

Membrane Technology for
solid/liquid and **liquid/liquid** separation

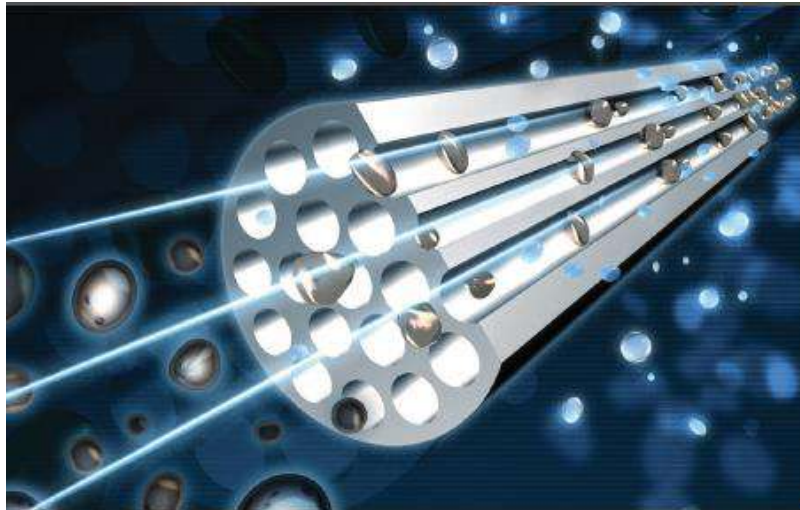


2025 Symposium 13 & 14 May 2025

More for less: Enhancing Value and Efficiency in Dairy

"Value Engineering by applying Membrane Technologies"

Carsten Orzol / CEO



MEMCON Total Process Solution® (MTPS®) provides customised membrane technology solutions for *liquid-liquid* and *liquid-solid* separation.

The **MEMCON** membrane systems can mechanically separate any kind of liquid into valuable and unwanted substances at the client's production process.

MEMCON's comprehensive laboratory and pilot plant equipment are used to assist in feasibility studies and project costing forecasts.



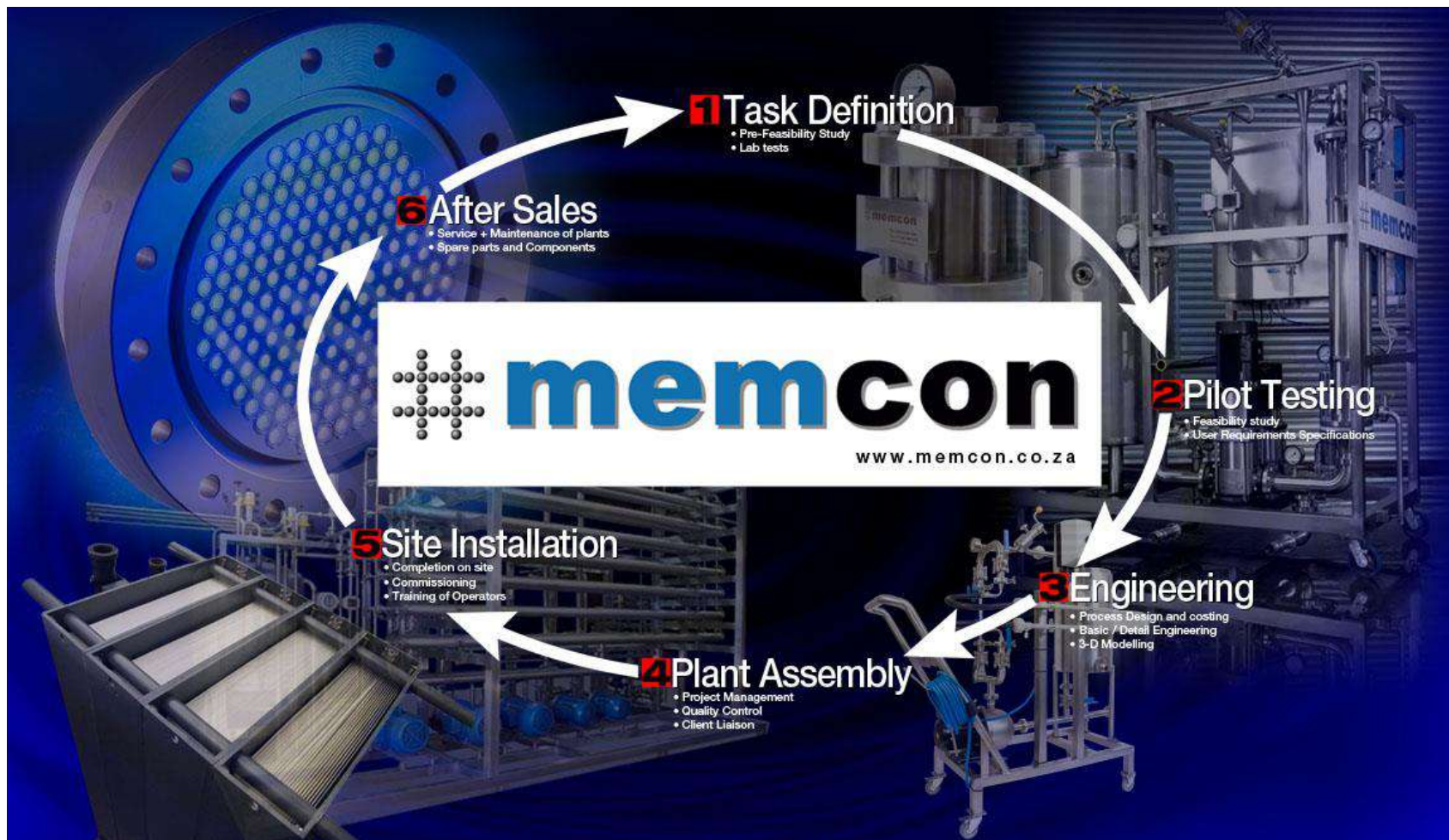
Customer Benefits:

Legal environmental compliance with reduced operational expenditure by designing a technical solution that **guarantees** compliance with environmental legislation (Local and International).

Reduced total cost of process operation (lowering operational expenses, recovering valuable substances back to process, i.e. fresh water).

