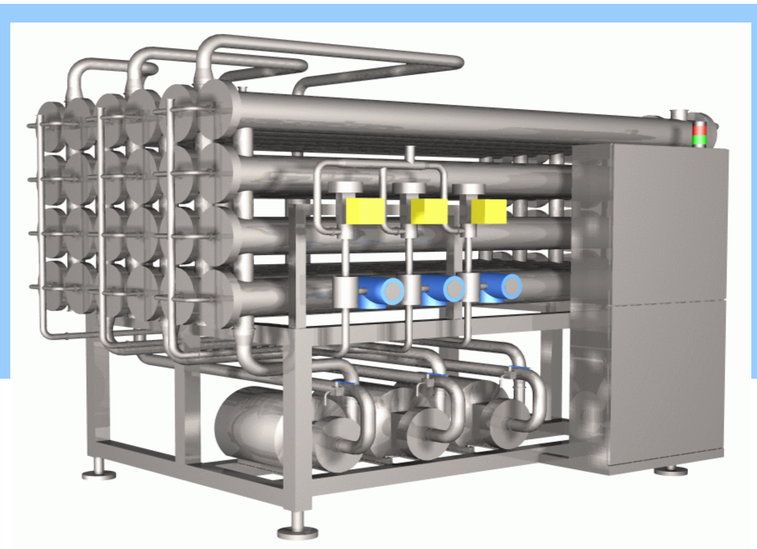


MMS AG Membrane Systems

Beer Dealcoholization

Methods for beer dealcoholisation

Evaporation

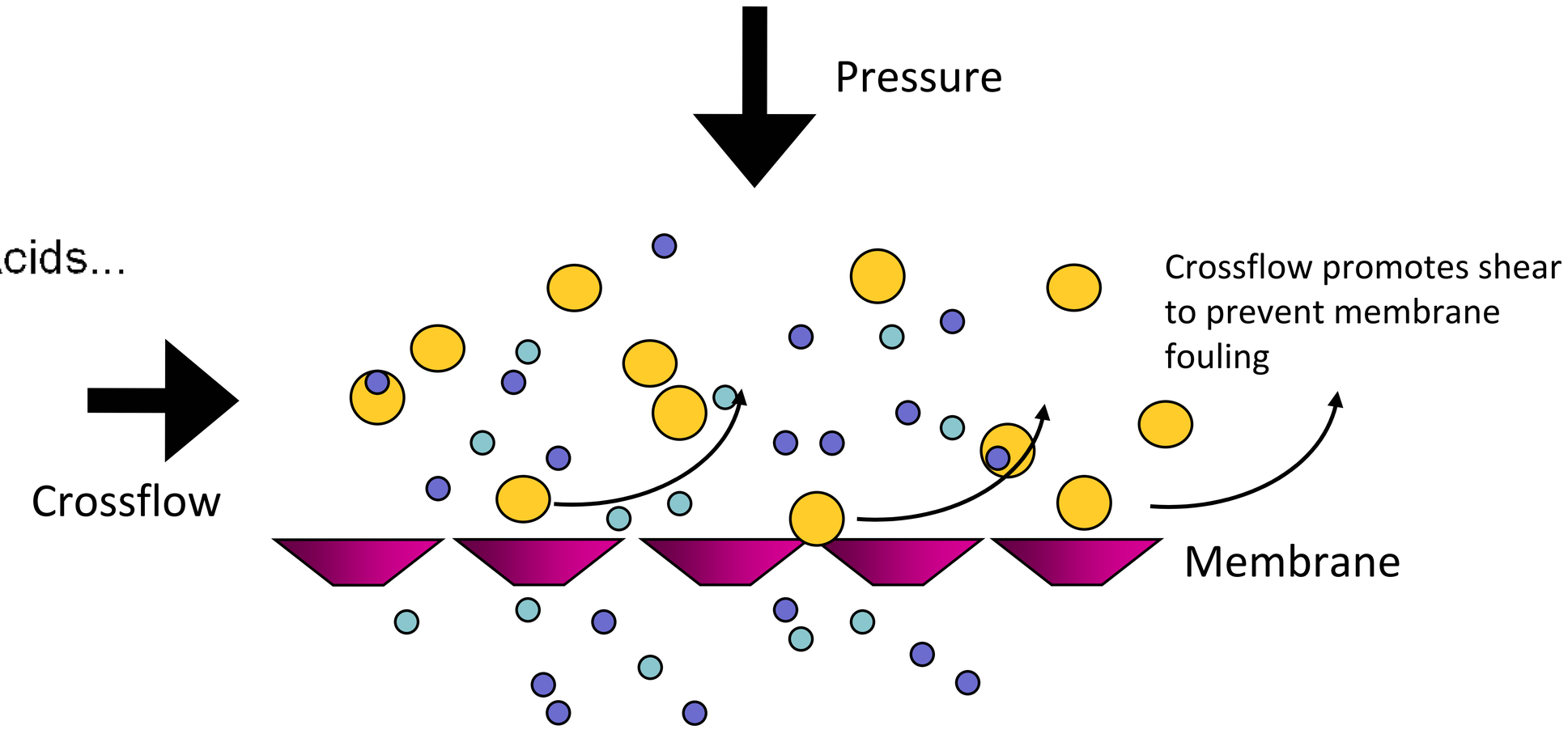
- Thermal de-alcoholisation in falling film or thin layer evaporators by ethanol evaporation
- Operating parameters: 60-200mbar, 40-60°C
- Quality of beer: slight color increase, loss of volatile aromas, loss of acids, loss of CO_2, loss of „body“, high risk for worty, bready, caramely, and fatty acid taste
- High investment and operating cost
- High space requirement

