Solvent Extraction

Contents

- Introduction
- Eduleanu Process
  - Description
  - Flowsheet
- Udex Process
  - Description
  - Flowsheet
  - Operating conditions and yield Pattern
- Hydrotreating

Introduction

- Secondary Refining Processes

  ↓

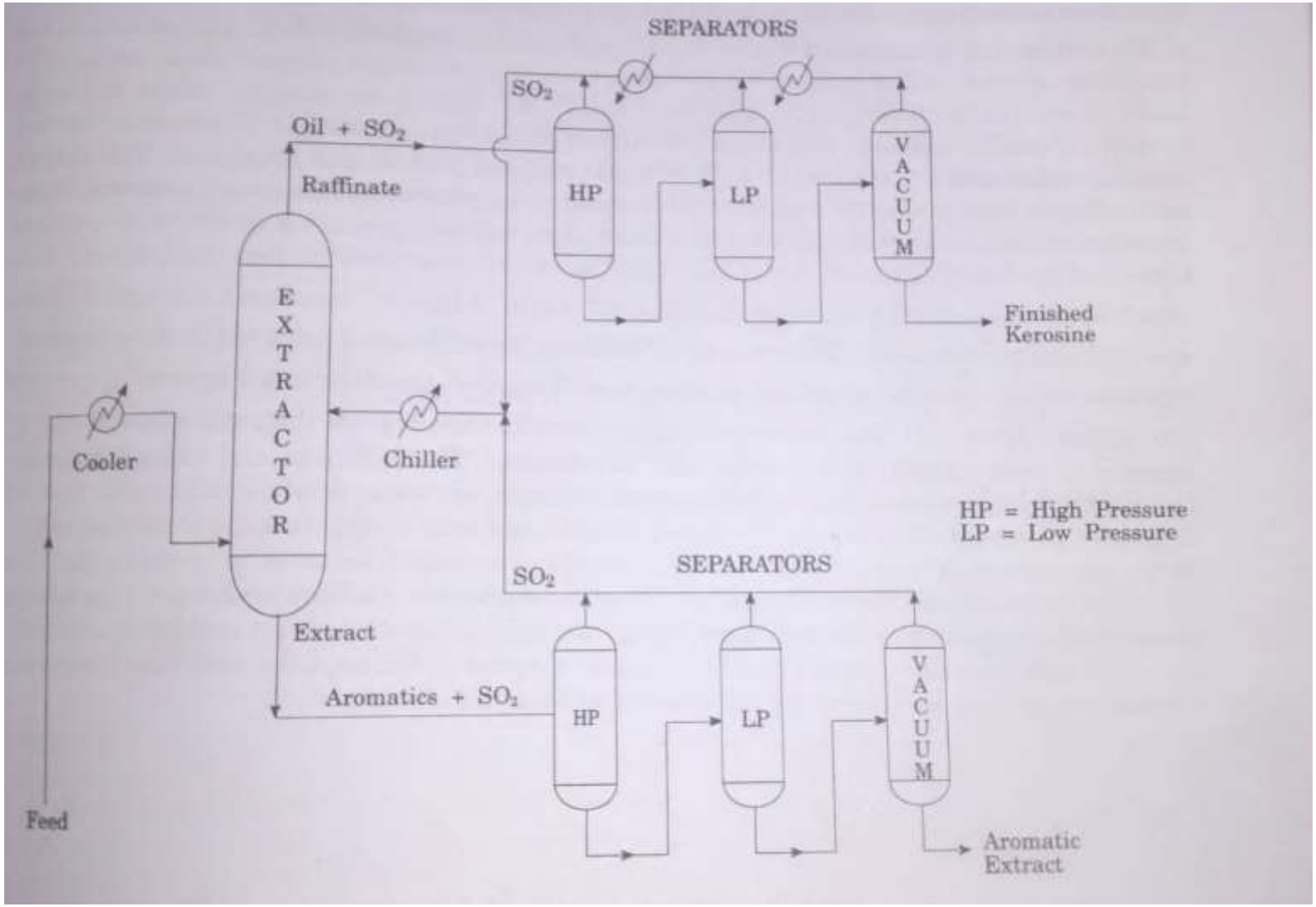
  Finishing or treating Processes.
- Types of Secondary Refining Processes
  - Hydrogen Sulphide removal Processes
  - Sulphur recovery Processes
  - Sweetening Processes
  - **Solvent Extraction Processes**
  - Hydrotreating Processes.