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Application Examples 1

Dairy Waste Water recycling



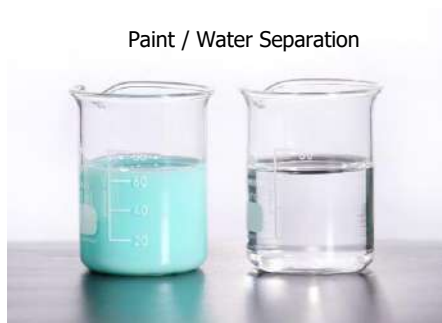
Dissolved Metals / Acid Separation



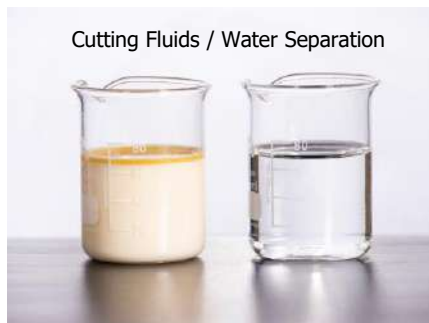
Precipitated Base Metals / Acid Separation



Paint / Water Separation



Cutting Fluids / Water Separation

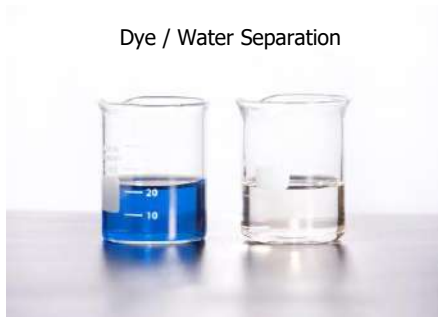


Milk solids / Water Separation



Application Examples 2

Dye / Water Separation



Tannery Waste Water Treatment



Oily Waste Water Treatment



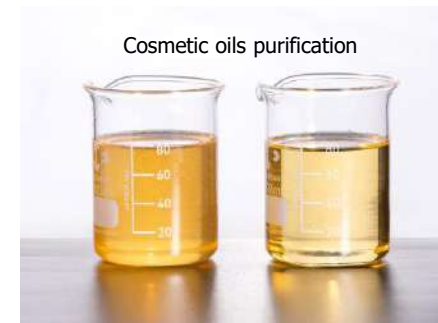
Landfill Leachate Treatment

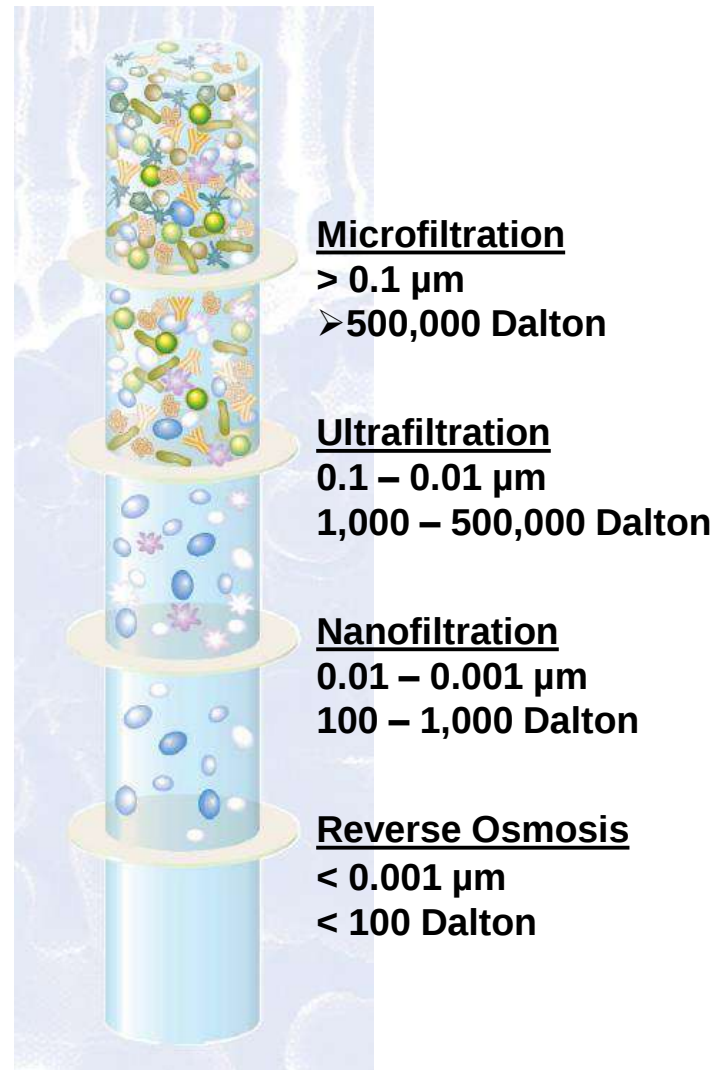
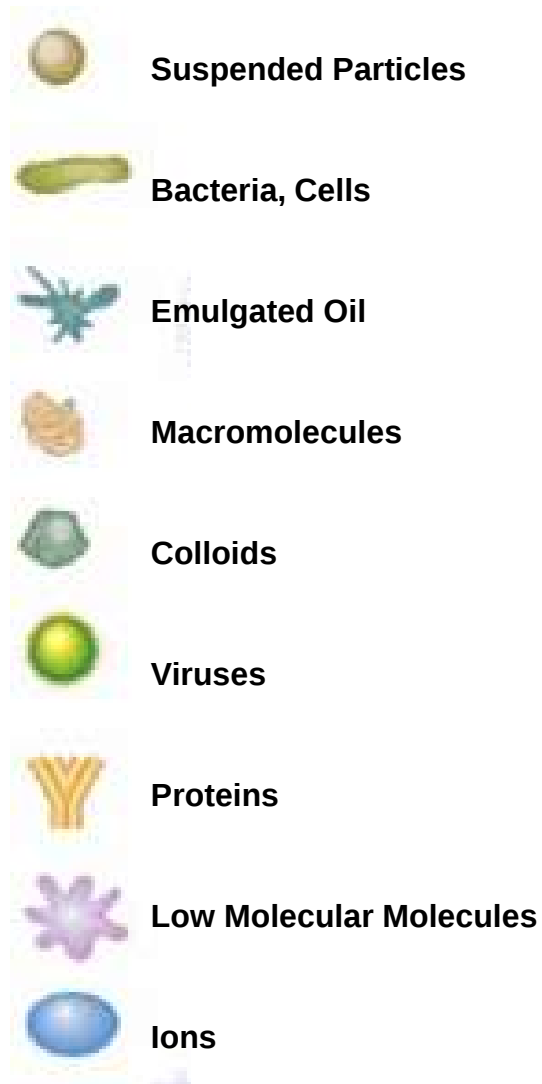


