



# LECTURE - 16

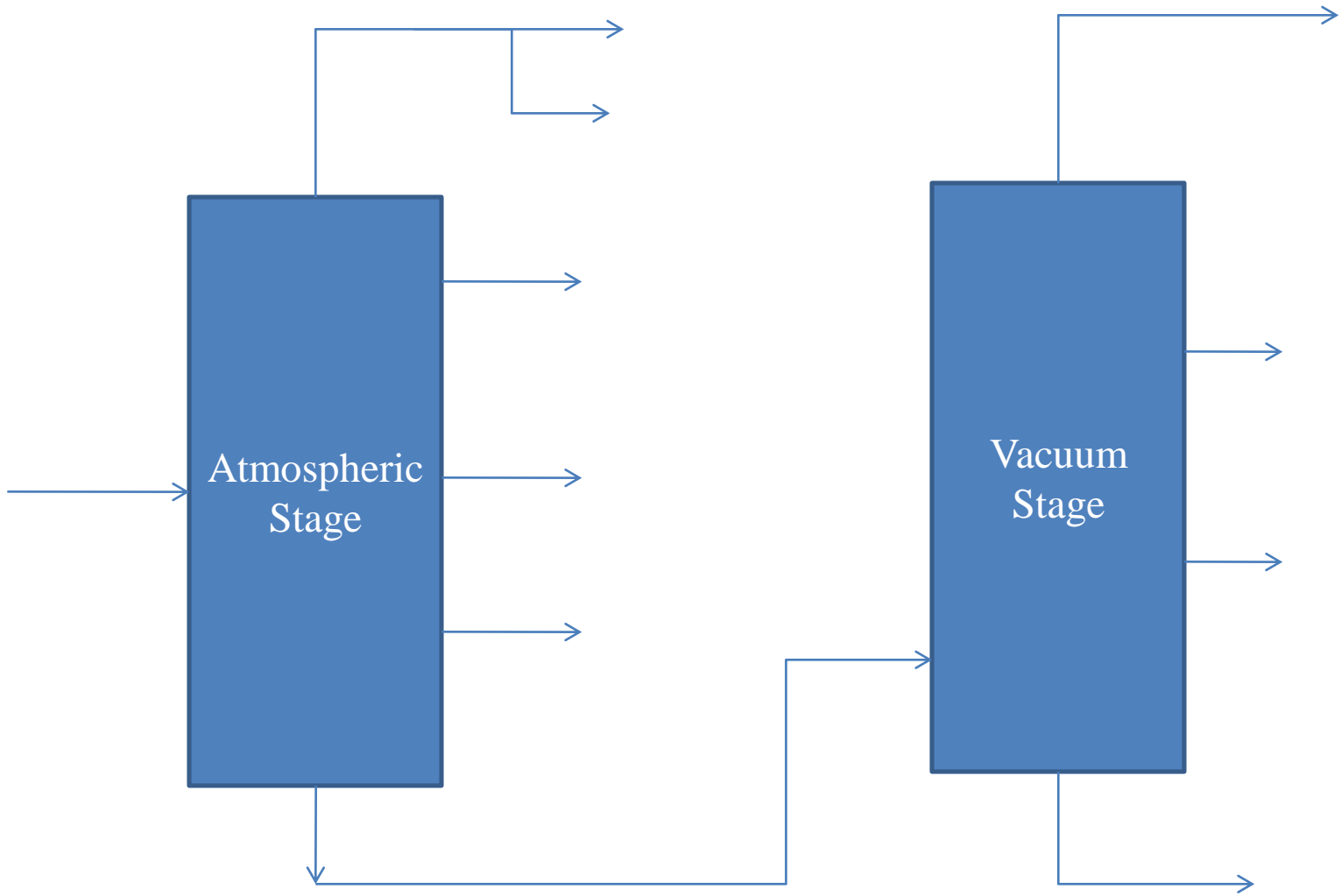
# **CRUDE OIL DISTILLATION**

- It is carried out in two stages-
  1. Atmospheric Distillation
  2. Vacuum Distillation

# WHY IT IS DIFFERENT?

These are differ from conventional distillation in following ways.

