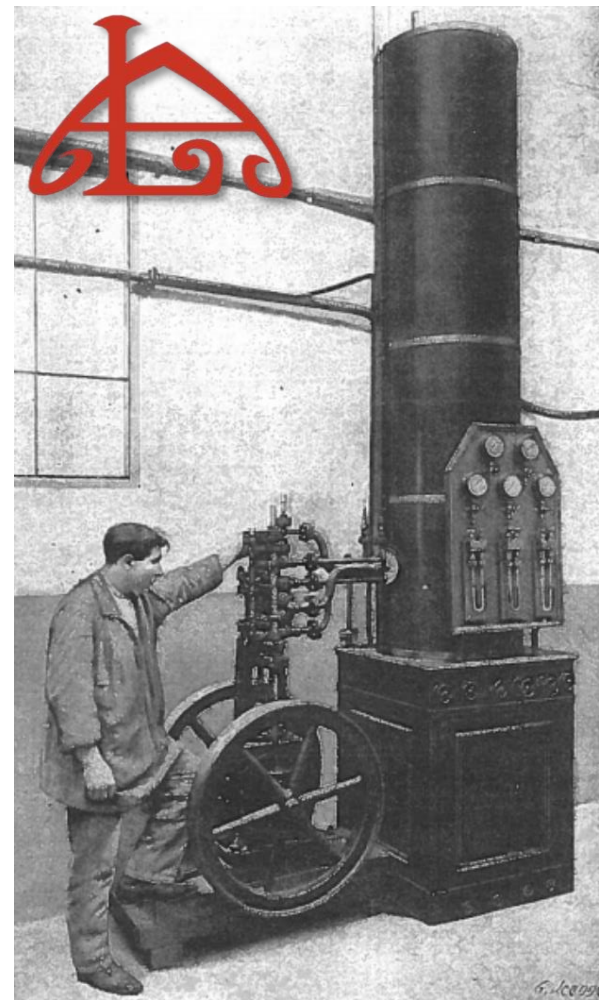
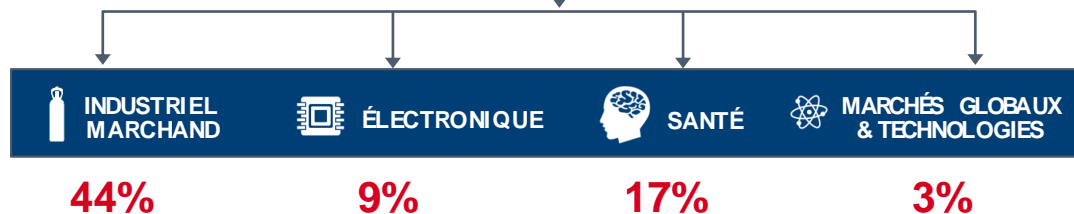
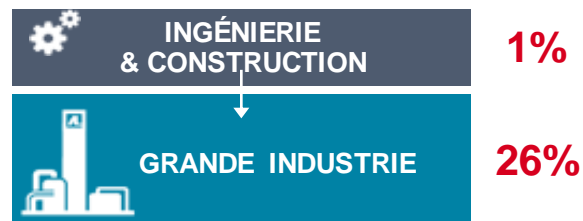