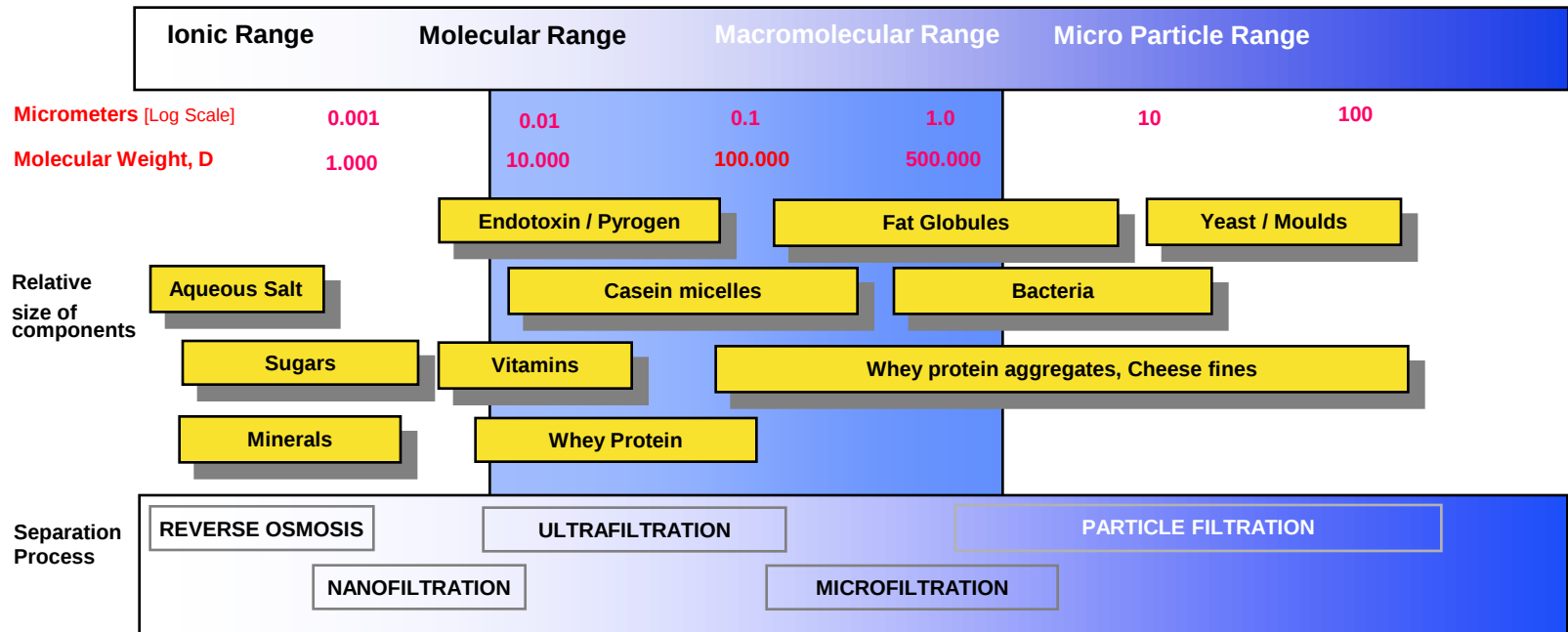
Precipitated Precious Metals/Acid Separation