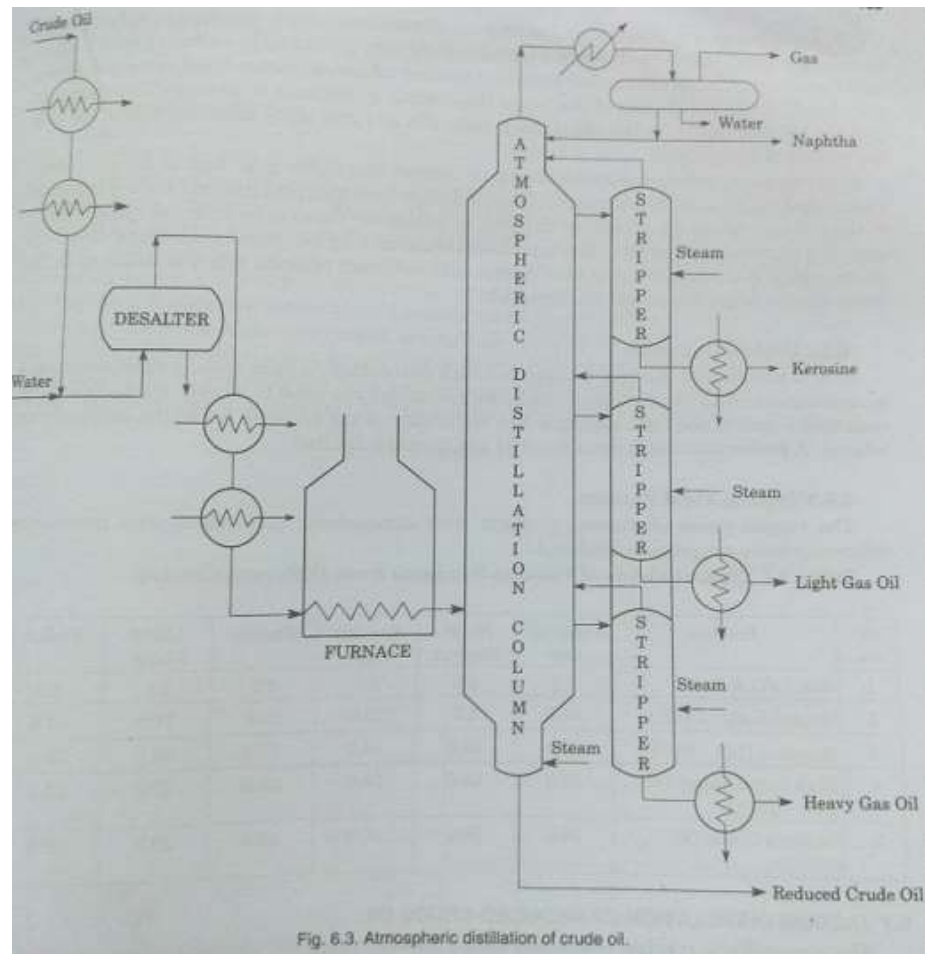
- ❖ A large part of heat of vaporization is supplied to the feed stream rather than by way of reboiling the liquid in the bottom of the column.
- ❖ Several products of volatility intermediate between the overhead distillation & bottom products are withdrawn as side streams.
- ❖ Live-steam is injected into the bottom of the column & the side stream strippers for the control of the IBP of the fraction.



# ATMOSPHERIC DISTILLATION OF CRUDE OIL

- It is carried out at pressure slightly above atmospheric pressure to;
  - I. Raise the boiling point of light ends so that refinery cooling water may be used to condense some of the propane & butanes in the overhead distillate.
  - II. Pressure the uncondensed gases to the meant processing step.
  - III. Allow for column pressure drop.

# ATMOSPHERIC DISTILLATION OF CRUDE OIL



# PROCESS DESCRIPTION

- The salt content of crude oil is reduced in electrical desalting equipment.
- The desalted crude oil is prepared by heat exchange with products from atmospheric distillation column to as high a temperature as possible before it enters the furnace where it is heated suitable temperature that gives required % of vaporization in flash zone.
- The temperature to which the crude oil can be heated before flashing in this without undergoing cracking is dictated by the thermal stability of crude oil. (350-360°C)

