

Department Of Chemical Engineering

Seminar On

PACKING IN DISTILLATION COLUMN

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- Roll :-04



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- **Packing Material**
- **Types of packing**
- **New Generation of Packing Material in Structural packing**

Introduction

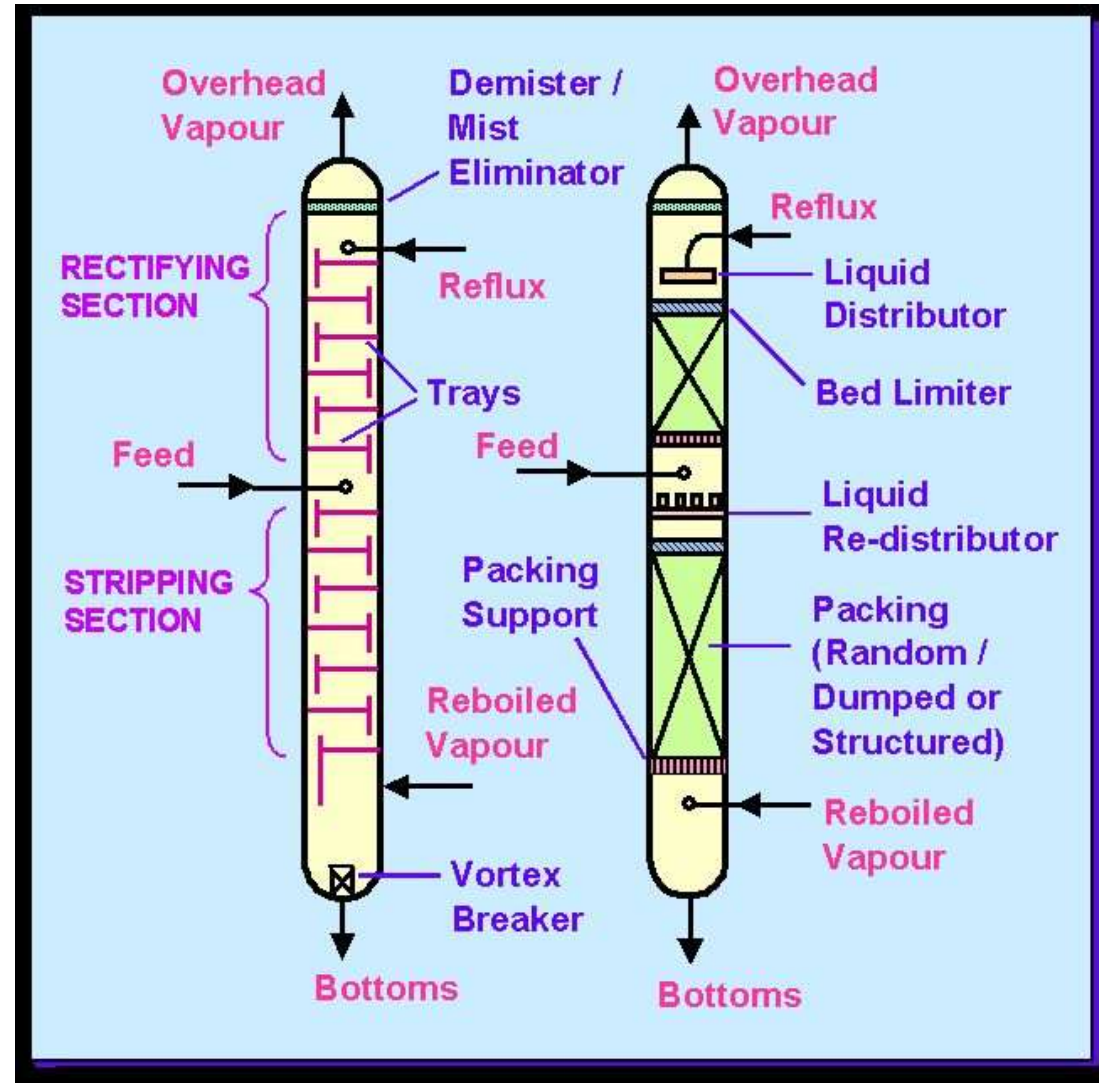
- Packing Column used in following unit process
 - 1) Distillation
 - 2) Liquid-liquid Extraction
 - 3) Gas absorption

1)Distillation

- About distillation
 - Principle
- Classification of distillation

Selection of column type: Tray & Packed

- Flow
- performance
- Pressure drop
- Suitable liquid
- Cleaning
- Corrosion problem
- Diameter of column



