Refinery

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INTRODUCTION TO PETROCHEMICAL INDUSTRIES



# Processes in Oil Refinery

PHYSICAL PROCESSES	CHEMICAL PROCESSES	
	THERMAL	CATALYTIC
Desalting and Dehydration	Visbreaking	Hydrotreating
Distillation	Delayed Coking	Catalytic Reforming
Propane De-asphalting	Fluid Coking	Catalytic Cracking
Solvent Extraction and De-waxing		Hydrocracking
Blending		Catalytic De-waxing
		Alkylation
		Polymerization
		Isomerization

# Physical processes

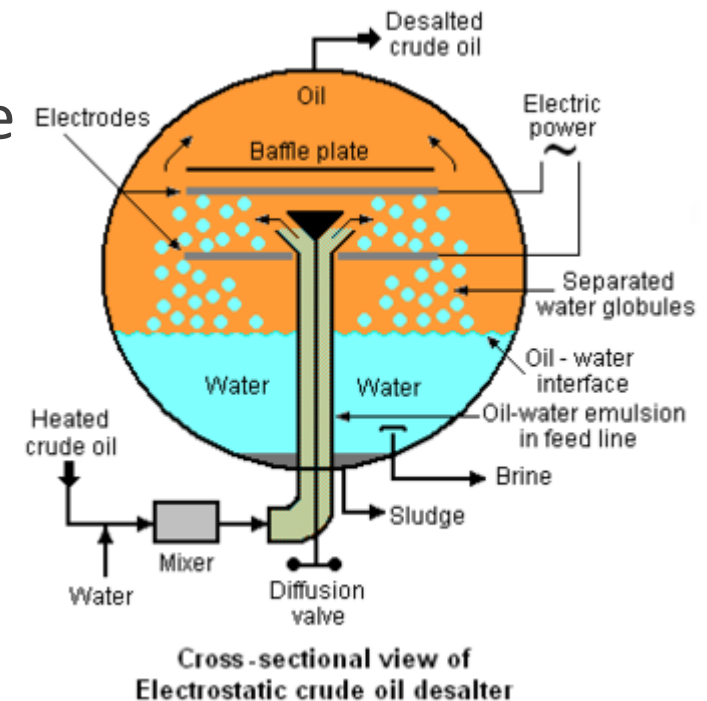
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## **DESALTING AND DEHYDRATION**

- Removal of water, inorganic salts, suspended solids and water soluble trace metal from crude oil
- Desalting and dehydration reduces
  - Corrosion of equipment
  - Plugging and fouling of equipment
  - Poisoning catalysts in processing units
- Types: Chemical and Electrical/Electrostatic De-salting

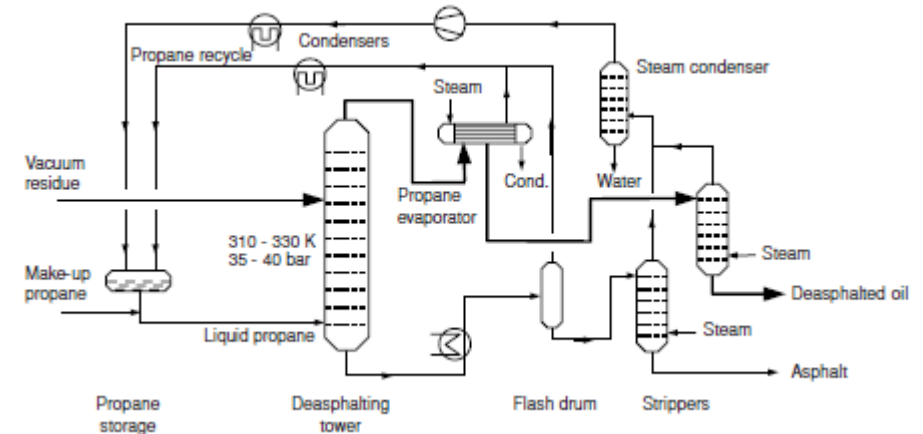
# Desalting and Dehydration

- Chemical Desalting
  - Hot water and surfactants are added to the crude oil
  - Crude is heated to dissolve impurities and cause coalescence
- Electrical/Electrostatic Desalting
  - High voltage is introduced to electrodes in a desalter filled with water-crude emulsion.
  - Electrostatic coalescence of the emulsified droplet occurs.
  - Separated water globules falls to the bottom of the tank.