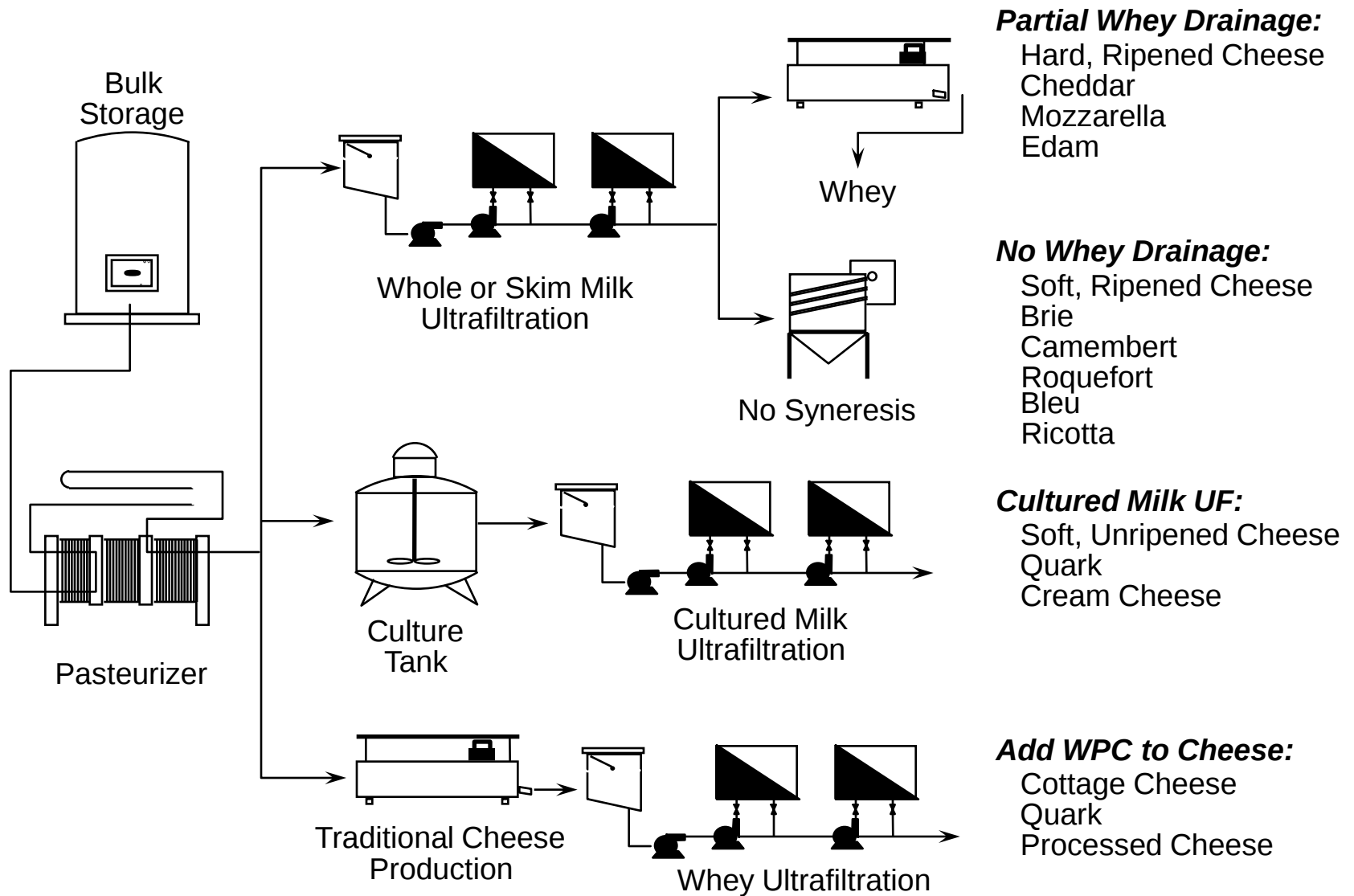
Cosmetic oils purification





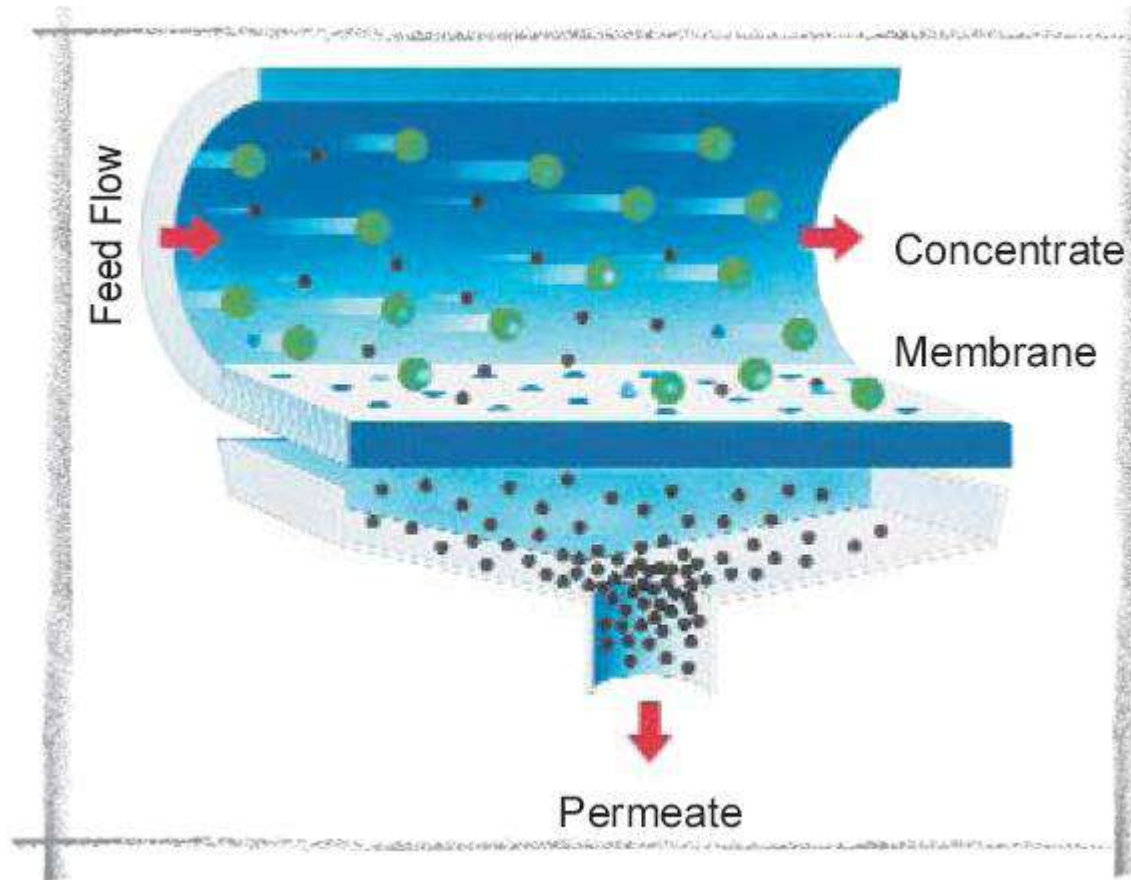


Cheese Making Options with Membrane Technology

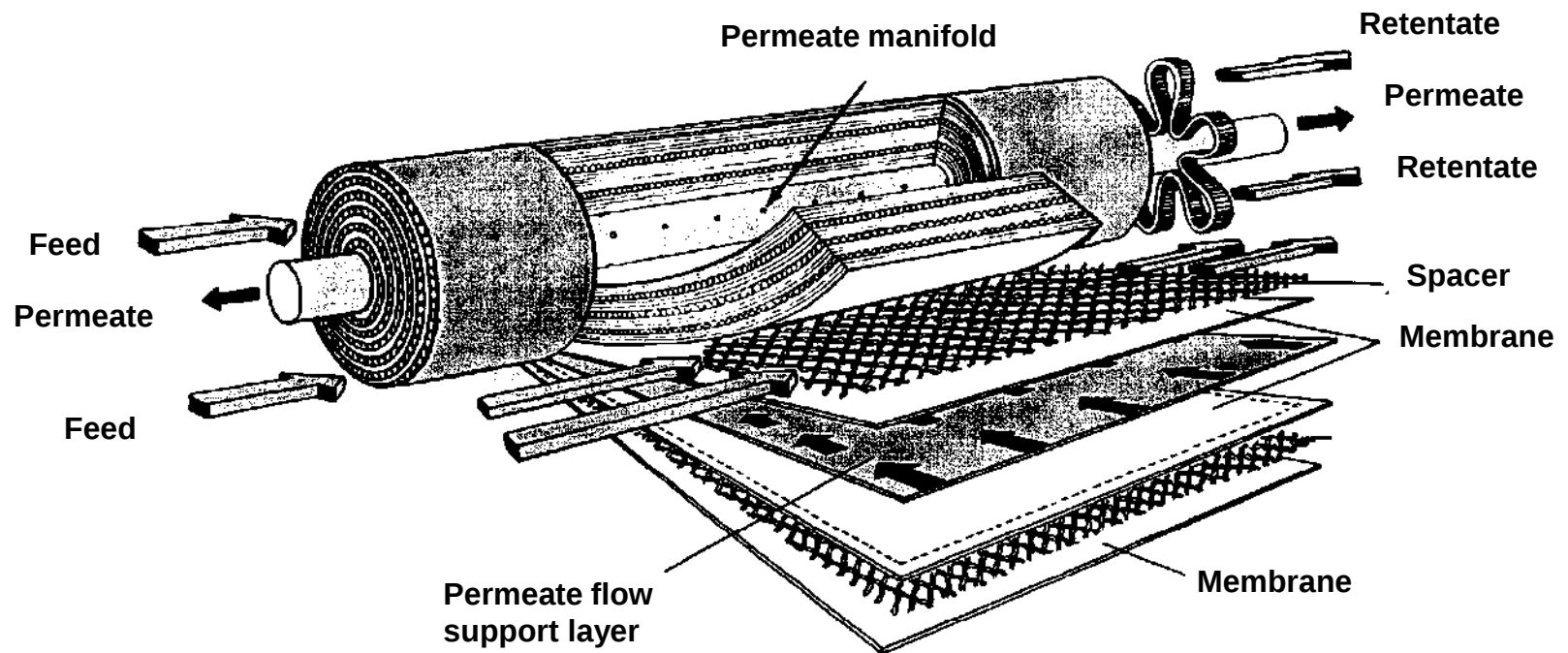


Membrane Modules

Crossflow Filtration Principle



Spiral Membrane Module



Stainless Steel Pressure Vessels for Spiral Membrane Modules

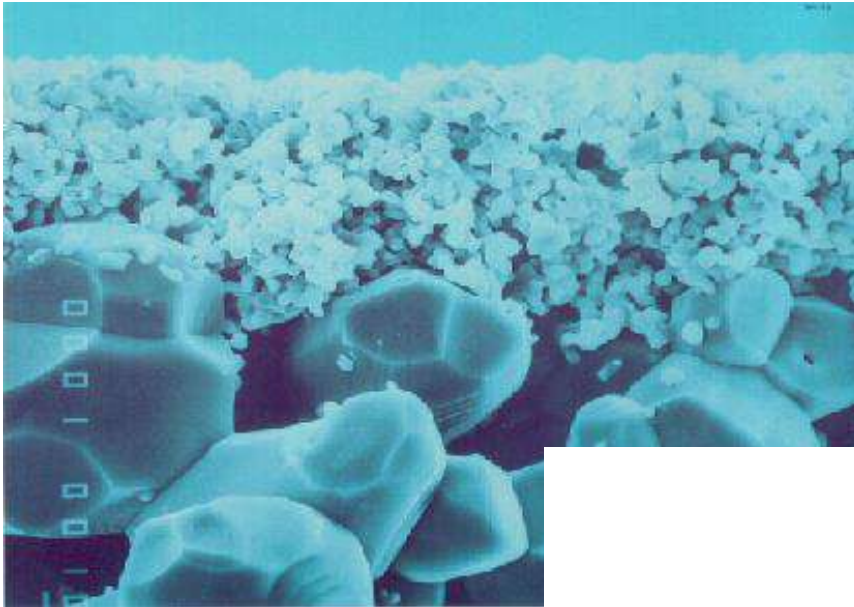


Polymeric Membrane Selectivities

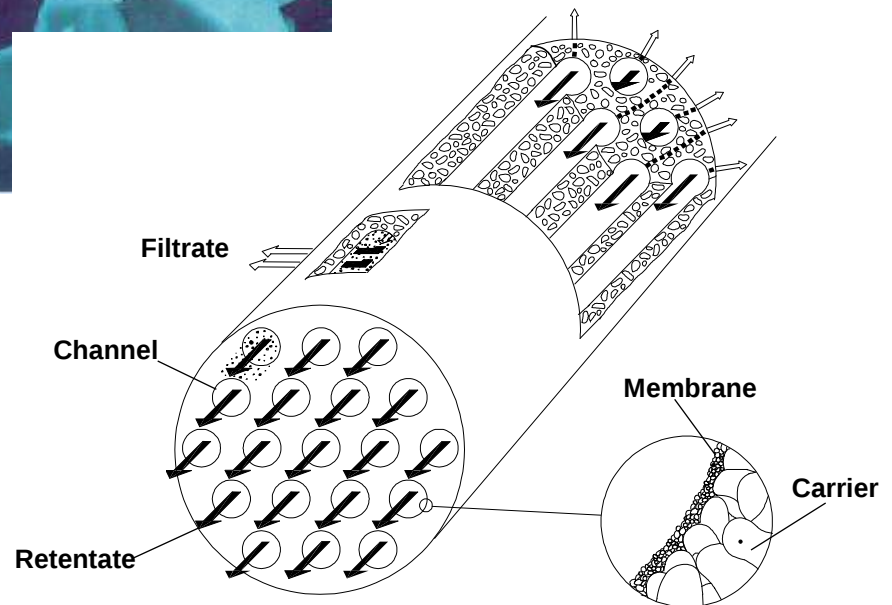
Name	Material	MWCO
		[kDalton]
UF-PES-004H	Poly (ether) sulfone	4
