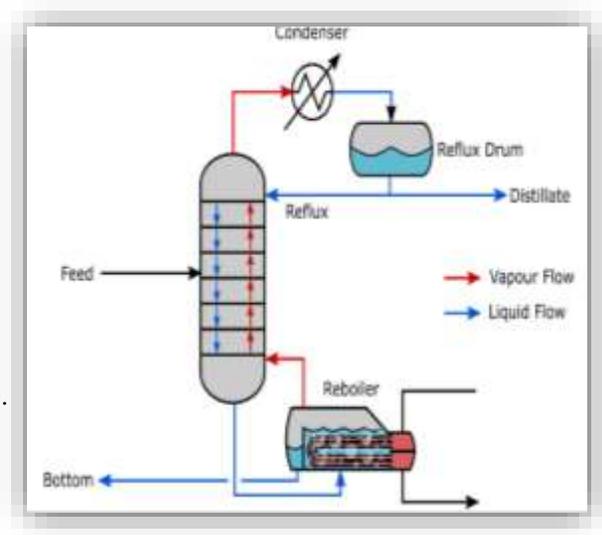


COLUMNS

A column is a vertical vessel used in chemical process industries to bring two different phases into intimate contact so that mass transfer can occur and a mixture can be separated into different components. The type of column (distillation or extraction) depends on the phases involved and the separation principle.



Distillation / Extraction Column

Aspect	Distillation Column	Extraction Column
Separation Basis	Difference in boiling points of components	Difference in solubility in two immiscible liquids
Phases Involved	Vapor-liquid	Liquid-liquid
Energy Requirement	High (needs reboiler & condenser)	Low (pumps, sometimes agitation)
Operating Temperature	Depends on boiling points (often high)	Can be low, even ambient
Internals	Trays (sieve, bubble cap, valve) or packing (random, structured)	Trays, packing, rotating disc contactors, pulsed columns
Number of Phases Exiting	Vapor distillate (top) and liquid bottoms	Two liquid phases (extract & raffinate)

APPLICATION

- Petroleum refining (crude oil fractionation)
- Alcohol distillation
- Air separation units
- Chemical Purifications
- Uranium extraction in nuclear fuel processing
- Caffeine removal from coffee (decaffeination)
- Pharmaceutical separations

MAJOR COMPONENTS

FOR DISTILLATION COLUMNS

Parameter	Typical Range
Tray Spacing	0.3 m – 0.6 m
Packing Type	Raschig rings, Pall rings, structured metal packing
MOC	SS304, SS316, MS, Hastelloy
Reboiler Duty	Based on bottom product rate & latent heat
Condenser Duty	Based on distillate vapor rate & latent heat

FOR EXTRACTION COLUMN

Parameter	Typical Range / Notes
Packing Type	Raschig rings, structured packing, perforated plates
MOC	Stainless Steel, Mild steel, Hastelloy
Continuous Phase	Opposite of dispersed phase
Mixing Method	Gravity flow, mechanical agitation, pulsing