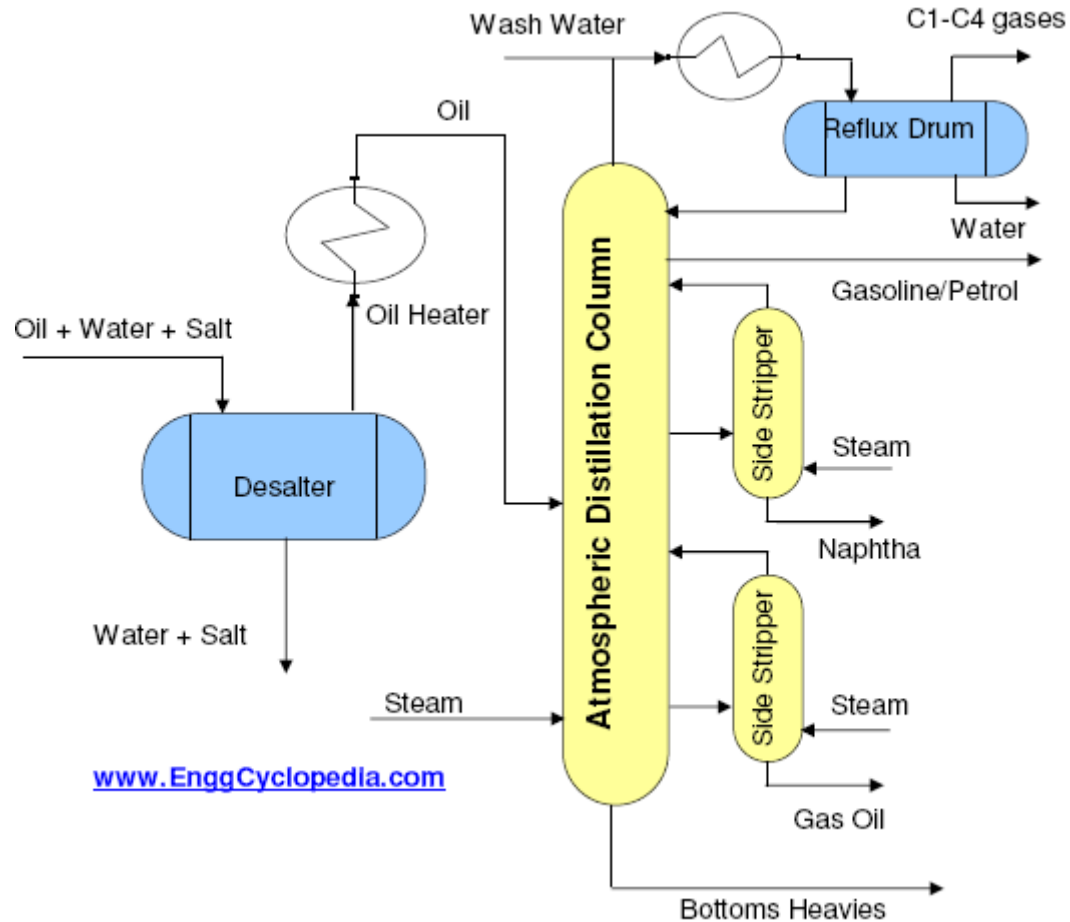
# PROCESS DESCRIPTION

- The furnace effluent is flashed into the flash zone of atmospheric column where vapor & liquid separate.
- The pressure at the flash zone is set after fixing the reflux drum pressure & adding this the lie & column pressure drop.
- The overflash is kept in the range of 3-6% on crude.
- A greater gap implies better fractionation.
- Steam is introduced at the bottom section of the column at a rate of 12-24 kg/m<sup>3</sup> of column bottoms.



- Higher steam rates may be used when additional vaporization of flash zone liquid is required at a limiting temperature thus giving a greater overall vaporization.
- The side stream-products are steam stripped to remove the lighter components.
- The lighter HC are condensed in an overhead condenser & sent to a reflux drum where gas & liquid separate.

# ATMOSPHERIC DISTILLATION OF CRUDE OIL



# **VACUUM DISTILLATION OF** **REDUCED CRUDE OIL**

- The atmospheric residue, commonly called reduced crude oil, contains a large volume of distillable oils.
- The general function of vacuum column is to remove the maximum possible amount of distillation from the charge stock in consistent with meeting product specifications on the residue as well as distillates.
- The residue from the vacuum column may be used for bitumen production or it can be blended with lighter streams to meet specifications of products like fertilizer feedstock.

# PROCESS DESCRIPTION

- The reduced crude oil is first preheated by heat exchange with products from vacuum column & then heated in the reduced crude furnace to suitable temperature that gives required % of vaporization in the flash zone.
- The overflow condenses on the wash section plates & returns to the flash zone and bottom stripping section.
- This prevents coking in the wash section plates & also carry over of coke to the bottom side stream product

# PROCESS DESCRIPTION

- The heated charge enters the flash zone of vacuum column.
- Steam is introduced in the furnace coil to decrease the residence time & minimize coking.
- Steam is introduced at the bottom section of the column to reduce the partial pressure of HC in the flash zone.
- The steam also helps to strip off light ends in the bottom product.
- The steam requirements depends on the partial pressure of HC in flash zone.

- The HC vapors & steam rise in the column and products are withdrawn at different sections.
- The overhead vapors from the vacuum column contain steam, inerts & small quantity of entrained HC.
- The steam & HC present in the overhead vapors are condensed by pre-&after-condensers of ejector system.
- The flash temperature is limited by the effect of temperature on cracking and the effects of cracking on product quality.
- The maximum flash zone temperature is 380-400°C.
- The flash zone pressure is determined by setting optimum jet suction pressure & calculating the pressure loss between the flash zone & the ejector inlet.

# PRODUCTS FROM ATMOSPHERIC & VACUUM DISTILLATION

PRODUCT	USES
Light Vacuum Gas Oil (LVGO)	A blending component for LDO
	Feedstock for catalytic cracker/hydrocrackers
Heavy Vacuum Gas Oil (HVGO)	A feed component for visbreaker
	Feedstock for catalytic cracker/hydrocracker
Vacuum Residue (VR)	Bitumen production
	A feed component for visbreaker

**THANK YOU**