

MBR Membrane Bioreactors

Membrane separation of activated sludge

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MEMBRANE BIOREACTORS

BIOMEMBRANES – ALTERNATIVE TO SECONDARY CLARIFIER

**REDUCTION OF AREA OCCUPIED BY SECONDARY
CLARIFIERS – e.g. WWTP Bottrop, Emschergenossenschaft**

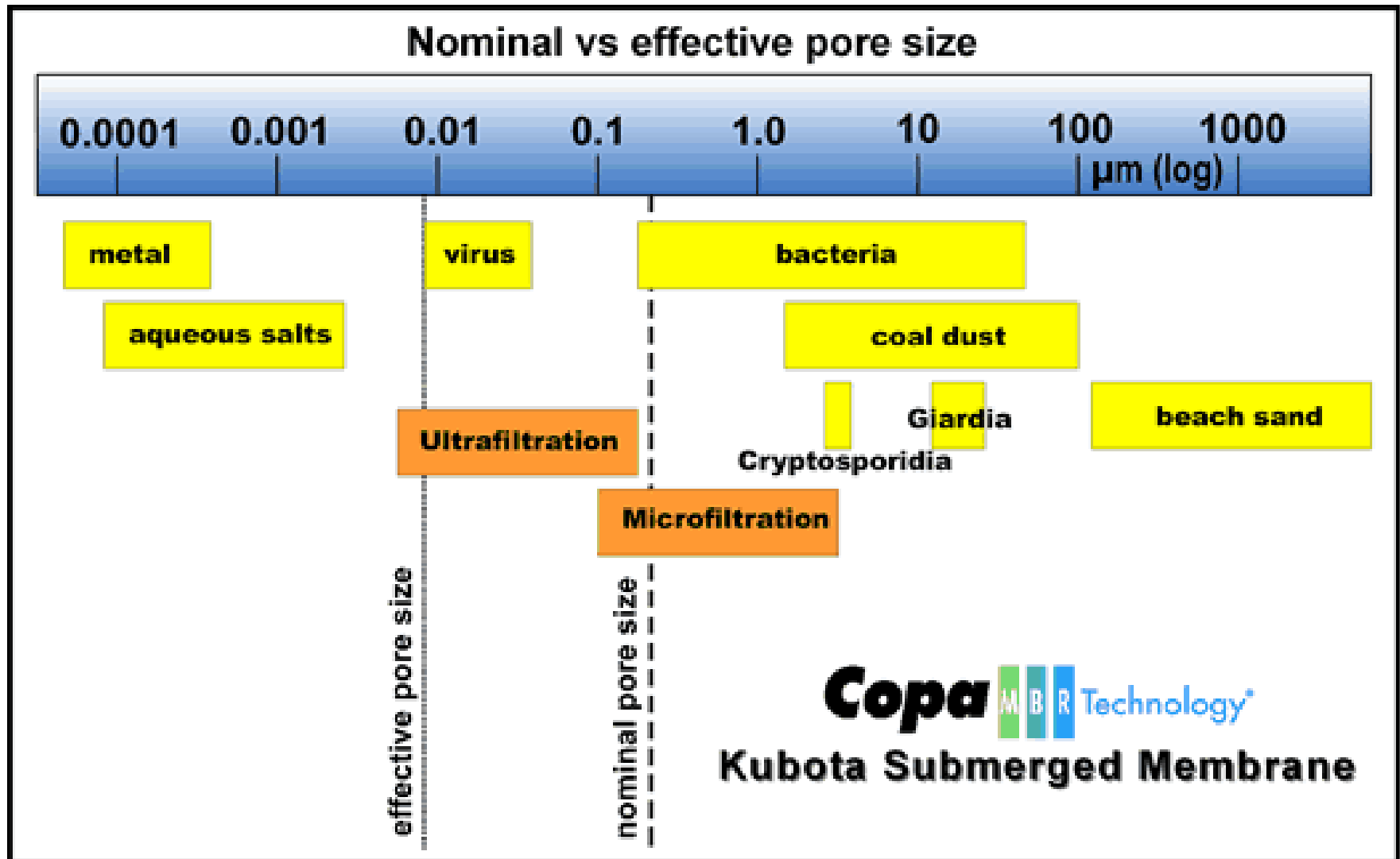


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REDUCTION OF AREA OCCUPIED BY SECONDARY CLARIFIERS – e.g. Central WWTP Vienna – Simmering