Types of packing material

- 1) Tray or plate column

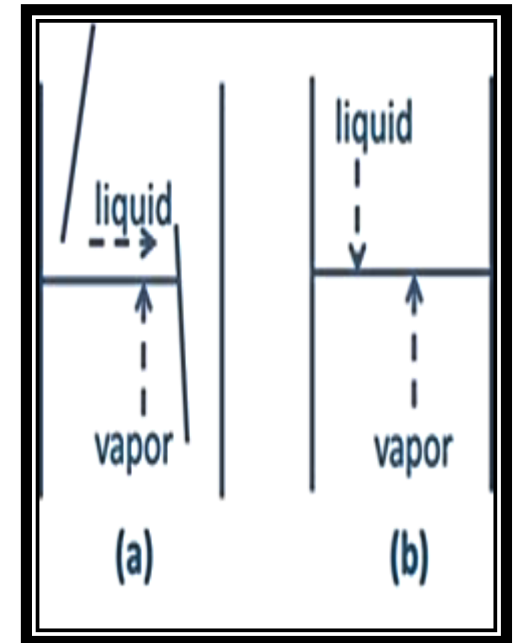
1) Types of packing of Tray

- 2) Packed column

2) Types of packing material

➤ **Selection of tray**

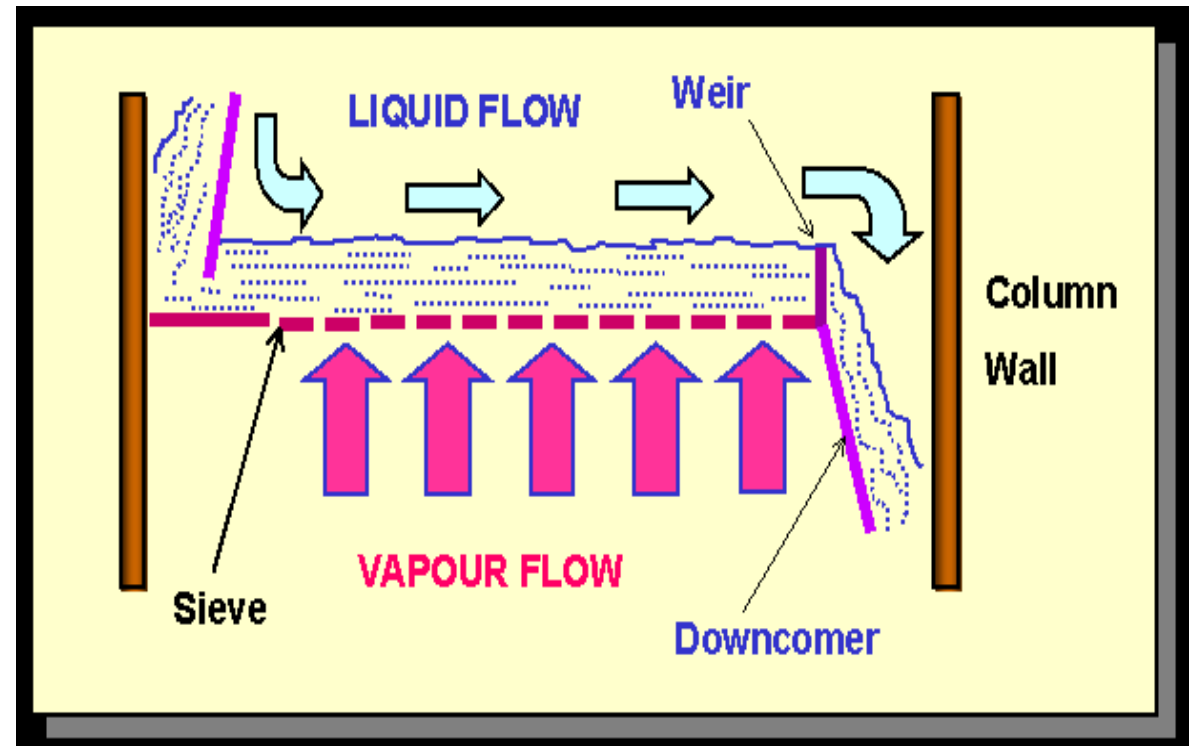
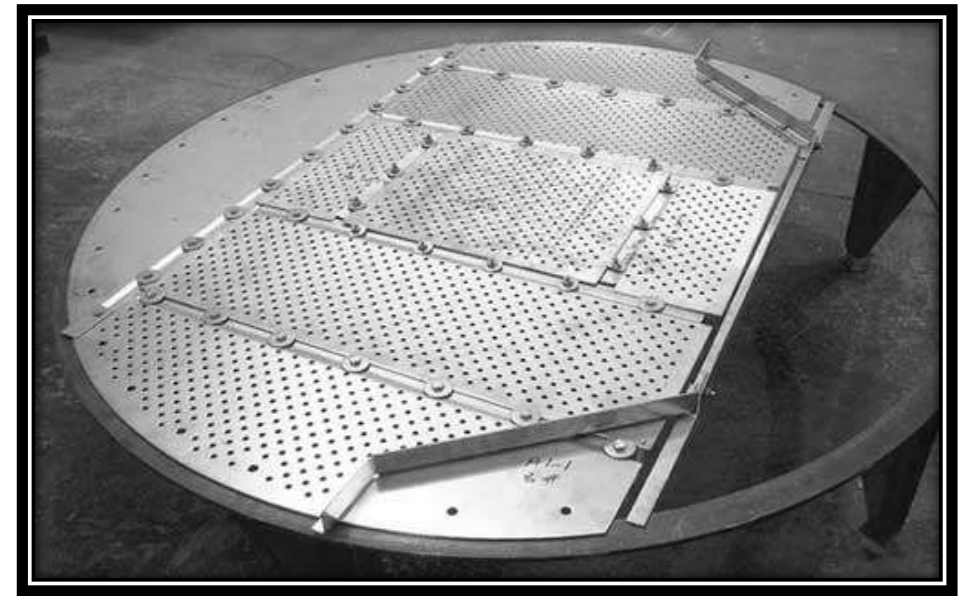
- ☐ Capacity & efficiency
- ☐ Pressure drop
- ☐ Liquid flow
- ☐ Turndown ratio
- ☐ Cost