- Solvent Extraction is used in the petroleum refining and petrochemical industries since 1920
- In the petroleum industry extraction processes are widely used in two areas :
  (i) In the production of light aromatics
  (ii) In the de-aromatisation of lube fractions for improving the quality of base oils.
- The main criteria in the selection of the solvents are their physico-chemical characteristics such as solvent power (solubility of aromatics in the solvent) and

Edeleanu Process

- This process is the oldest liquid- liquid extraction process used in petroleum industry.
- This was initially and successfully used in the refining of kerosene, gas oil and light petroleum fractions.
- It uses liquid Sulphur dioxide as solvent. At normal boiling point of SO_2 of -10℃ aromatic and unsaturated hydrocarbon are completely miscible with SO_2 but paraffinic and naphthenic hydrocarbon are not.
- The solvent capacity of liquid SO_2 was increased by adding benzene in small amounts and used for processing of more paraffinic feeds.
- Because of the high solvent losses, toxic nature of the solvent and corrosion of process equipment, Edeleanu process is no longer in use.

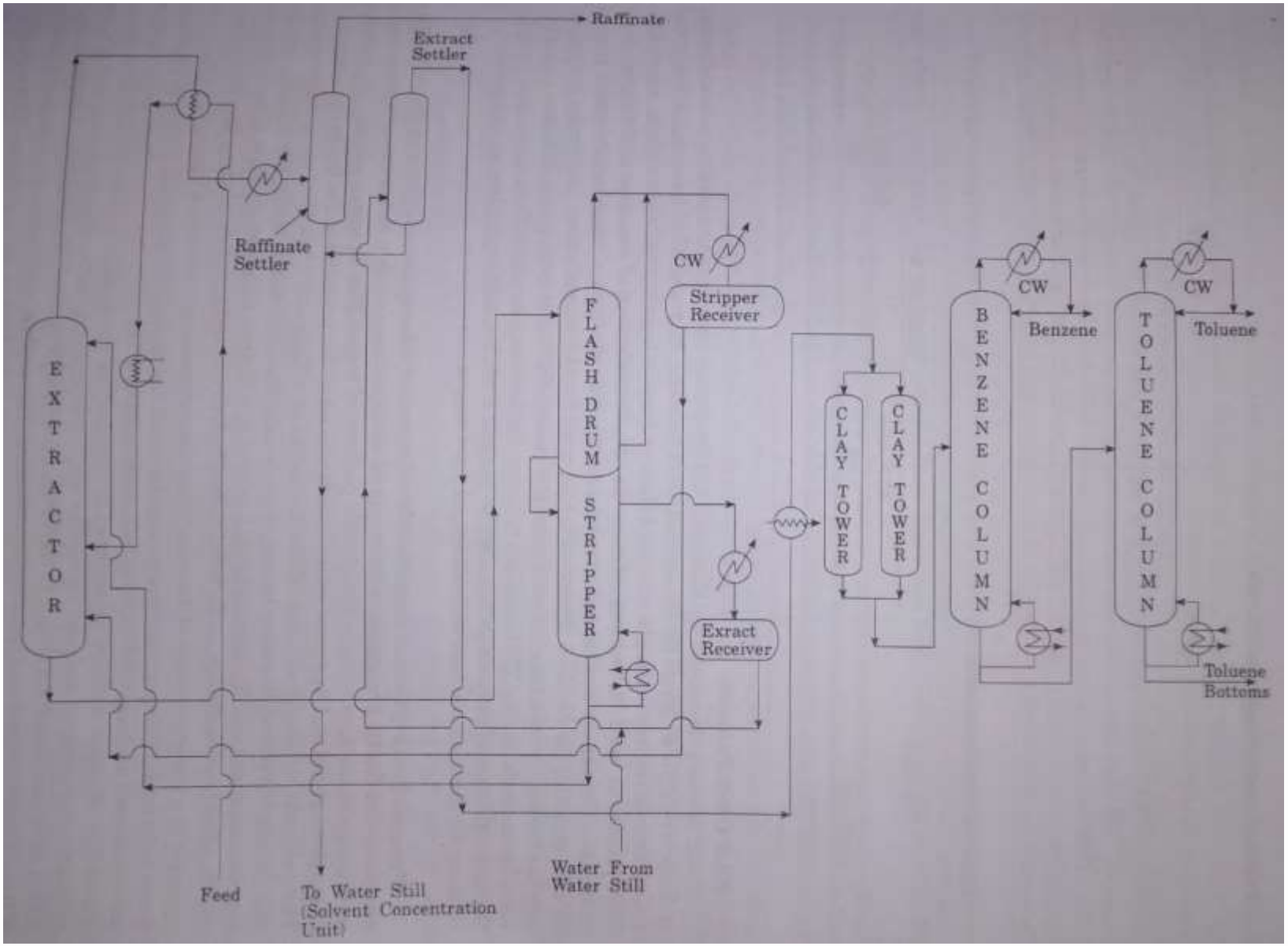
Edeleanu process for treating kerosine



Udex process

- Udex process is developed by Universal Oil Product.
- It uses concentrated aqueous solution of di-or tri-ethylene glycol.
- This process is used for the extraction of benzene, toluene, ethyl benzene, xylene and heavy aromatic compounds.