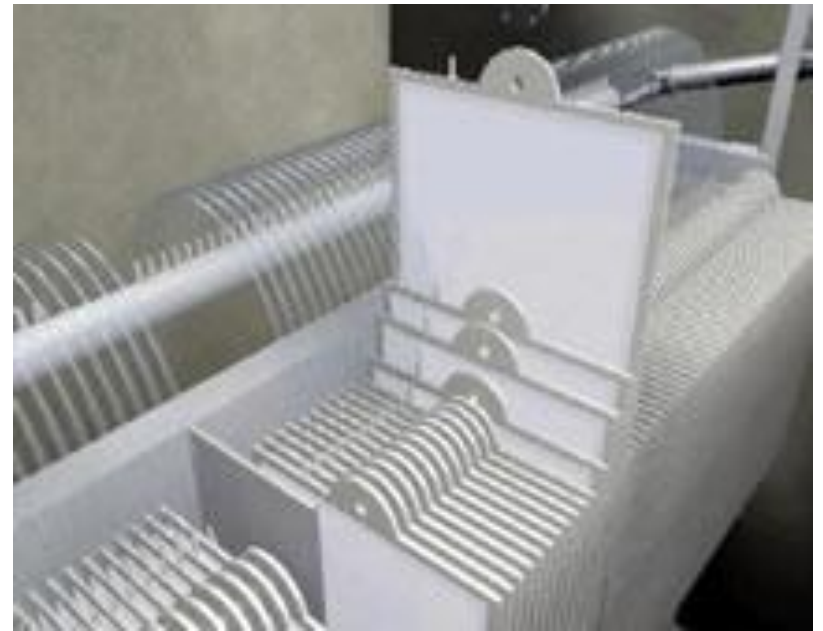


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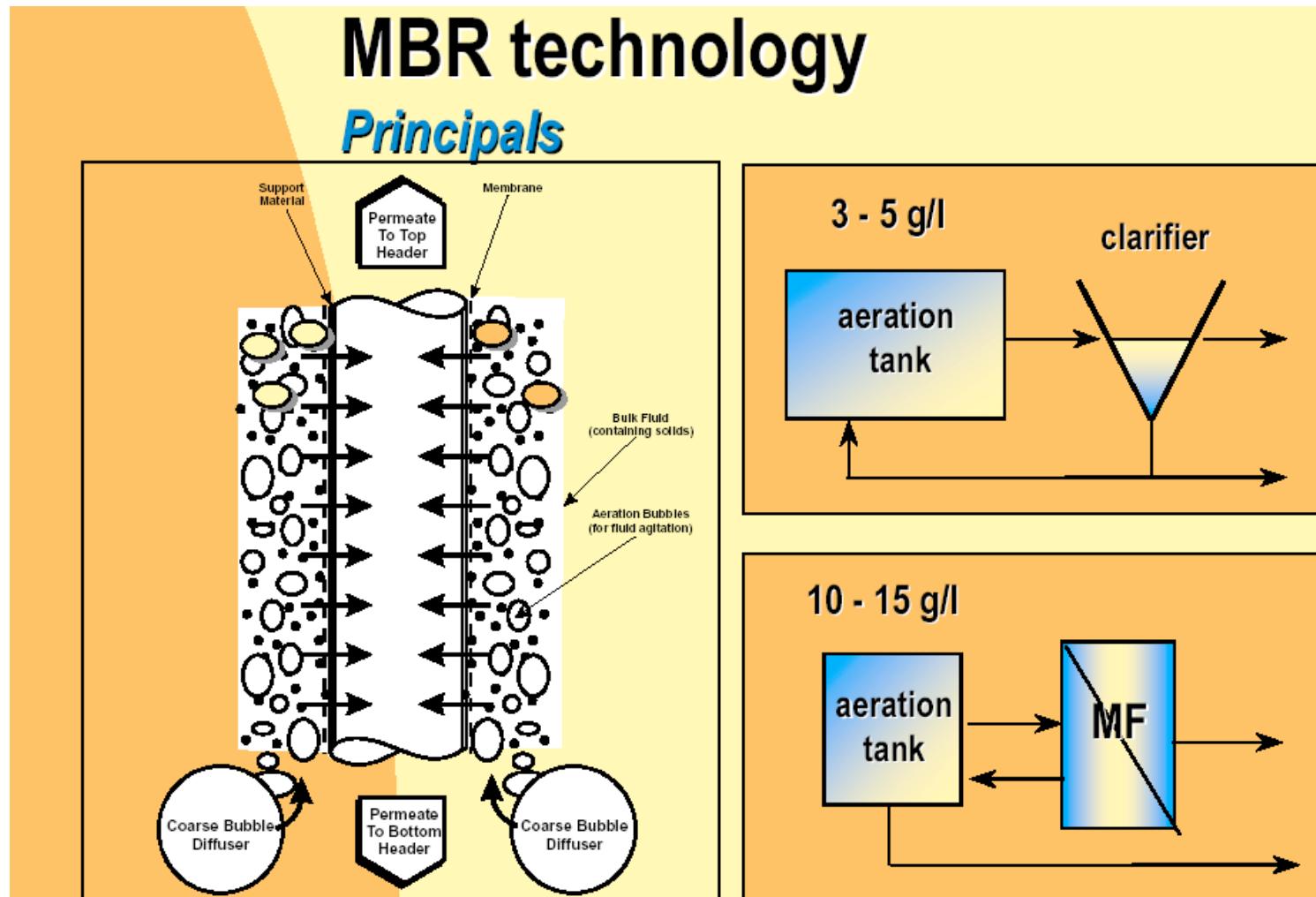
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SUBMERGED DESK MODULES