A) Tray

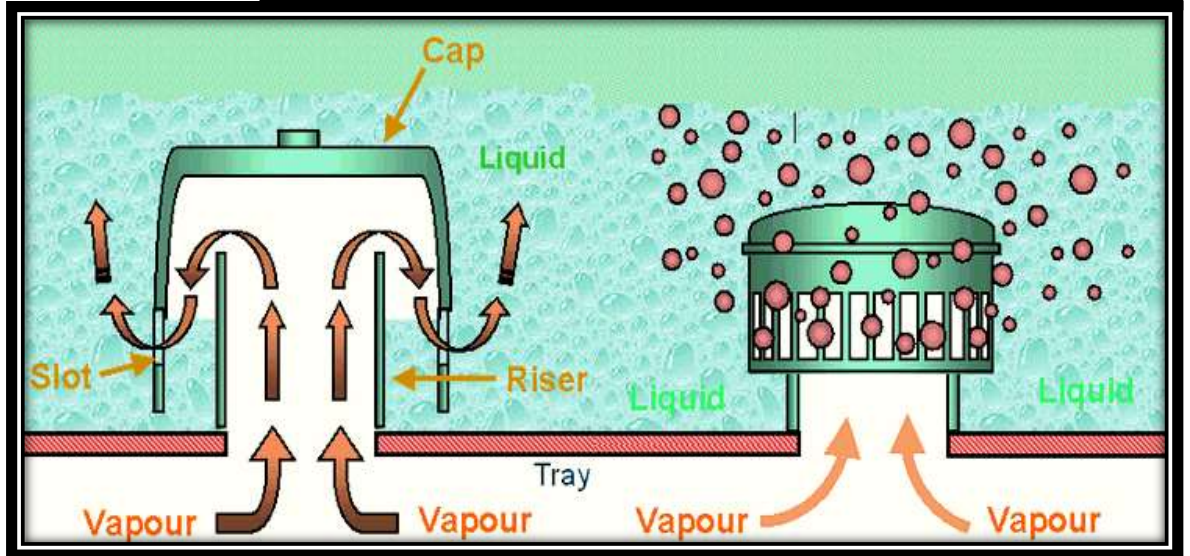
a) Sieve Tray

- Construction of sieve tray(1.5-25mm)
- Arrangement of holes
- Flow pattern
- Pressure drop
- maintenance
- Application