Reverse Osmosis

- Pressure and concentration based membrane seperation
- Operating parameters: 25-35bar, 5-20°C
- Quality of beer: fuller taste, lower risk of worty taste, reduced CO_2 loss, slightly sour character compared to original beer
- Modular design for simple scalability
- Small foot print
- Suitable for small to larsge scale operation
- Cost effective (investmern to operating cost)

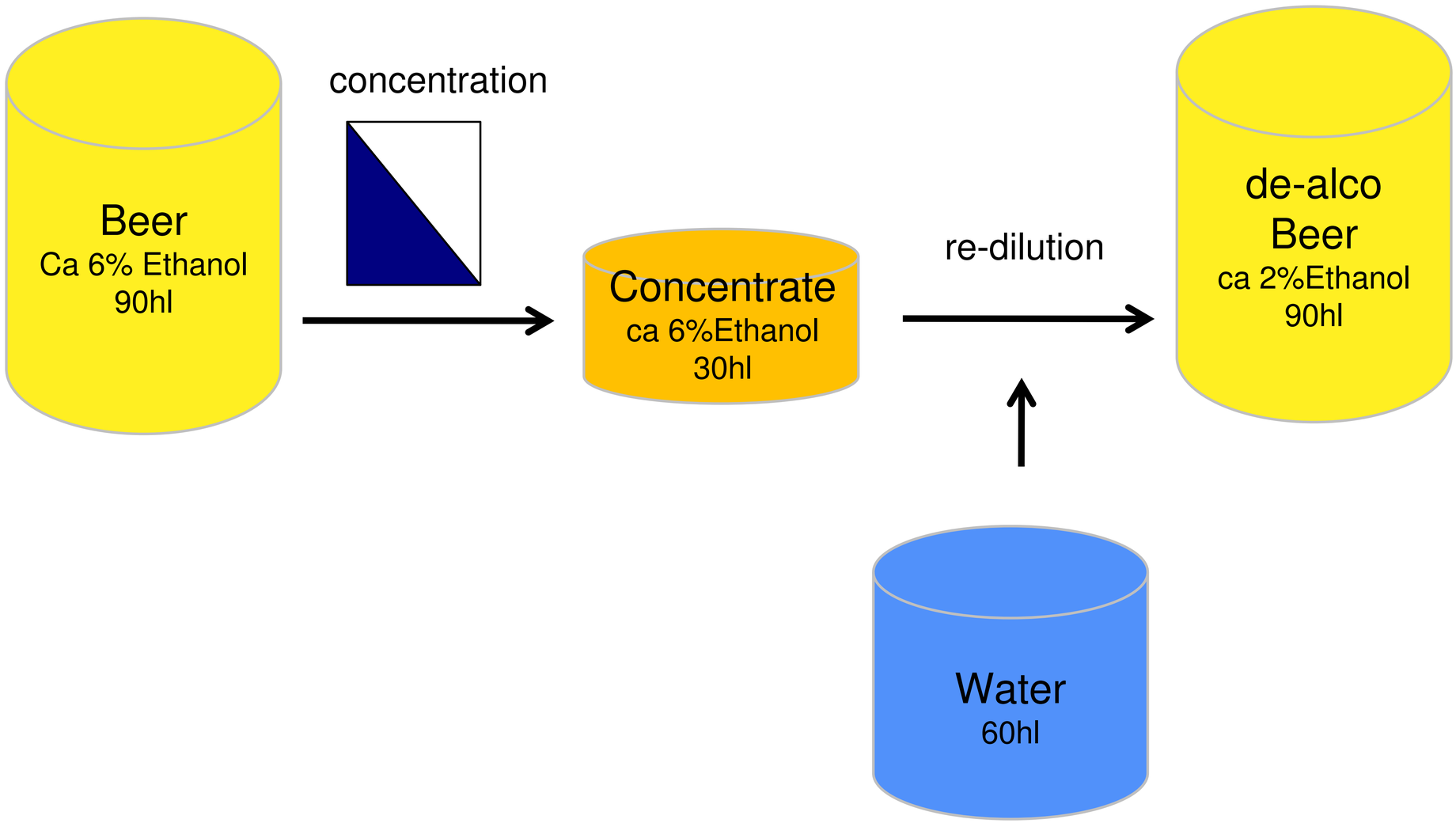
Membrane filtration principle

- Water