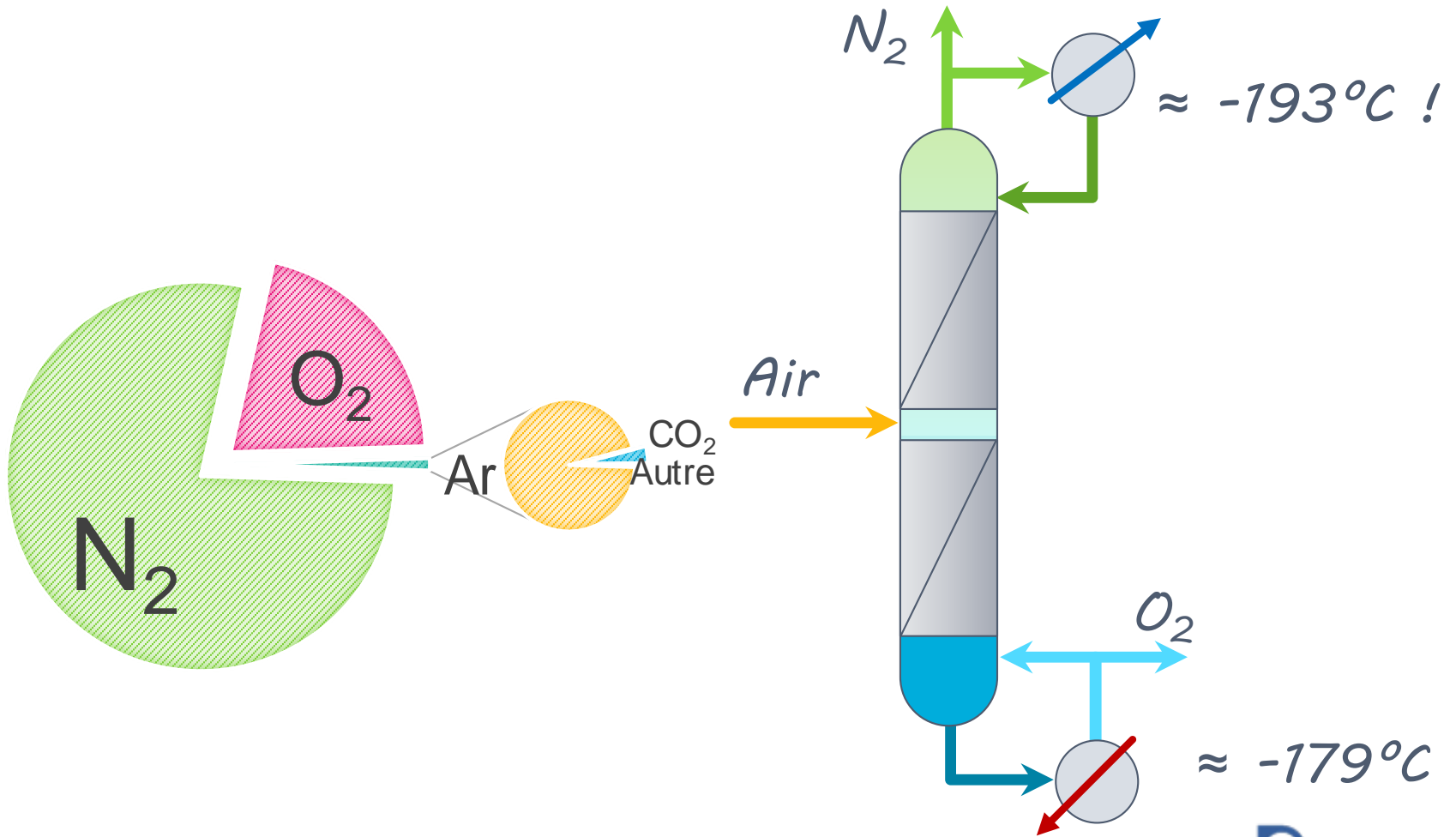
Le garnissage structuré
en distillation :
incontournable et
incompris