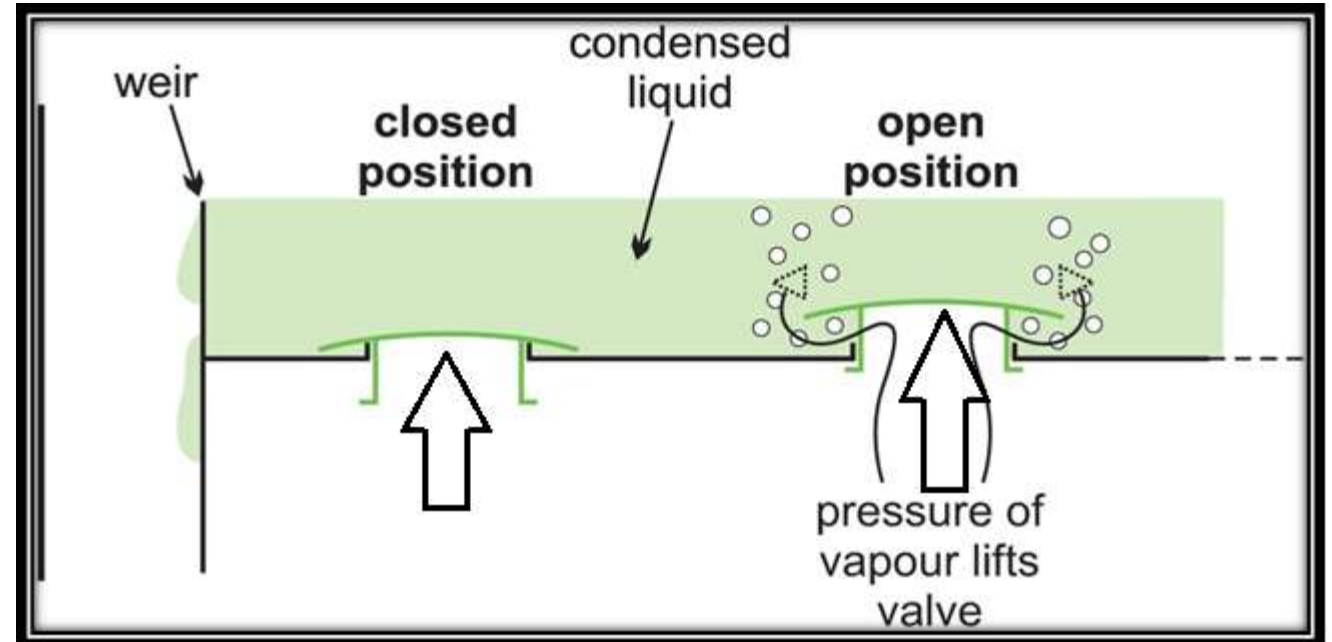
b)Bubble Cap Tray

- Construction of bubble cap tray(20-160mm)
- Arrangement of holes
- Flow pattern
- Pressure drop
- maintenance
- Application



c) Valve Tray

- Construction of valve tray(40-150mm)
- Arrangement of holes
- Flow pattern-
- Pressure drop-
- Maintenance-
- Application

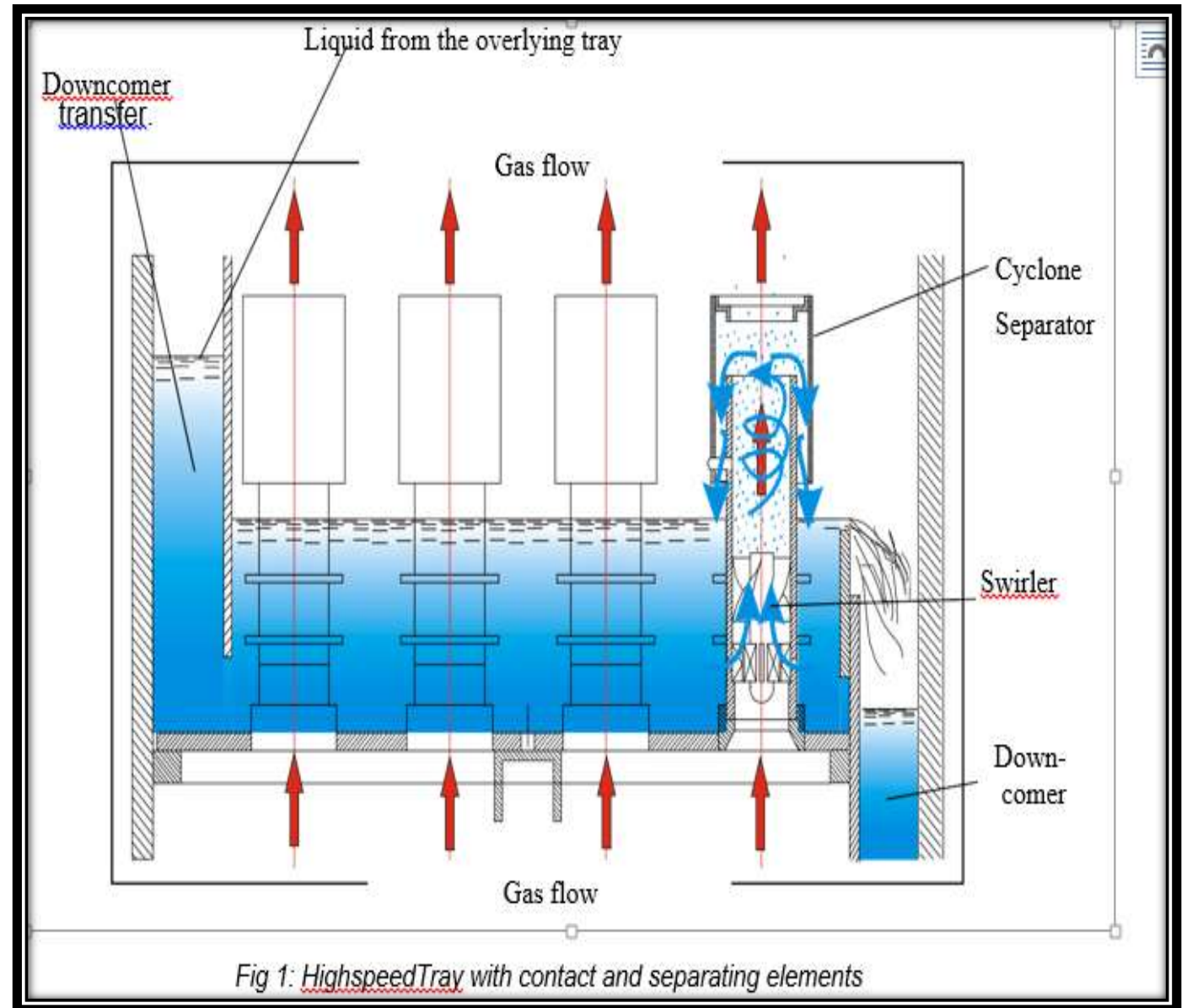


New Generation Tray

- High-speed Mass-Transfer
Tray
- High-Powered Adaptive Valve
Tray

High-speed Mass-Transfer Tray

- Construction
- Moc
- Flow pattern
- Application
- **Advantages:**
- **Disadvantages:**
- **Use:**