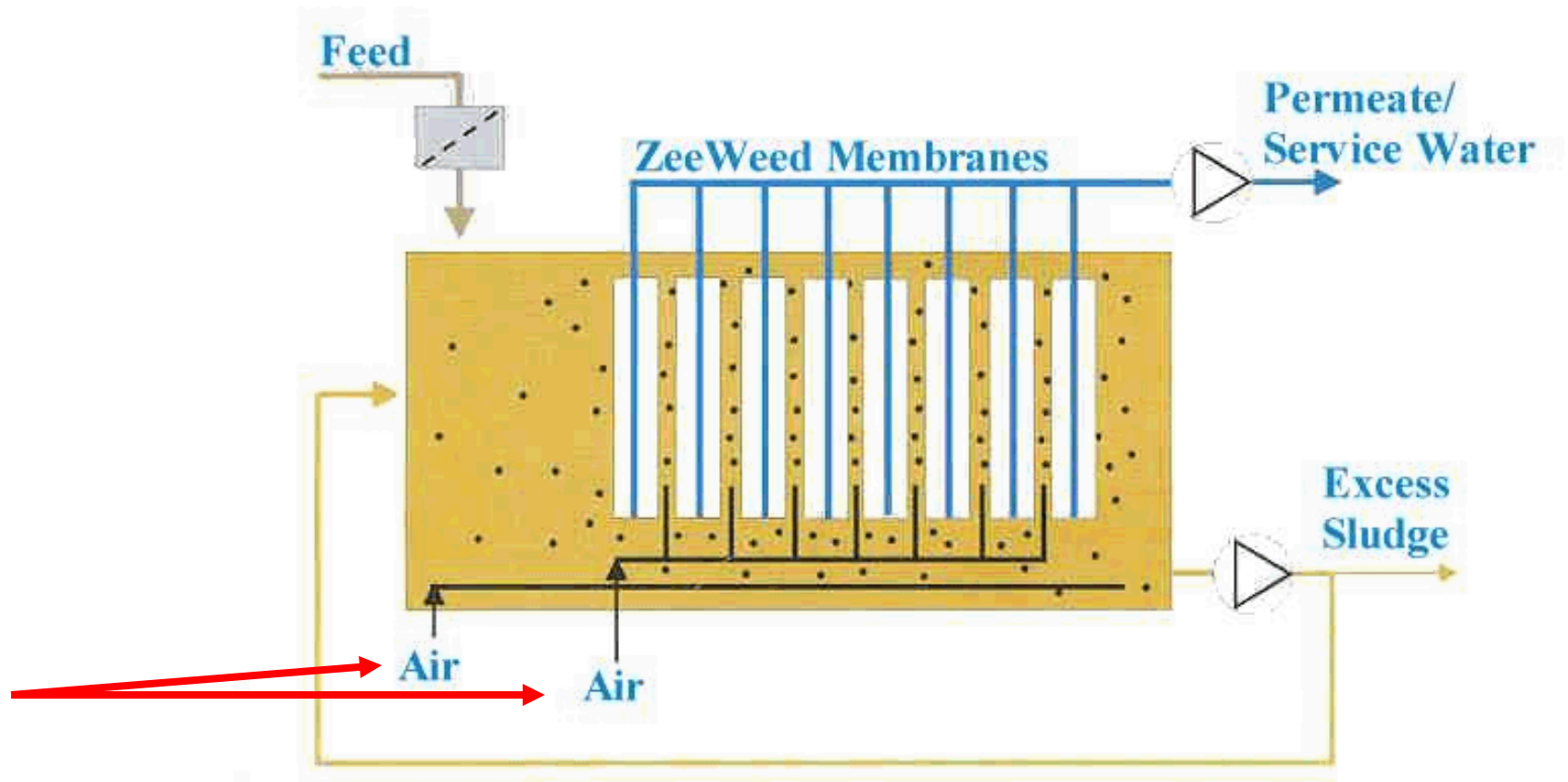
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Submerged hollow fiber modules