18/03/2021

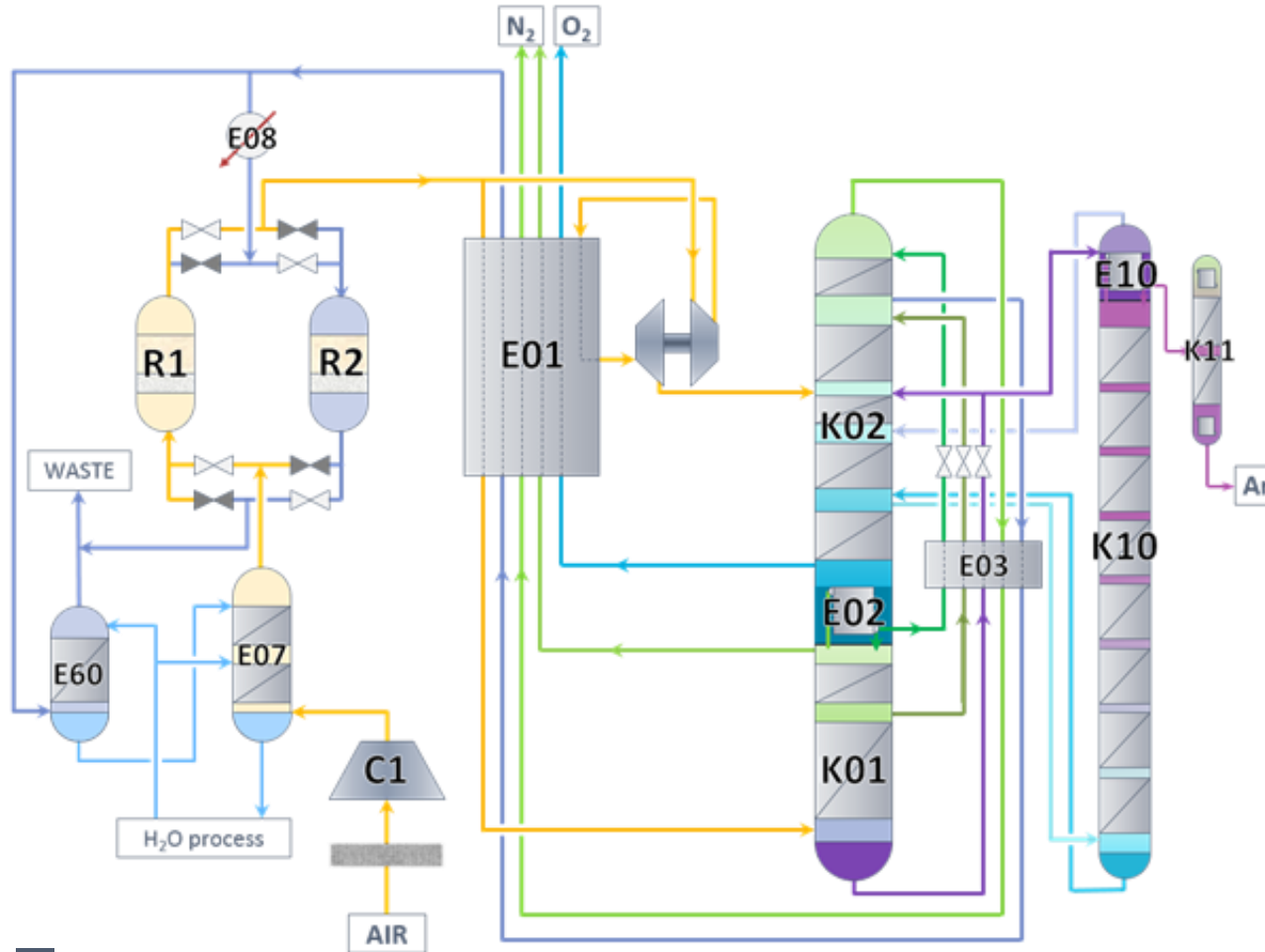
Mikaël Wattiau | R&D



Fondamentaux



Distillation des gaz de l'air



Efficiency x 2.5

0.75 à 0.3 kWh/Nm³O₂

Productivity x 100

2 à 200 tpd O₂ / m²

Multi-products

N₂, Ar, rare gases

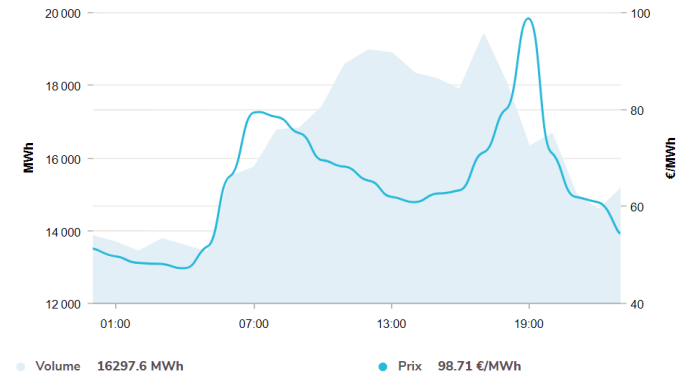
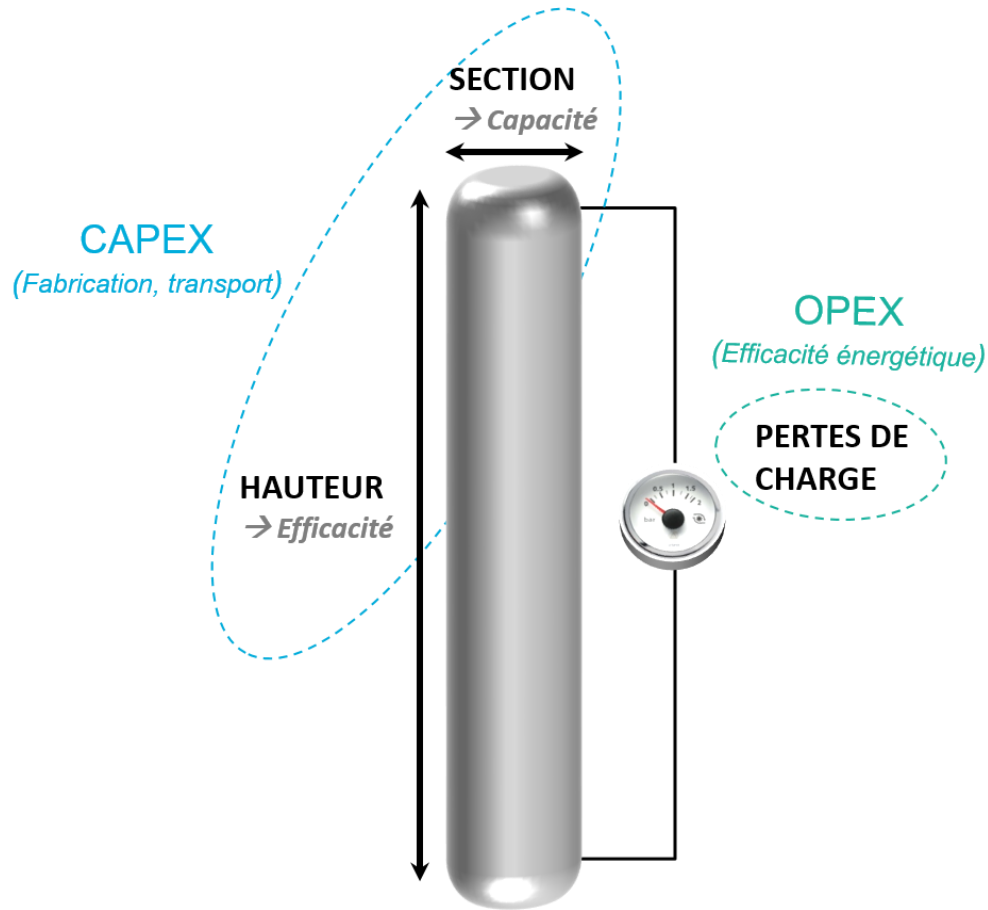
Multi-types