P005F	Poly (ether) sulfone	5
P010F	Poly (ether) sulfone	10
P020F	Poly (ether) sulfone	20
UF-PES-030H	Poly (ether) sulfone	30
UF-PES-050H	Poly (ether) sulfone	50
UF-PS-100H	Poly (ether) sulfone	100
P150F	Poly (ether) sulfone	150
C005F	Cellulose	5
C010F	Cellulose	10
C030F	Cellulose	30
C100F	Cellulose	100
NF-PES.10	Poly (ether) sulfone	NF
N030F	Poly (ether) sulfone	NF



Ceramic Membranes

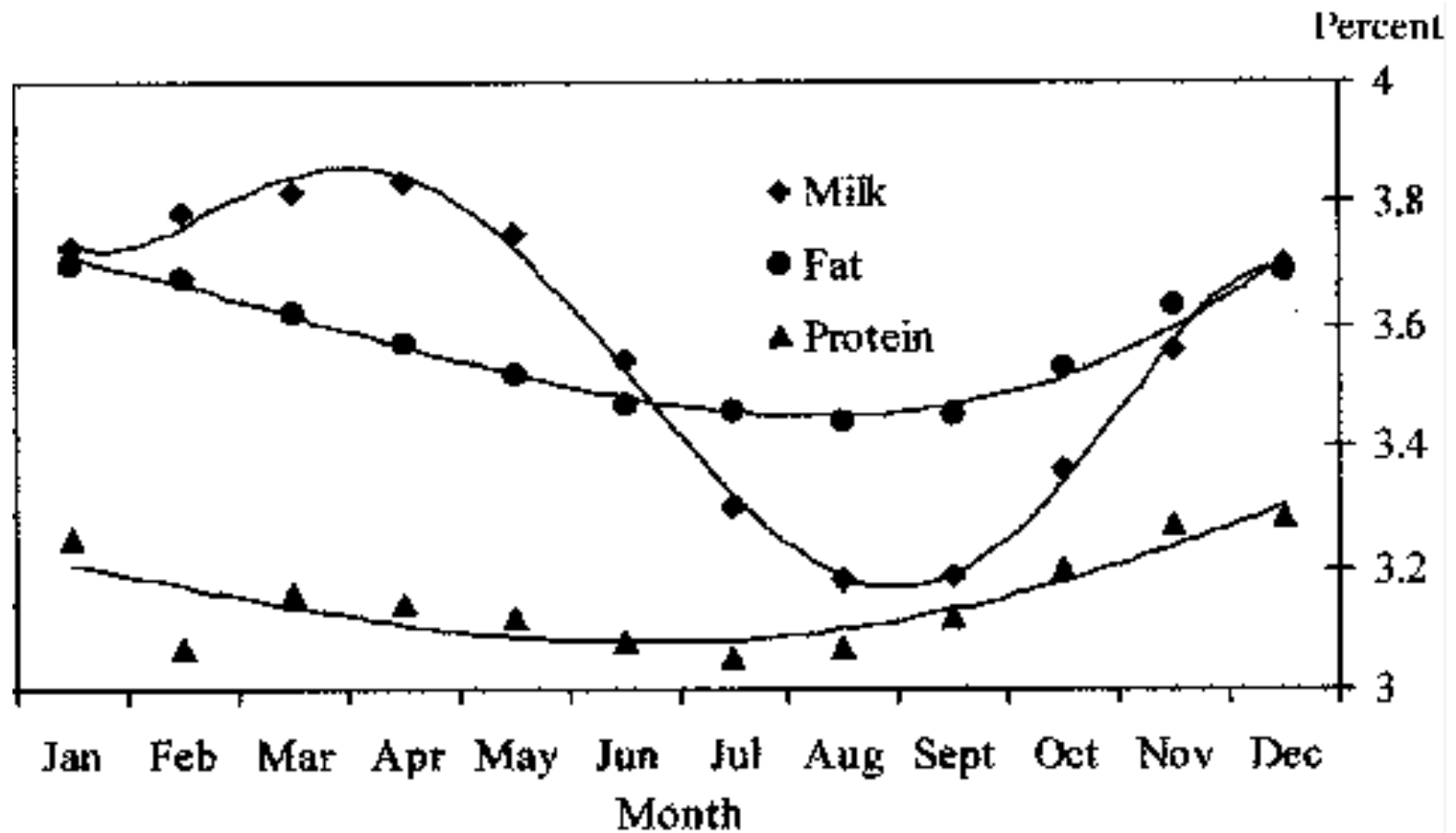


- 2.0 – 8.0 mm channel ID
- ceramic material Al_2O_3 , Zr_2 , TiO_2
- Selectivity $0.001\ \mu\text{m}$ to $3.0\ \mu\text{m}$