# Solvent De-asphalting

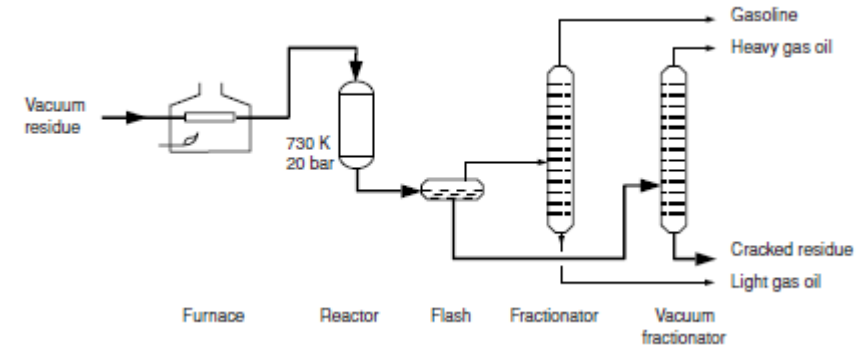
- Reduces coke-forming tendency of heavier distillates
- Done by solvent extraction
- Liquid propane, butane and pentane are used.
- Propane selectively dissolves alkanes leaving the asphaltenic materials (aromatic compounds) at 310-330 K and 35-40 bar.
- Propane is evaporated, condensed and recycled.



# Thermal Processes

## VISBREAKING

- Mild form of thermal cracking that lowers viscosity of heavy crude-oil residues
- Residuum is heated ( $425^{\circ}\text{C}$ - $510^{\circ}\text{C}$ ) at atmospheric pressure in a heater
- Over-cracking is checked with cool gas oil
- Thermally cracked residue(tar) is vacuum flashed in a stripper



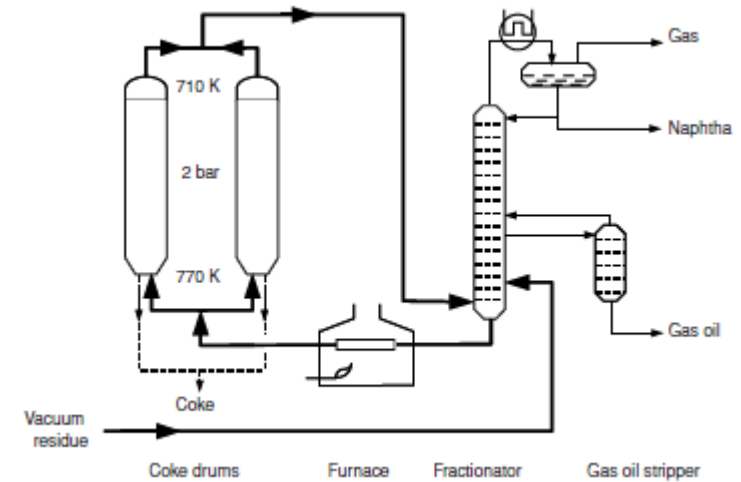
# Coking

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- Severe thermal cracking which changes heavy residuals into lighter products
- Produces straight-run gasoline(Coker naphtha) and middle distillate fractions
- Middle distillates serve as catalytic cracking feedstock
- Reduces hydrogen which is responsible for producing a form of carbon called coke
- Types: Delayed coking, fluid coking

# Delayed Coking

- Heat is applied to residuum
- Heated residuum is transferred to coke drums
- Drums hold feedstock while cracking occurs
- Coke is deposited as solid