Purity, Pressure,
Gas/Liquid



× 400

Enjeux colonne



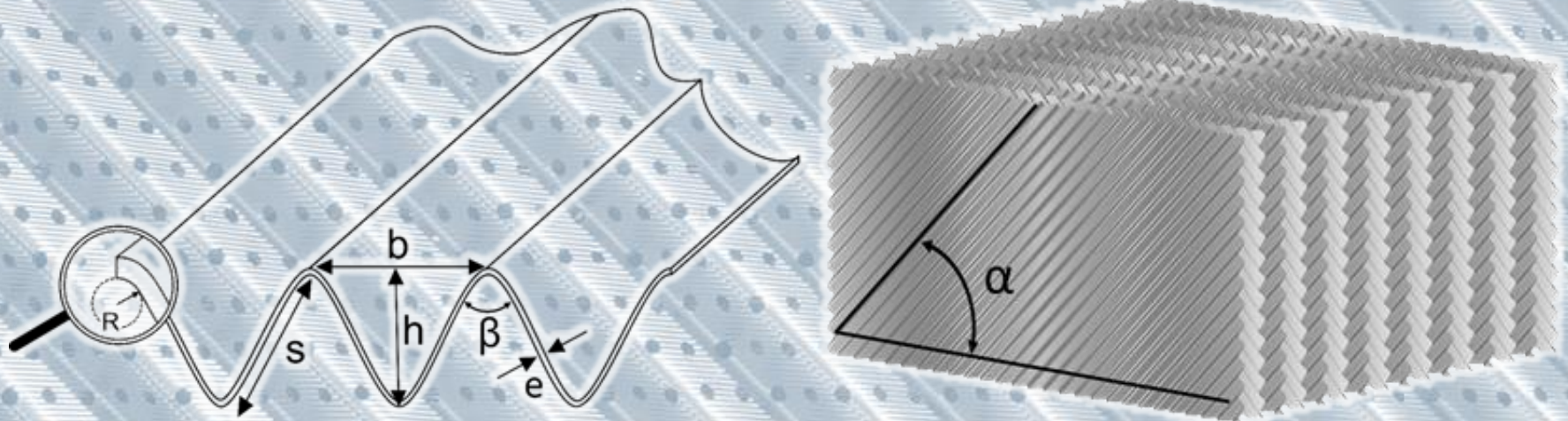
3 types of contactors



Characteristic	Unit	Trays	Random packing	Structured packing
Capacity				
F-factor	$Pa^{0.5}$	0.3-2.4	0.3-2.9	0.1-4.4
C-factor	m/s	0.009-0.075	0.009-0.09	0.003-0.14
Pressure drop / theor. stage				
$\Delta P/NTP$	$mbar$	4-11	1.2-2.4	0.01-1.1
Mass-transfer efficiency				
HETP	cm	60-120	45-150	10-76

Chen, G. K. (1984). Packed column internals. *Chemical engineering (New York, NY)*, 91(5), 40-51.

Structured packing



2 key parameters:

- Specific area a_p (m^2/m^3) 125-750 m^2/m^3 to 64-1600 m^2/m^3
- Canal angle α ($^\circ$) 45 or 60 $^\circ$ resp. Y-type or X-type