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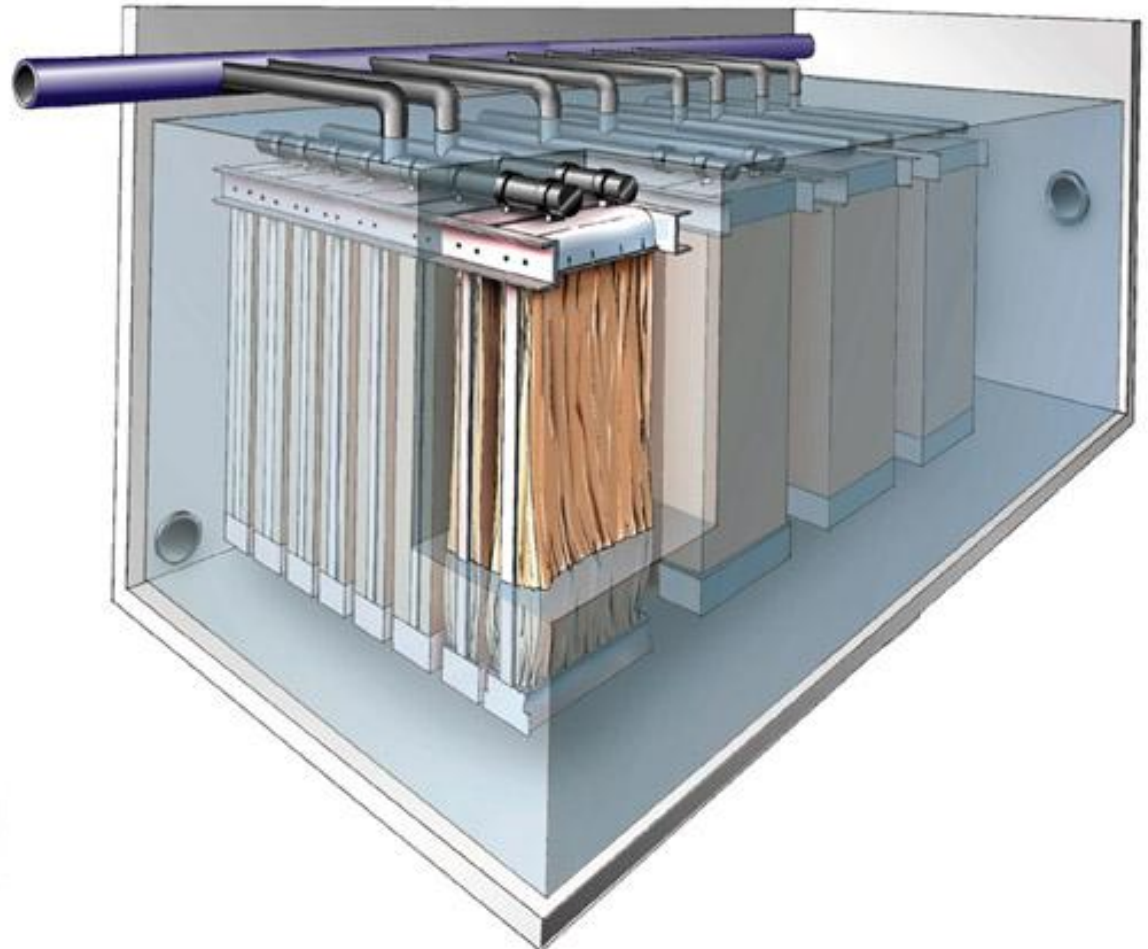
Submerged hollow fiber modules, e.g.
ZeeWeed®-membranes



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Submerged hollow fiber modules, e.g.

ZeeWeed®
membranes



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**Example of installation:
WWTP Markranstädt
12 000 PE**