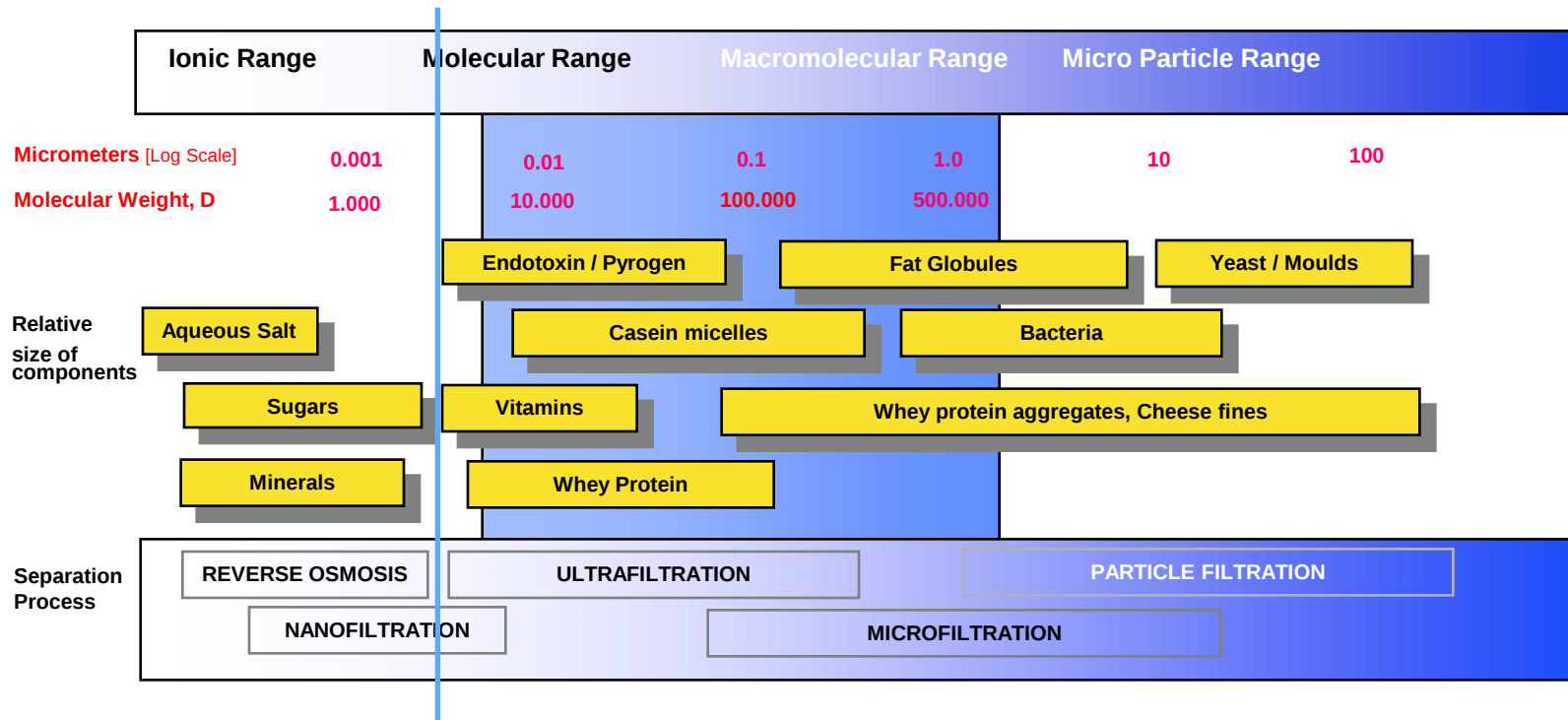


1– Cheese Milk Protein Standardization

Cheese Milk Protein Standardization



Cheese Milk Protein Standardization



Example:

	Flow Rate	app. TDS
Feed	35 000 kg/h	12.5 %
Permeate	8 000 kg/h	5.8 %
Retentate	27 000 kg/h	14.5 %

The aim is to standardise Protein to 4.2 %. At the minimum possible Protein concentration in the untreated milk of 3.4 % a Permeate volume of app. 7 000 kg/h has to get removed from the feed flow of 35 000 kg/h (at protein rejection of 100 %).