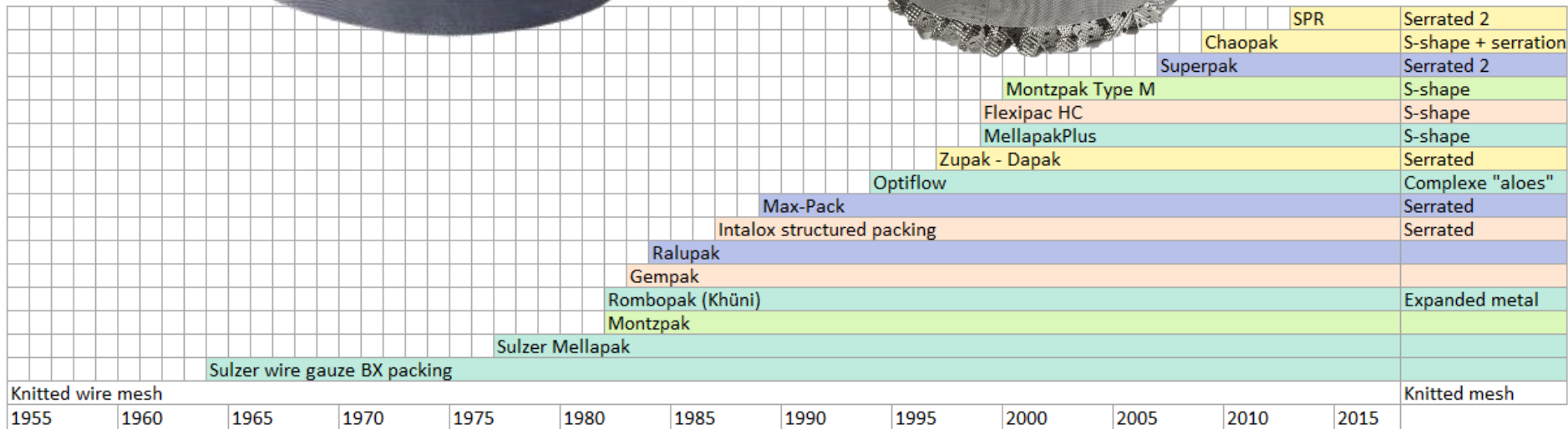
Structured packing



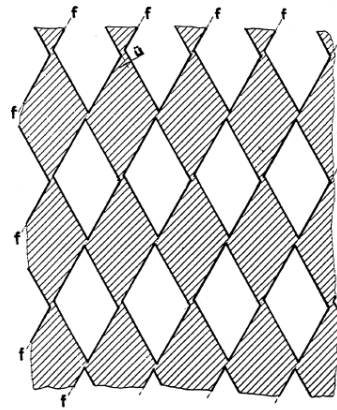
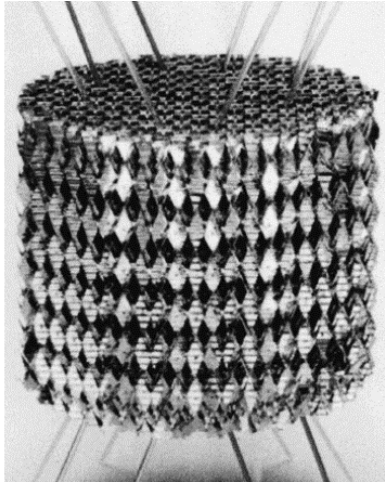
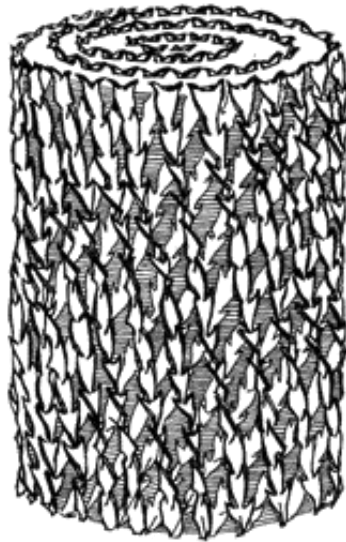
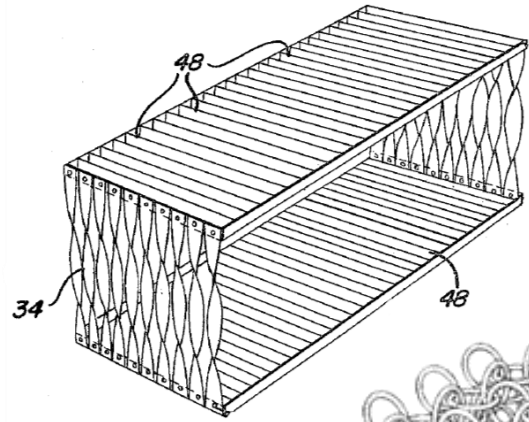
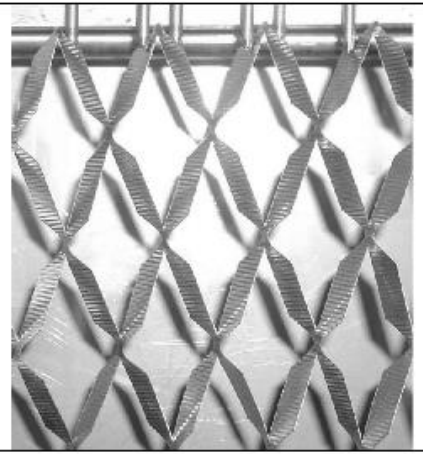
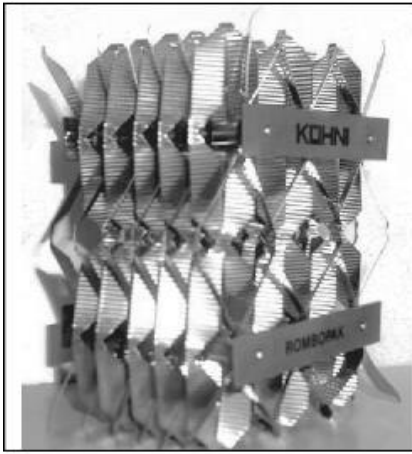
Sulzer BX