High-Powered Adaptive Valve Tray

- It is modification of valve tray
- It has more efficacy
- It has more contact area of liquid and gas
- Valve tray as one of the most important mass transfer and heat transfer equipment's for vapor–liquid is widely used in distillation, absorption and extraction units of petroleum, chemical industry



Comparison of Trays:

Tray type	Capacity	Efficacy	Pressure drop	Entrainment	turndown	cost
Bubble cap	Medium	medium	High	3times than Sieve tray	Excellent	100-200%more than sieve tray
valve	High	high	Medium	medium	4 to 10.1	20-50% more than sieve tray
sieve	High	high	medium	medium	2.1	Cheapest for all type

Advantages of tray column

- Capacity, efficiency, pressure drop is more than packed column
- Cost is less than packed column
- Maintains easier than packed column
- High liquid residence time

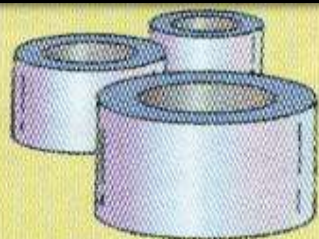
Packed Column

- Introduction
- Moc
- **Types of packing**
 - 1)Random Packing
 - 2)Structural Packing

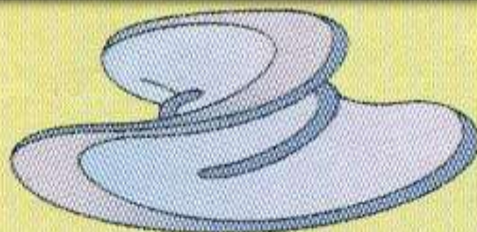
Packing Material

- **Ceramic:** superior wettability, corrosion resistance at elevated
1) Rasching rings, 2) intalox saddle 3) berl saddle,
- **Metal:** superior strength & good wettability & good wettability
1) intalix 2) pall rings 3) super rings 4) top pack
- **Plastic:** inexpensive, good strength but may have poor wettability at low liquid rate
 - e.g-1) High flow ring, 2) super intalox saddle 3) plastic hasckett