440 m² per module



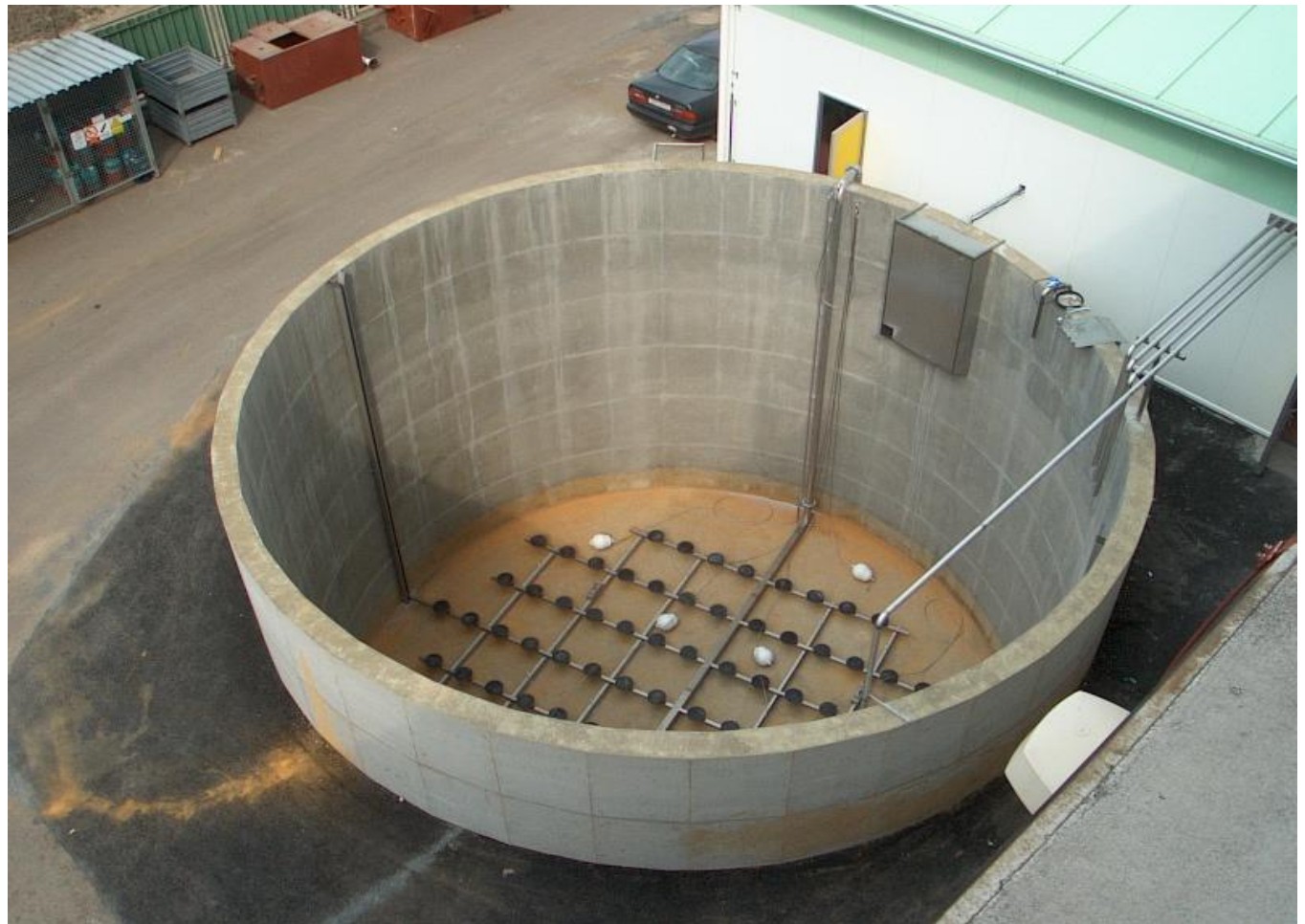
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Submerged modules in operation



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External modules



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External modules