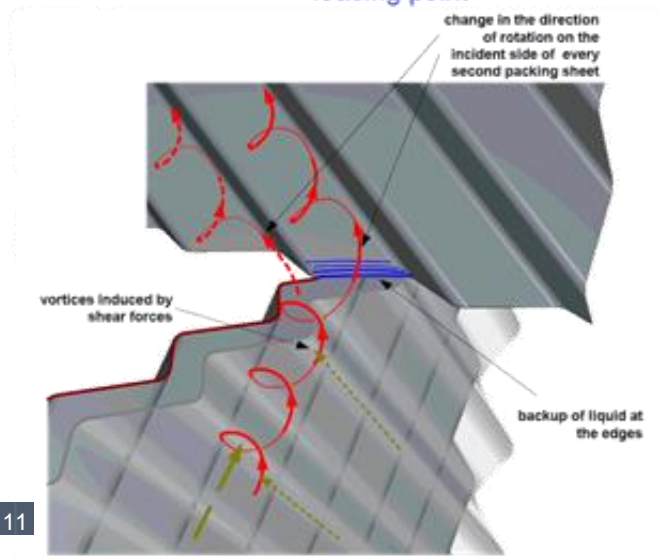
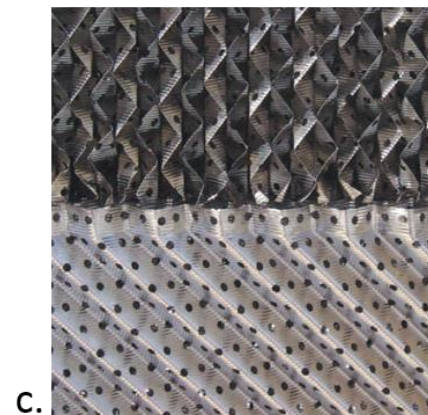
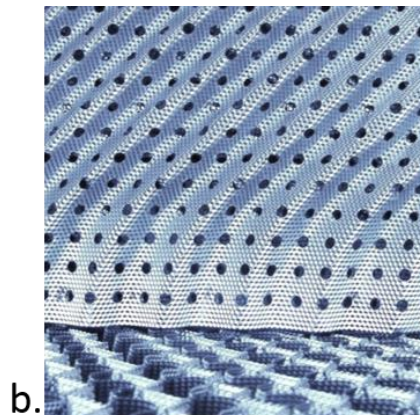
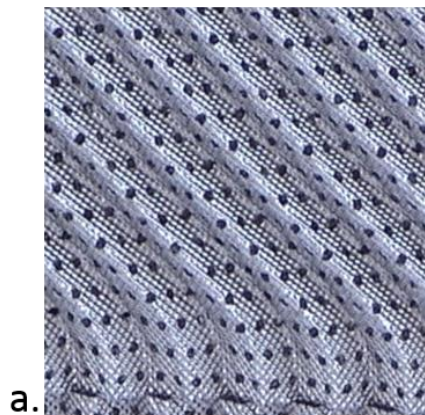
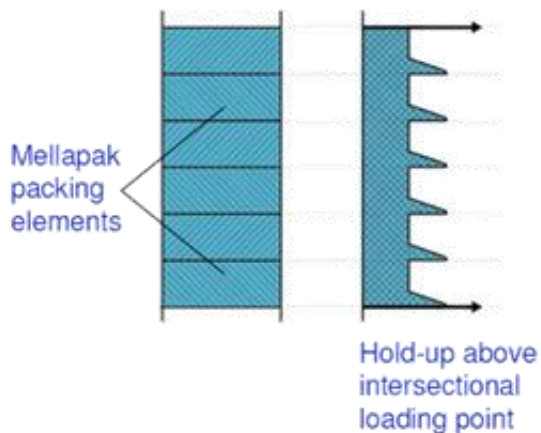
Sulzer Mellapak