UF Plant for Protein standardization of Cheese Milk



2 – Whey Protein Recovery

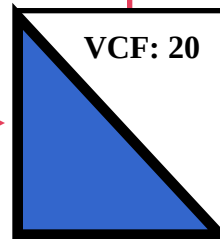
Mass balance

Sweet Whey Ultrafiltration

Feed

DM:	6,20 %
Protein:	0,60 %
NPN:	0,20 %
Lactose:	4,80 %
Ash:	0,55 %
Fat:	0,05 %

60 m³/h



57 m³/h

Permeate

DM:	5,50 %
Protein:	0,03 %
NPN:	0,17 %
Lactose:	4,70 %
Ash:	0,51 %
Fat:	0,00 %

3 m³/h

Concentrate WPC 60

DM:	19,70 %
Protein:	11,10 %
NPN:	0,57 %
Lactose:	5,80 %
Ash:	1,10 %
Fat:	1,00 %

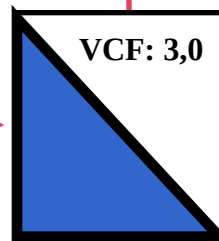
Mass balance

Sweet Whey Nanofiltration

Feed

DM:	6,20 %
Protein:	0,60 %
NPN:	0,20 %
Lactose:	4,80 %
Ash:	0,55 %
Fat:	0,05 %

60 m³/h



40,5 m³/h

Permeate

DM:	0,63 %
Protein:	0,00 %
NPN:	0,11 %
Lactose:	0,14 %
Ash:	0,38 %
Fat:	0,00 %

19,5 m³/h

Concentrate

DM:	17,20 %
Protein:	1,84 %
NPN:	0,37 %
Lactose:	14,44 %
Ash:	0,91 %
Fat:	0,15 %

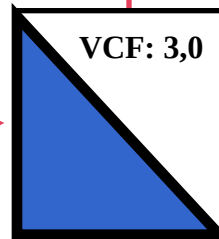
Mass balance

Sweet Whey Reverse Osmosis

Feed

TS:	6,20 %
Protein:	0,60 %
NPN:	0,20 %
Lactose:	4,80 %
Ash:	0,55 %
Fat:	0,05 %

60 m³/h



40 m³/h

Permeate

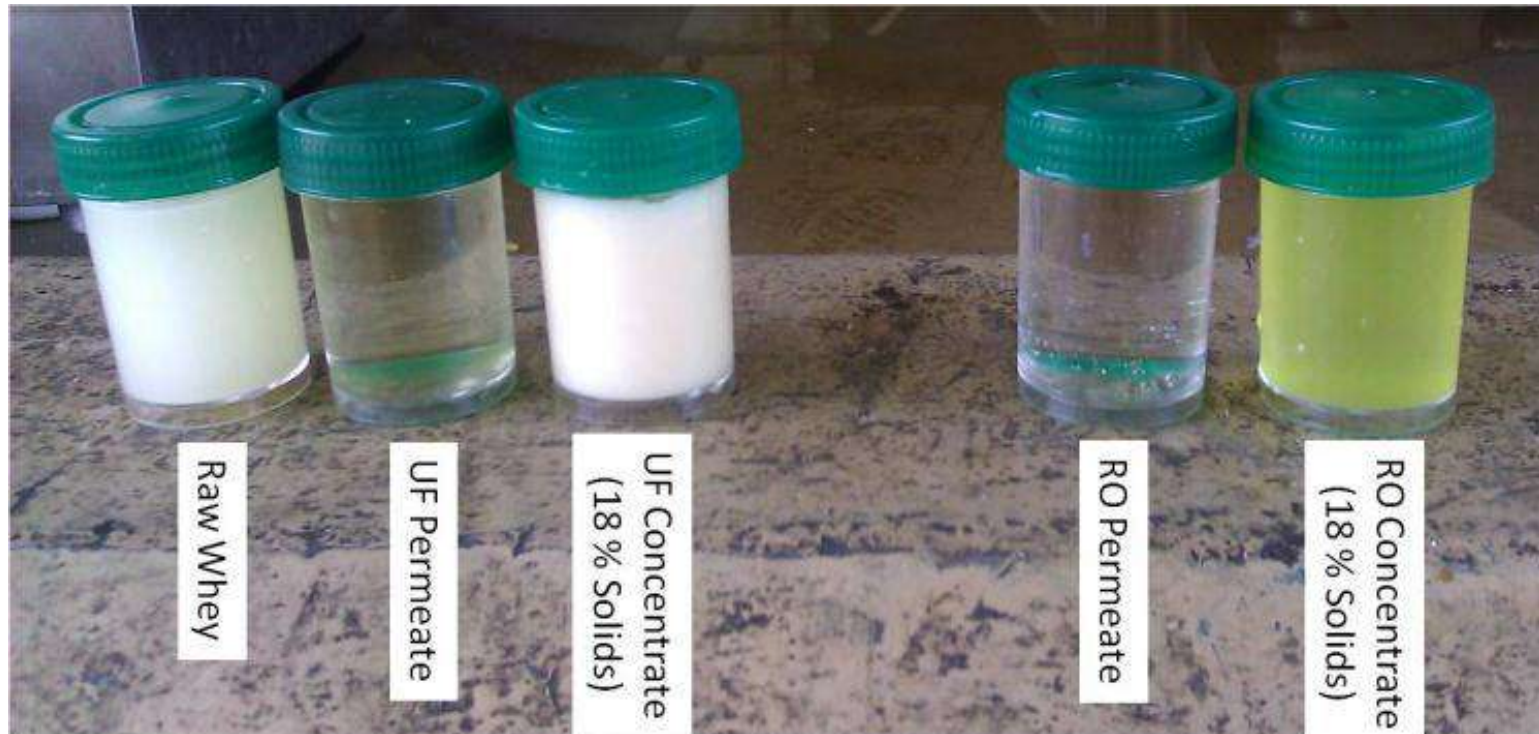
DM:	0,07 %
Protein:	0,00 %
NPN:	0,00 %
Lactose:	0,04 %
Ash:	0,02 %
Fat:	0,00 %

20 m³/h

Concentrate

TS:	18,50 %
Protein:	1,80 %
NPN:	0,58 %
Lactose:	14,33 %
Ash:	1,61 %
Fat:	0,15 %

Whey Protein Recovery



Recovery of Protein + Lactose from cheese whey

Whey Protein Recovery RO plant (35 t/hour)



3 – CIP Caustic Recycling

CIP Caustic Soda solution recycling

Main project drivers:

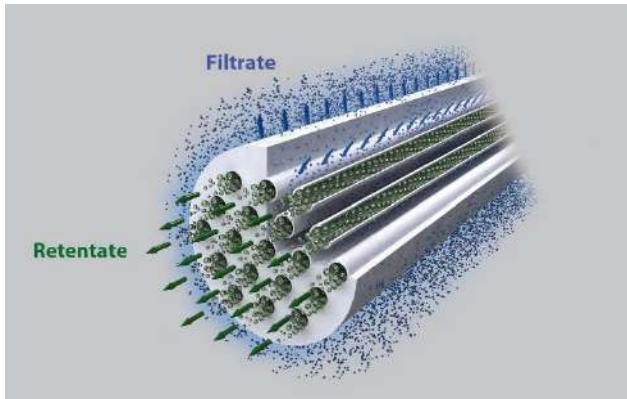
- Reduction of TDS/EC in the waste water
- Reduction of acid for waste water pH adjustment
- Reduction of Sodium in the waste water
- Reduction of fresh water consumption
- Reduction of energy consumption to heat fresh CIP solutions.



Spent Caustic

UF filtered Caustic

CIP Caustic Soda solution recycling



Ceramic UF membrane process:

Crossflow filtration along an ultra-fine active membrane surface at app. 5 bar system pressure. Clean Filtrate (Permeate) gets returned to the CIP Caustic tank, while the Concentrate (Retentate) gets returned in loop function back to the membrane module inlet for maximum concentration.



Typical ceramic UF membrane plant for treating 50 t/day spent caustic

CIP Caustic Soda solution recycling



Recycled Caustic (return to plant)
Spent Caustic (from plant)
Final Concentrate (< 5 %; disposal)