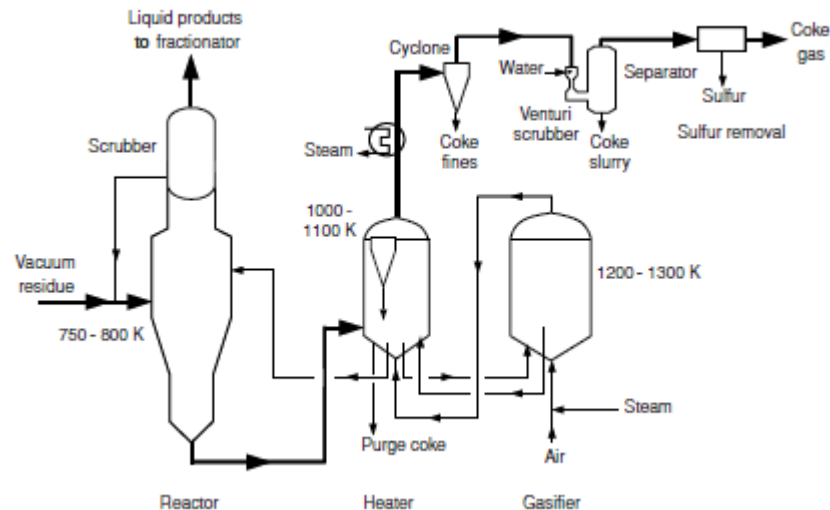




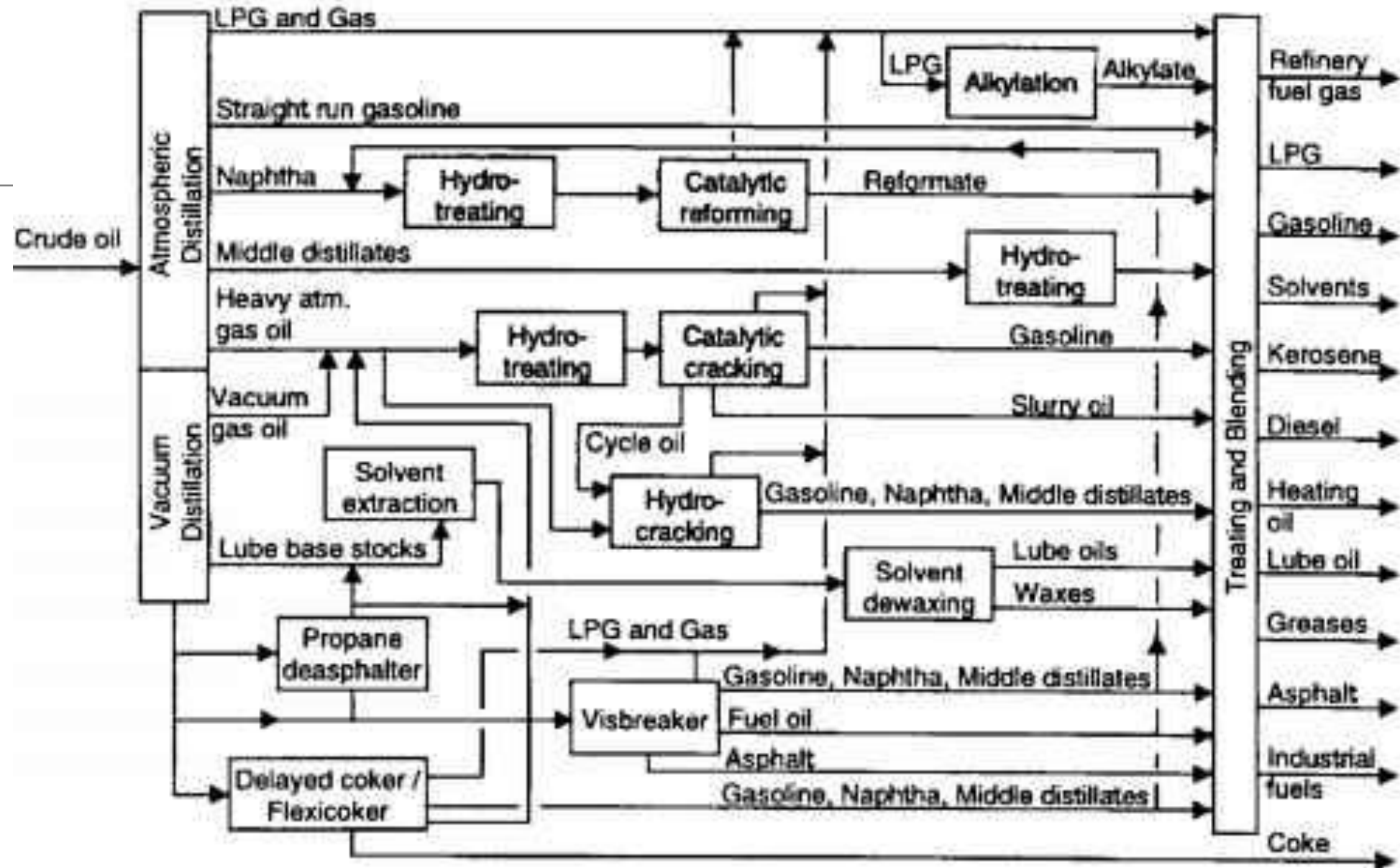
# Fluid Coking/Flexicoking

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- Feedstock is charged to a heated reactor
- Thermal cracking forming gas, liquids and more coke
- Coke is transferred as a fluidized solid to a heater
- Part of coke is burned to provide heat for cracking



# PETROLEUM REFINERY FLOW CHART



*That's All  
Folks!*