Sulzer
Montz
Koch-Glitsch
Raschig
Chinese

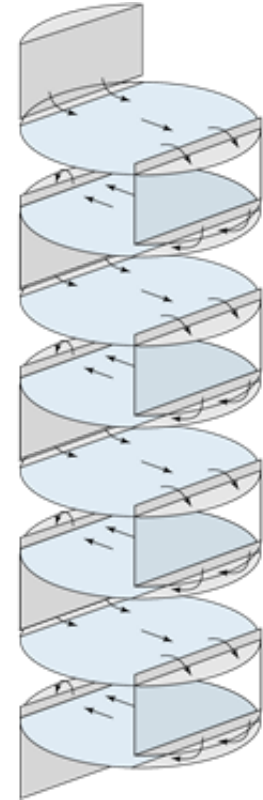
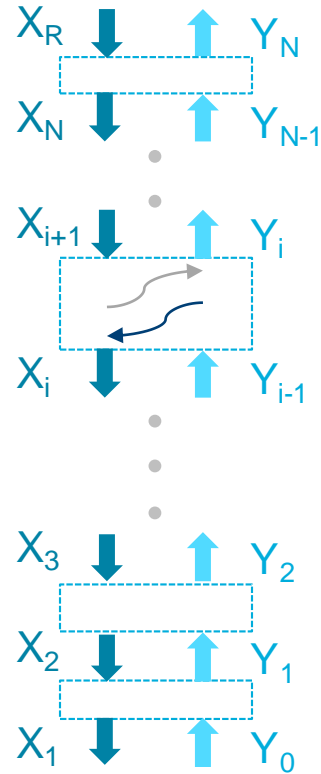
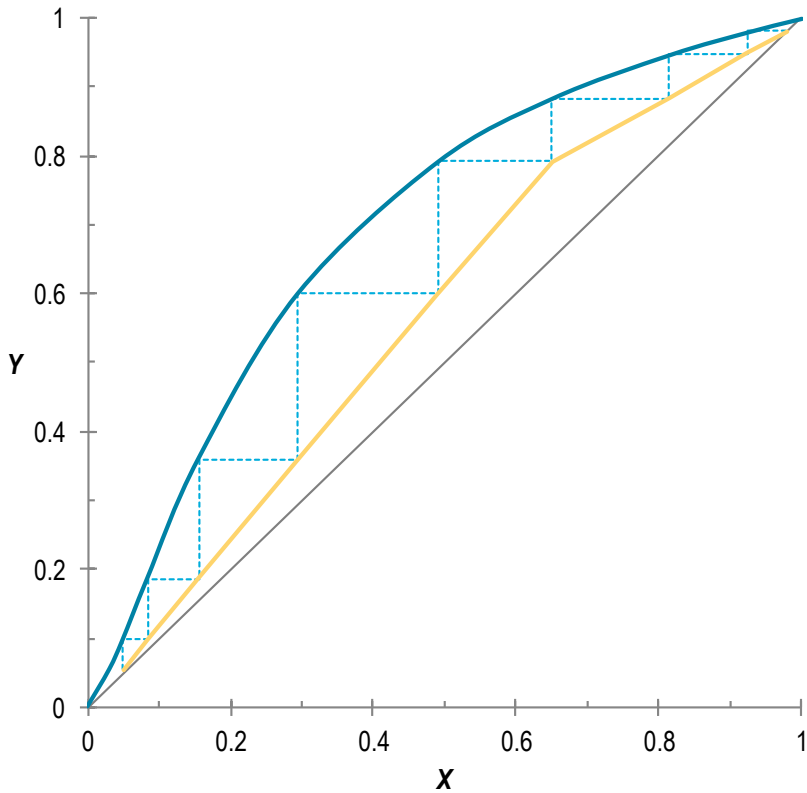


Interfaces modification

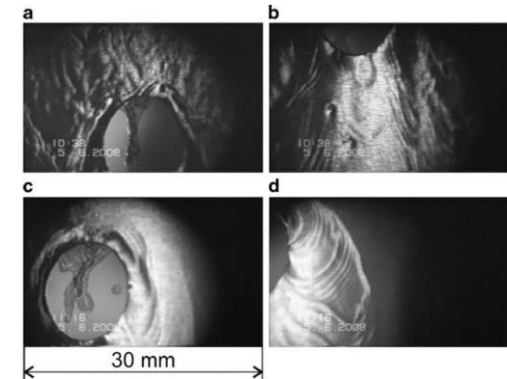
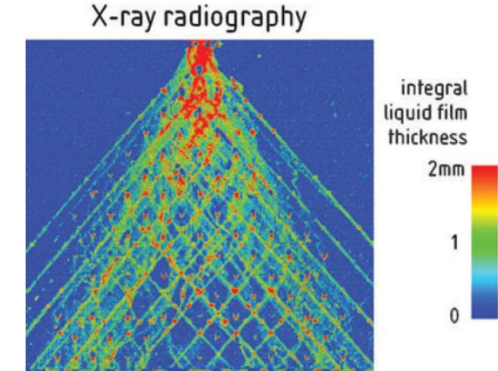
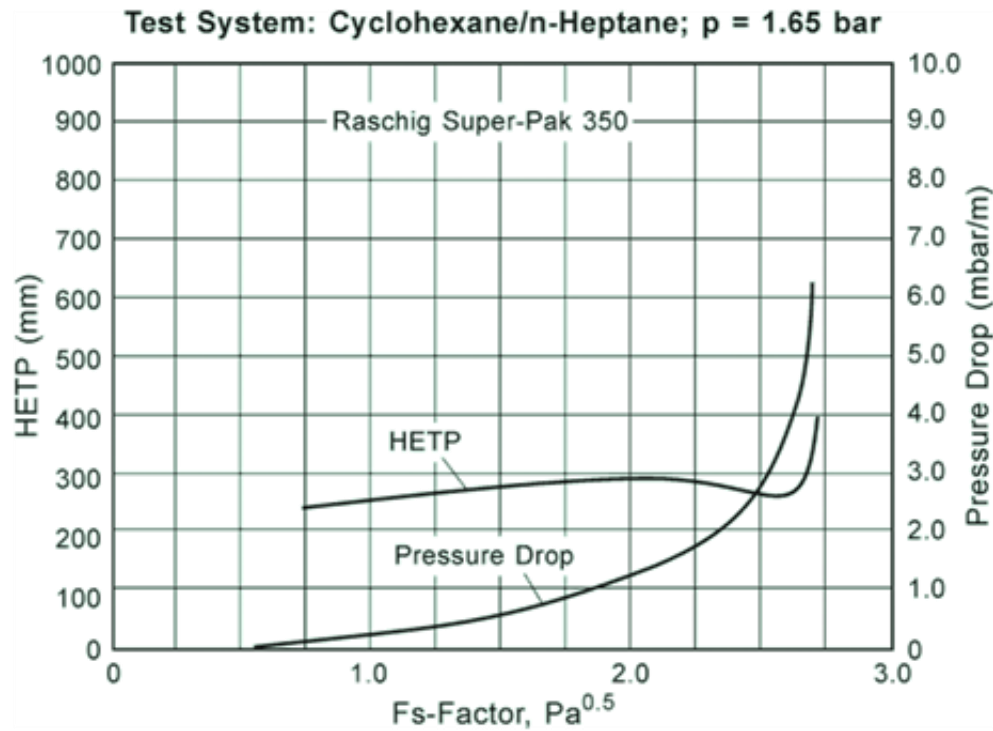