- Ethanol
- Aroma/Sugars/Acids…

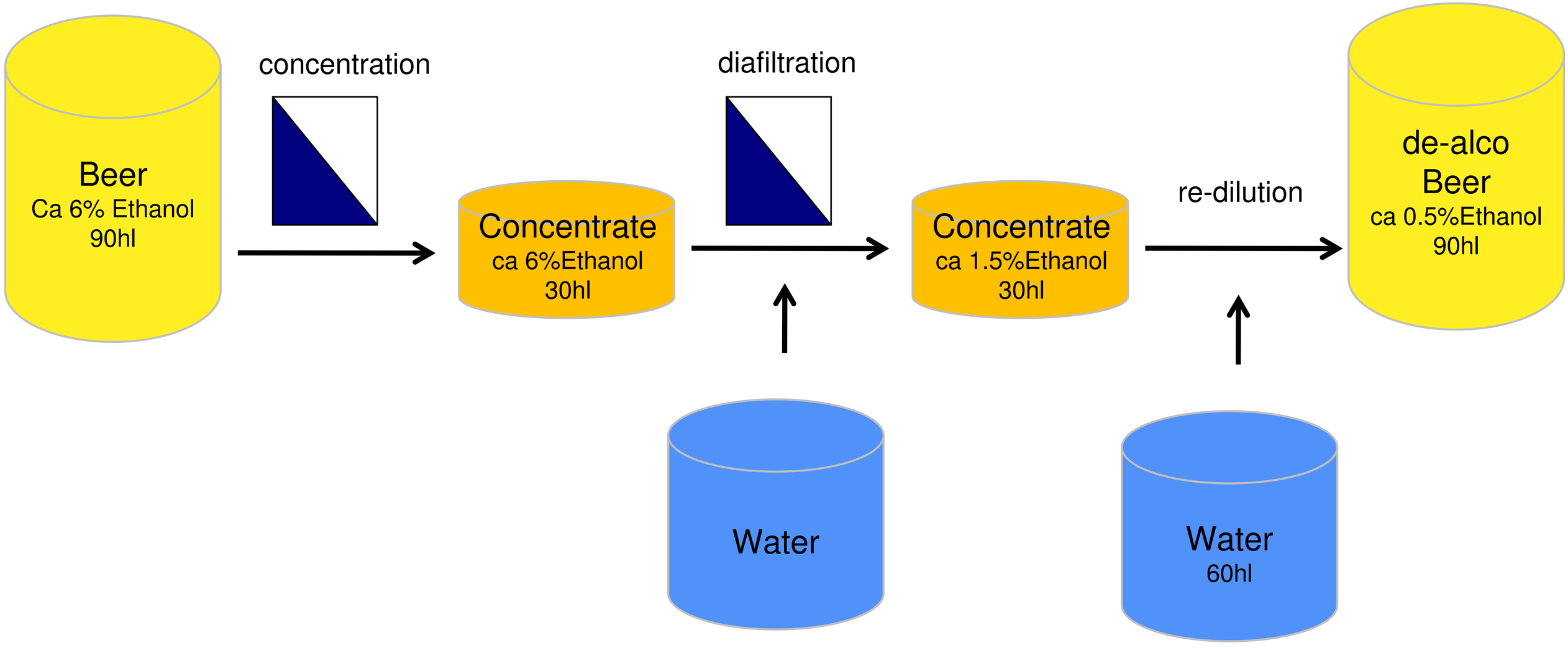


The membrane acts as physical barrier, permeable for only ethanol + water

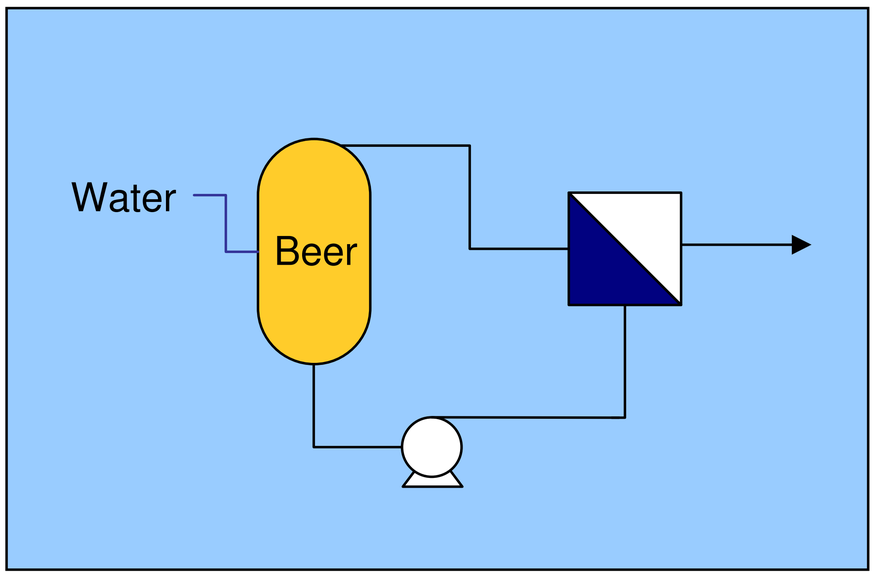
Process principle – partial dealcoholisation