Process flow sheet of Udex process



Typical operating conditions

Extractor pressure(top), kgf/cm^2	8.4
Extractor temperature, ℃	143
Solvent to Feed ratio (vol./vol.)	4.7
Solvent Composition	
(a) % of triethylene glycol	92
(b) % of water	8

Typical yield pattern

Product	*Yield*
Benzene	38
Toluene	14
Raffinate	47
C_8 bottom + loss	1

Hydrotreating Processes

- Application of Hydrotreating
  1. Reduction of Sulphur in the feed to the catalytic reformer.
  2. Desulphurization of naphtha , kerosine, gas oil and fuel oil.
  3. Improvement of colour, odour, oxidation stability of lubricating oil base stock and waxes.
  4. Mild hydrogenation of aromatics into napthenes in stream like high aromatics kerosine and gas oils to improve smoke point and cetane number.
  5. Hydrogenation of olefinic streams produced from thermal cracking process.

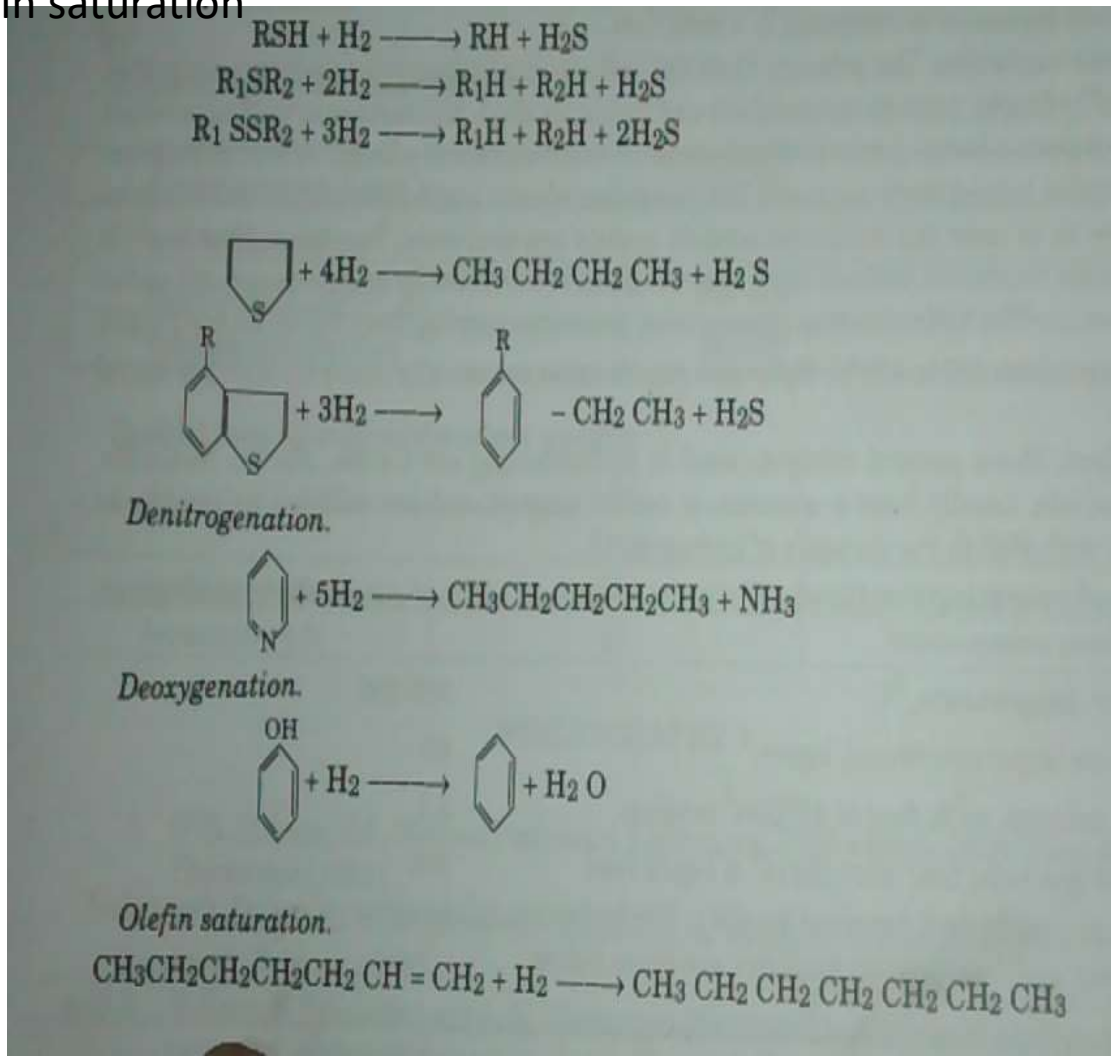
Hydrotreating process for Distillate desulphurization

- Feedstock along with recycle hydrogen-rich gas stream is preheated.
- Mixture is passed to a fix bed reactor.
- The reactor effluents after cooling go to high pressure separator where hydrogen rich gases are separated and recyle back to the reactor .
- The liquid product from high pressure separator goes to low pressure separator where light gases are stripped off.
- The liquid product from the low pressure separator is stabilized in a stabilizer.