+20-40% capacity with constant efficiency !

Dimensionnement

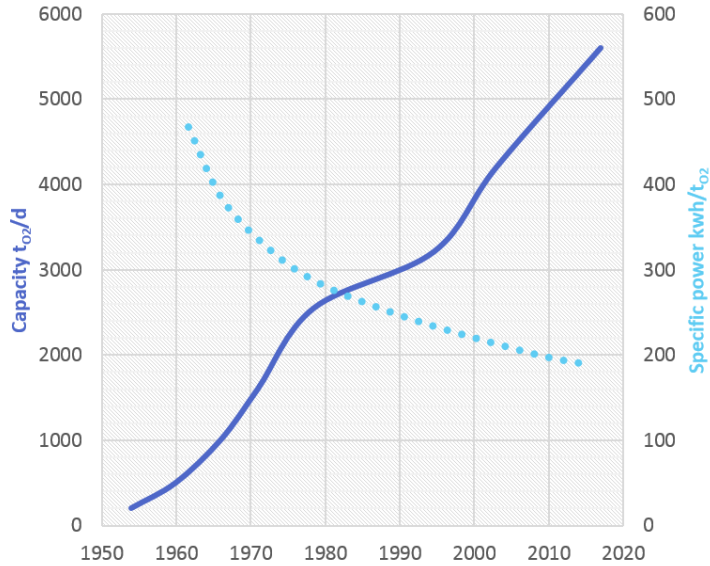


Evaluation des performances



$$\text{HETP} \left(\approx HTU \frac{\ln \lambda}{\lambda - 1} \right) \rightarrow \text{efficacité}$$

Structured packing industrialisation



Ø 2 – 6 m

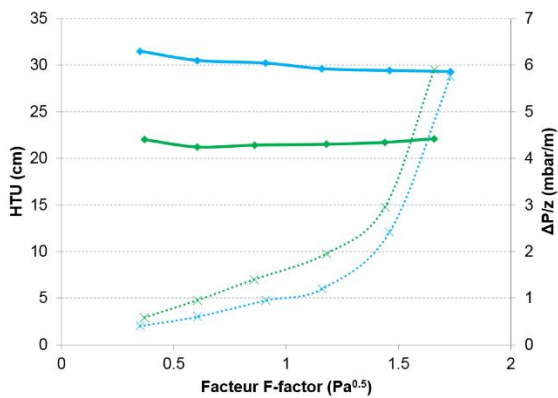
Ø 400 mm

Ø 100 mm



Nouvelles technologies

	BX-500	Equivalent SiC foam
Porosity ϵ	90%	85%
Specific area a	504 m ² /m ³	433 m ² /m ³
Corrugation angle α	60°	60°
Plate thickness e	0.15 mm	1 mm
Corrugation base b	10.2 mm	10.2 mm
Corrugation height h	6.3 mm	6.6 mm
Folding angle	78°	89°



—●— HTU BX-500 —●— HTU eq SiC foam
- - - x - - - ΔP/z BX-500 - - - x - - - ΔP/z eq SiC foam