***4 – Industrial Waste Water Treatment
Fresh Water Recycling***

Dairy Waste Water

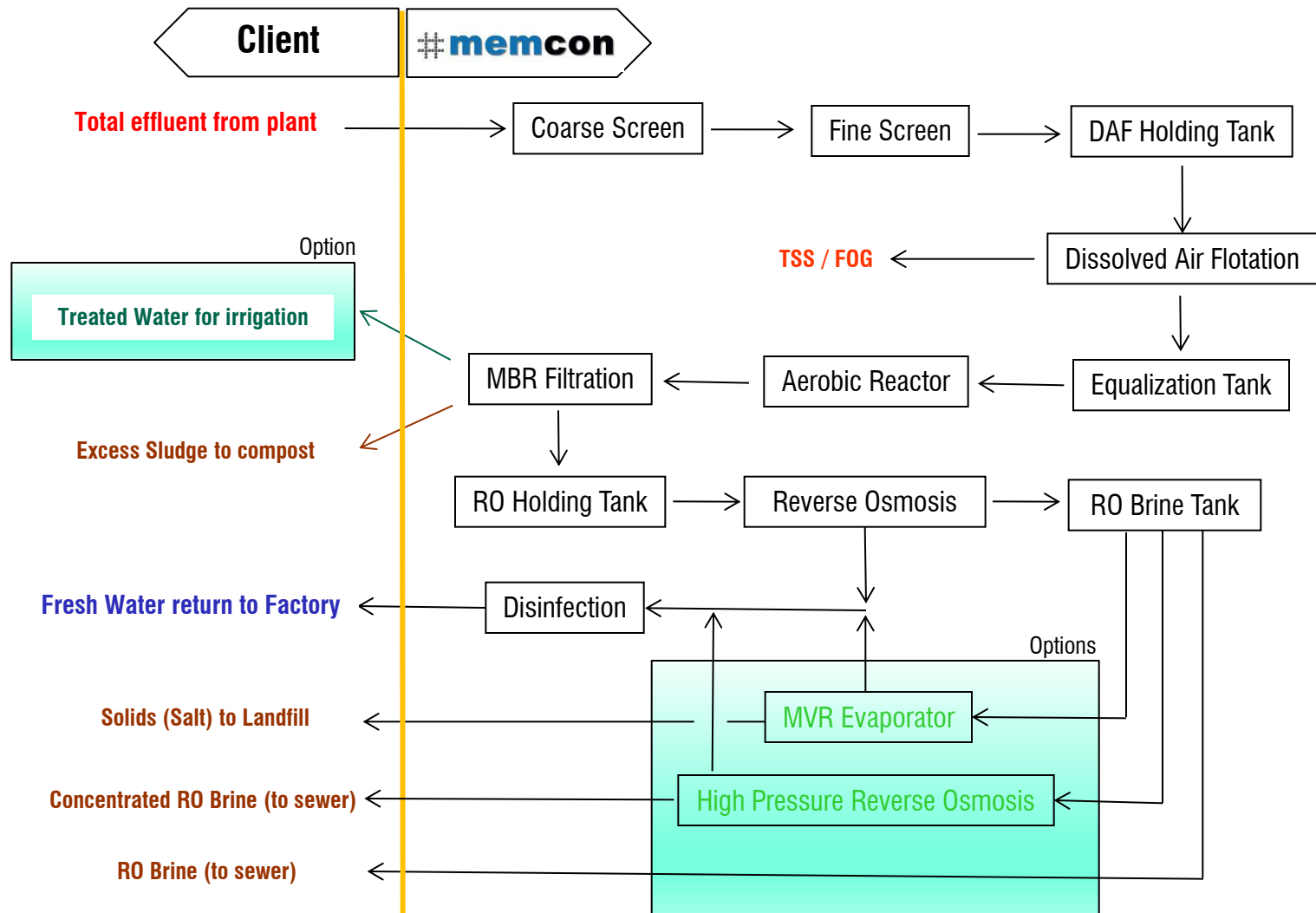


**Raw waste water | MBR Reactor Water | Treated Waste Water
(with Bacteria)**

Main Waste Water Constituents:

Fats/Oils/Greases, Aminoacids, Protein, Lactose, Sodium, Chlorides, Colloids, Stabilizers, Agglomerates, fine/coarse suspended solids, Nutrients, Salts, Colourants, Bacteria

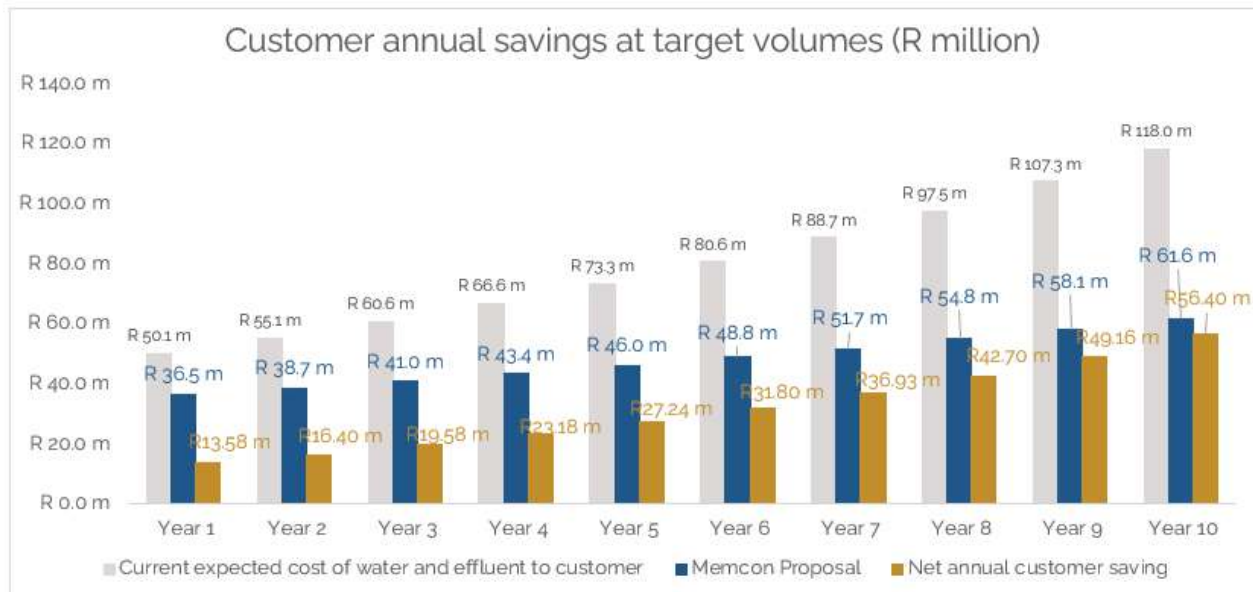
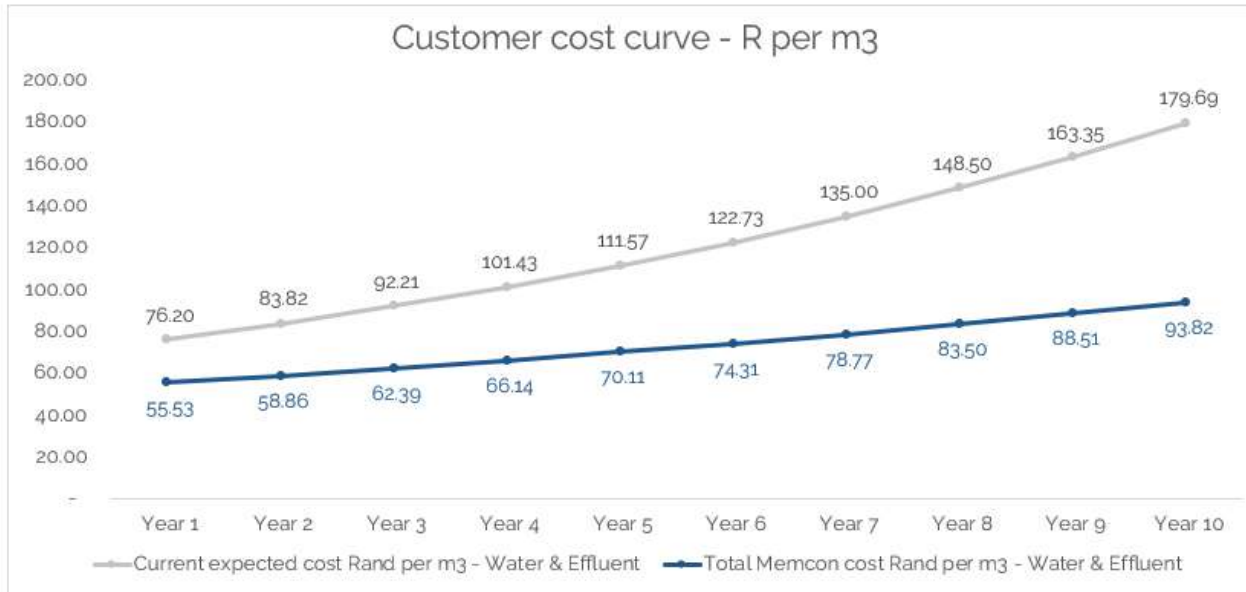
Dairy Waste Water Treatment / Fresh Water Recycling



Membrane Bio-Reactor Plant for Dairy Waste Water



Fresh Water Cost Projections & Savings



Summary - Buzzwords

"Value Engineering by applying Membrane Technologies" – Examples:

Cheese Milk Protein Standardization (enhanced cheese yield)

Whey Protein Recovery (WPC)

CIP Caustic Recycling

Waste Water Treatment (Legal Compliance, Fresh Water Recovery)

Utilities Recycling (i.e. Cooling Tower/Boiler Blowdown Water, Rinse water etc)

Evaporator Condensate Treatment (Fresh Water Recovery)

Fresh Milk Concentration for transportation savings

Whey / Milk Concentration prior to Evaporator (Energy savings, increased Evap capacities)

Waste Beneficiation (By-products, value-add)

ESG, Sustainability

Thank You



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