Process principle – “full” de-alcoholisation

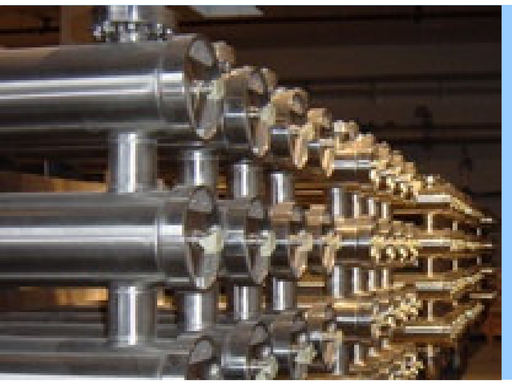


MMS AG De-alcoholisation system types
Batch systems



Batch Process

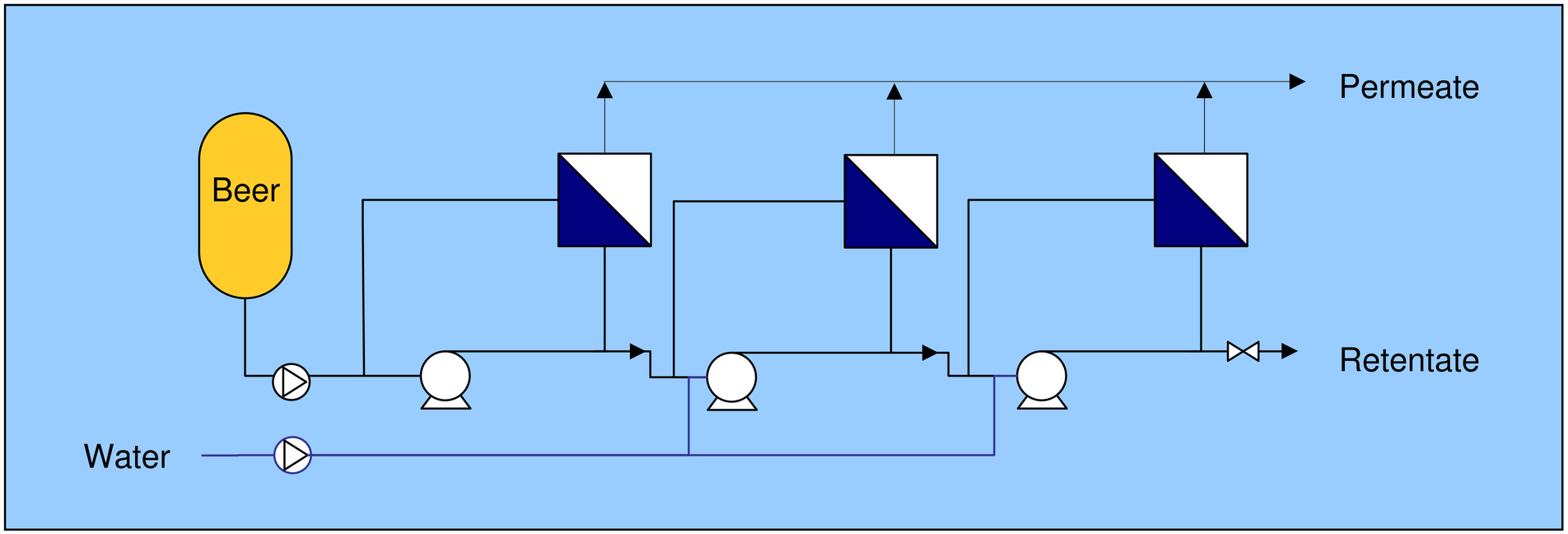
- Smaller scale, <300hl/day
- Long resistance time for retentate
- Lower investment cost



MMS AG De-alcoholisation system types
Continuous systems

Continuous or Feed & Bleed Process

- Larger scale, > 300hl/day
- Short resistance time for retentate



MMS AG – Summary

Reverse osmosis technology offers an effective and flexible solution for the removal of ethanol from beverages at moderate investment, in a broad capacity range with minimal space requirement