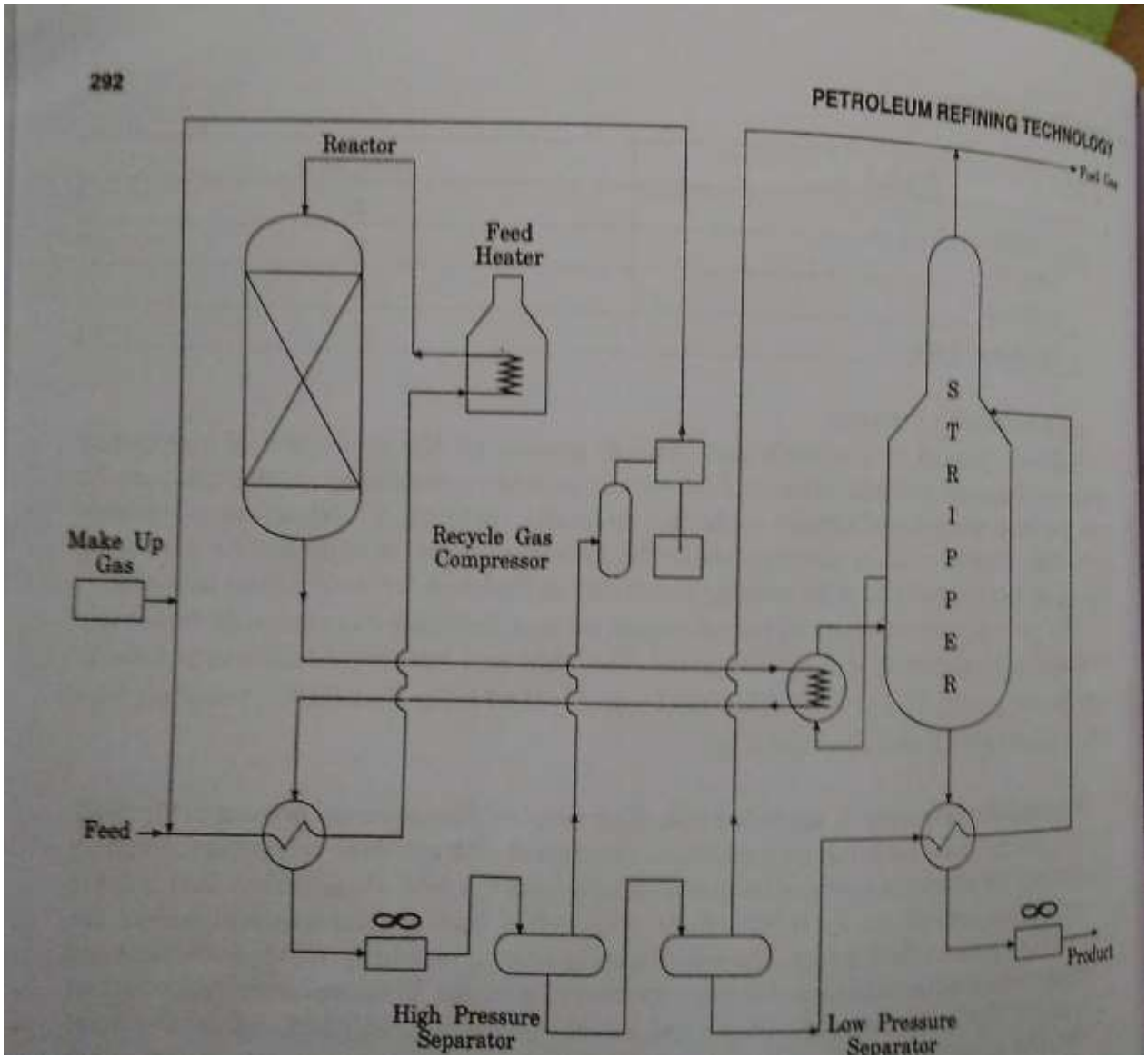
Catalyst Co-Mo, Ni-Co-Mo

Hydrotreating Reaction

These include desulphurization, denitrogenation, deoxygenation, olefin saturation



Flow sheet for Hydrotreating Process



Typical operating condition

Reactor temperature, ℃	360-390
Pressure (separator drum)	40
Space velocity, m^3/h	2.1
Recycle gas rate Nm^3 pure H_2/m3 of liquid feed	200

Thank You