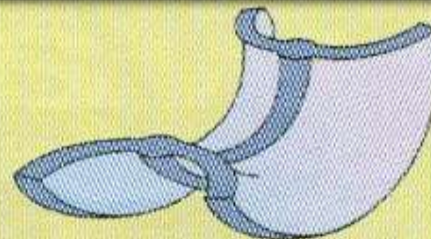
Packing Material



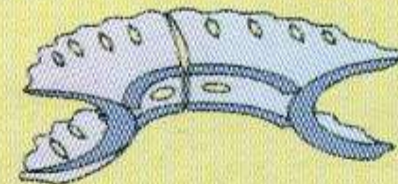
Ceramic Raschig rings



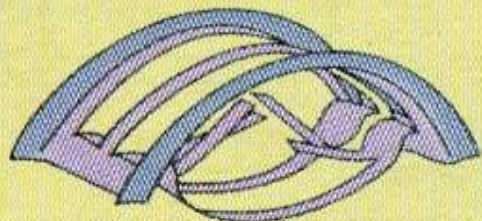
Ceramic Berl saddle



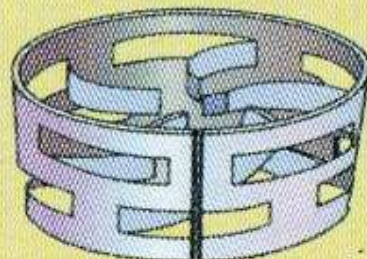
Ceramic Intalox saddle



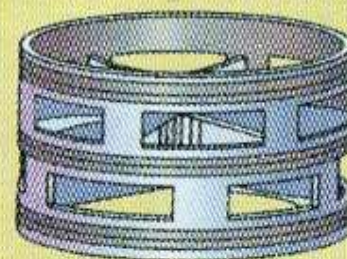
**Plastic super
Intalox saddle**



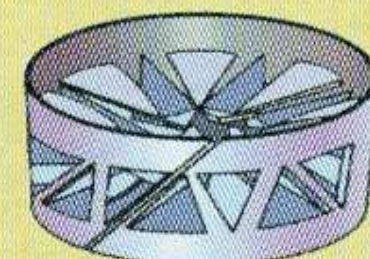
Metal Intalox IMTP



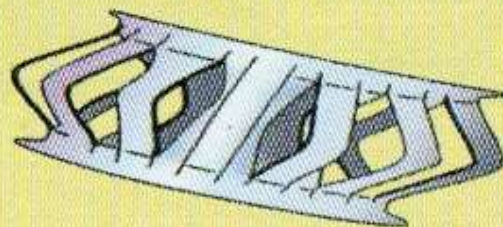
Metal Pall ring



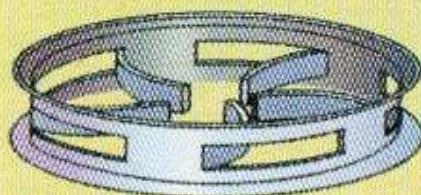
Plastic Flexiring



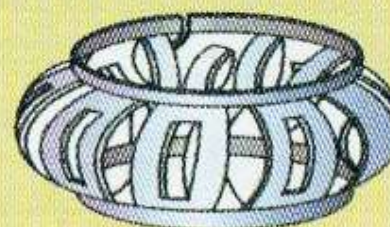
Plastic Blalock ring



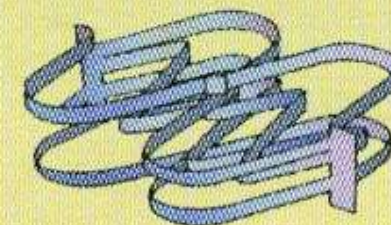
Metal Fleximax



**Metal Cascade
Mini-ring (CMR)**



Metal Top-pak



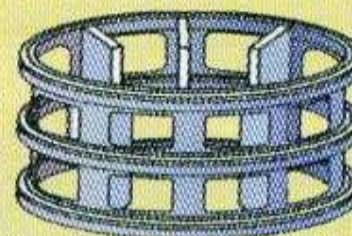
**Metal Raschig
Super-ring**



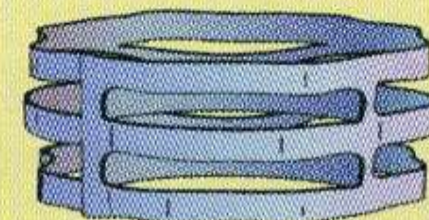
Plastic Tellerette



Plastic Hackett



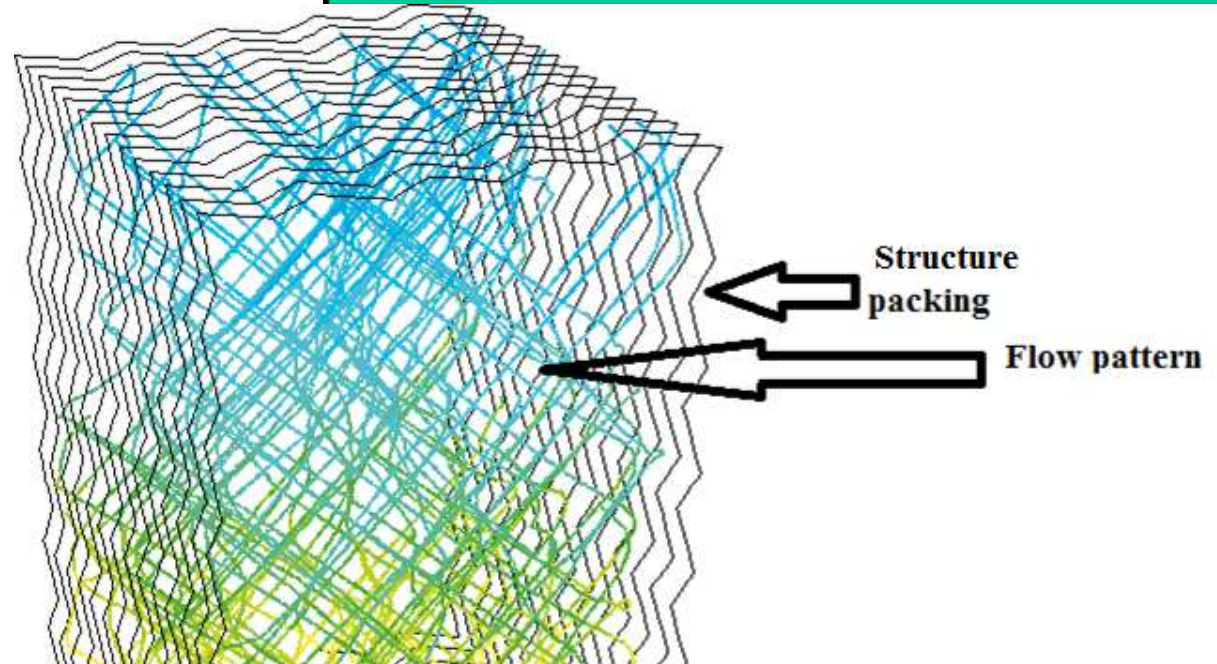
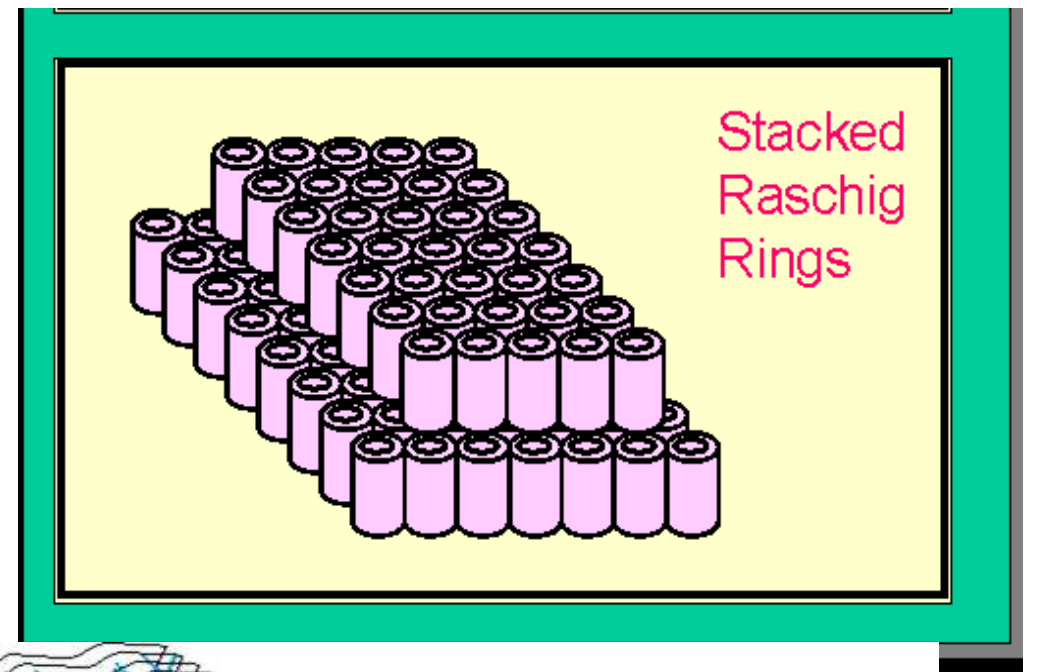
Plastic Hiflow ring



Metal VSP ring

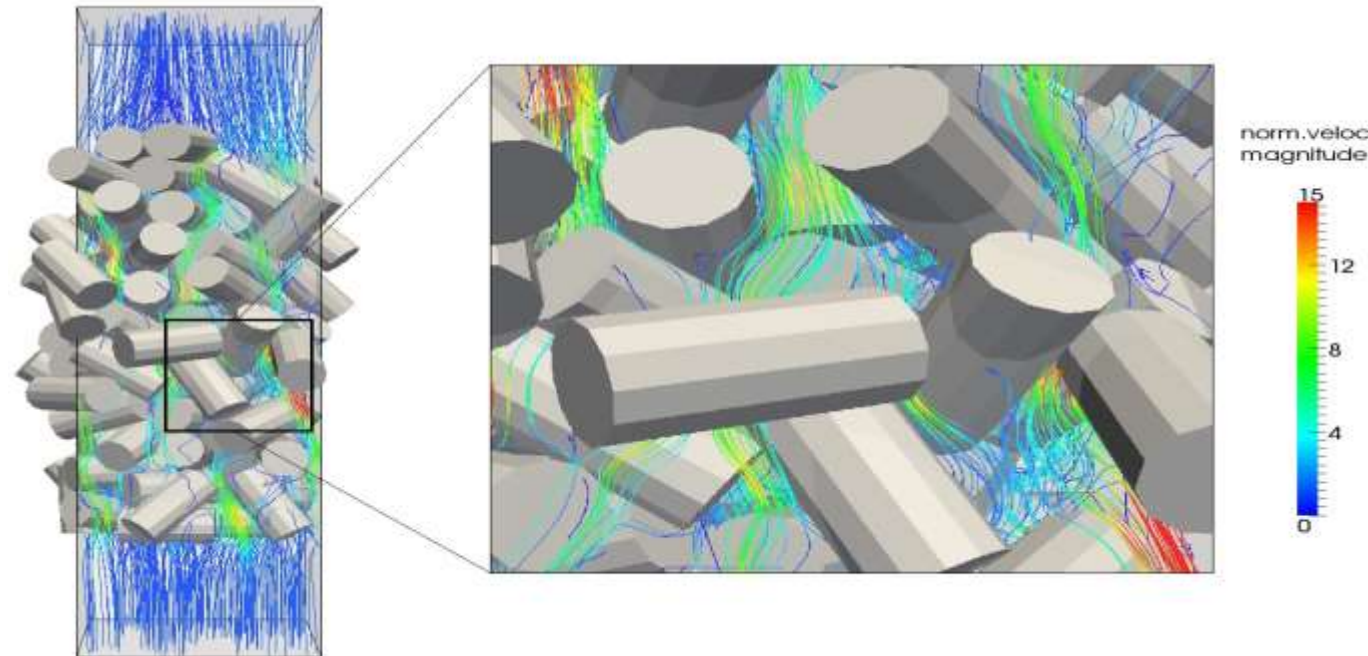
Structured packing:

- Construction
- Types of structured packing
 - 1) Mellapak
 - 2) Optiflow
- Moc
- Arrangement
- Flow pattern
- Application



Random packing

- Construction
- Types of structured packing
 - 1) High cap
 - 2) Wire mesh
 - 3) Lap pack
- Moc
- Arrangement
- Flow pattern
- Application



Comparison of random & structure packing

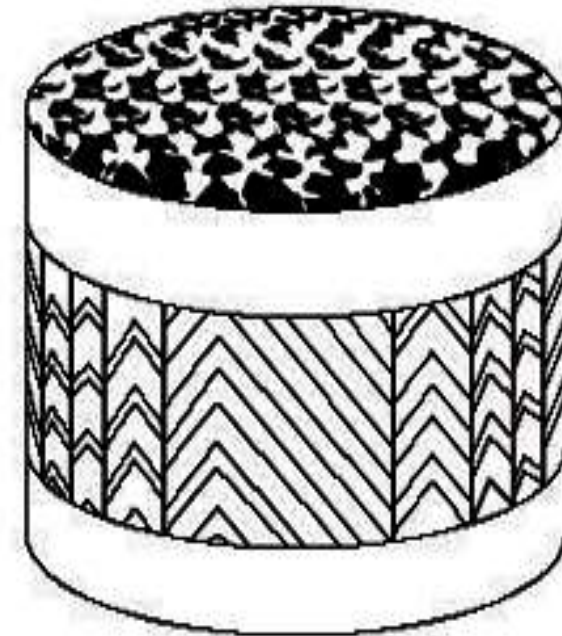
	Random packing		Structure packing
	Rasching ring and saddle	Through flow	
Relative cost	low	moderate	high
Pressure drop	moderate	low	high
efficiency	moderate	high	Very high
Vapour capacity	Fairly high	high	high
Typical turndown ratio	2	2	2

New Generation of Packing Material in Structural packing

- Mellapak
- Optiflow
- Mellapak plus

□ Mellapak

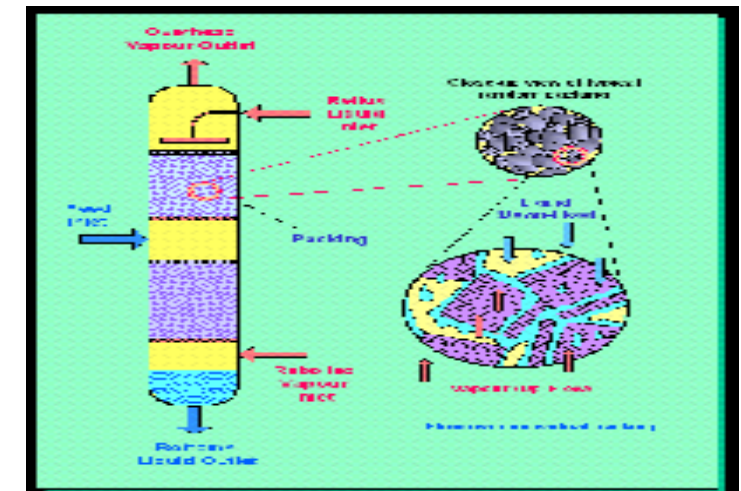
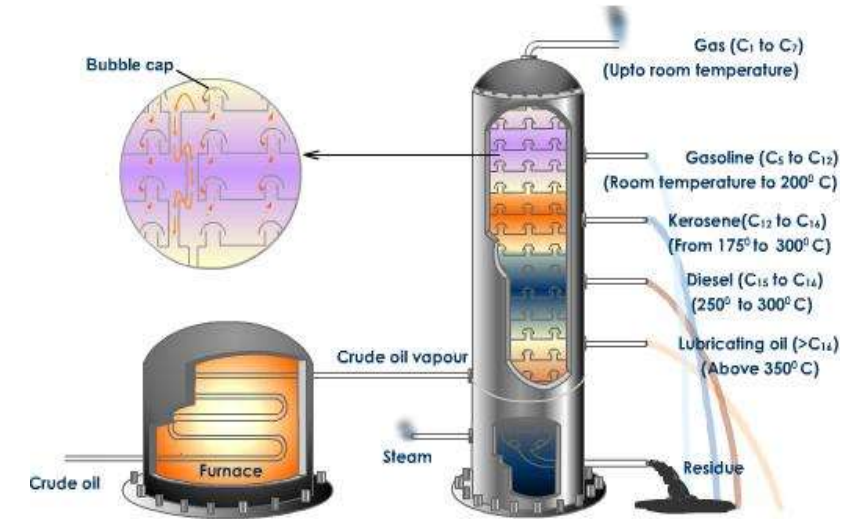
- Arrangement
- Flow pattern
- Application
- Efficacy



Mellapak

Comparison of Tray and packed column

	Tray column	Packed column
Area required	More	Less
Pressure drop	More	Less
Maintains	Easy	Difficult
Mass transfer area	Less	More



Conclusion

- A bubble cap tray use to a in industry more than sieve tray, valve tray
- A packed column is more expensive than tray column

Reference

- Robert E. Treybal”,Mass Transfer operations", distillation, Gas absorption, 1992 p.275,342.
- Henry Z.Kister”,distillation design p 833,1980
- K. Hartmann, V. Kiselev (1998) New Highspeed Fractionation Trays For Mass- Transfer Columns, AIChE Annual Meeting, Miami Beach, FL, November 15-20, 1998, Session ”Advances in Distillation Hardware”, Paper 134d

Thank you ...