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External modules

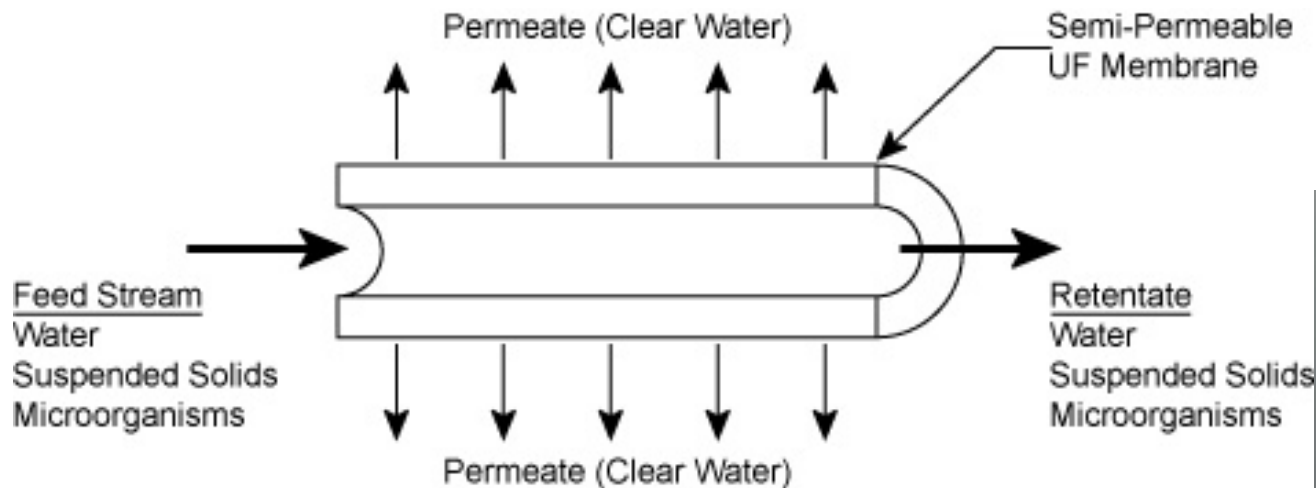
PLEIADE Ultrafiltration modules

Rhodia



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External tubular modules



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Operational problems:

- **perfect mechanical pre-treatment (hair)**
- **requirement of rather constant flow**
- **biomass concentration limited by oxygen transfer**
- **risk of intensive foaming (biopolymers)**
- **complicated cleaning and maintenance of biomembranes**

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Main advantages:

- **small built-up area**
- **almost zero SS**
- **almost zero bacteria in permeate,
reduction of viruses concentration**
- **permeate quality does not depend on the
properties of activated sludge**
- **possibility of wastewater reuse**

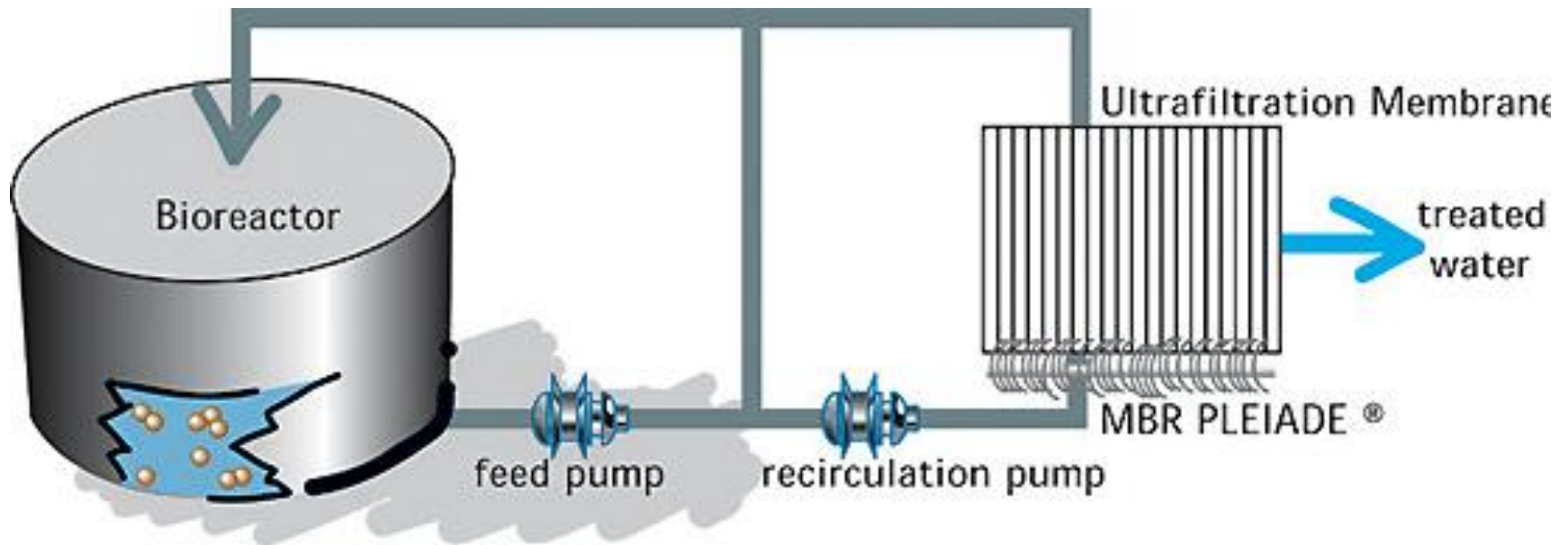
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**ORELIS' MEMBRANE BIOREACTOR HAS
BEEN CHOSEN FOR THE QUEEN MARY 2**



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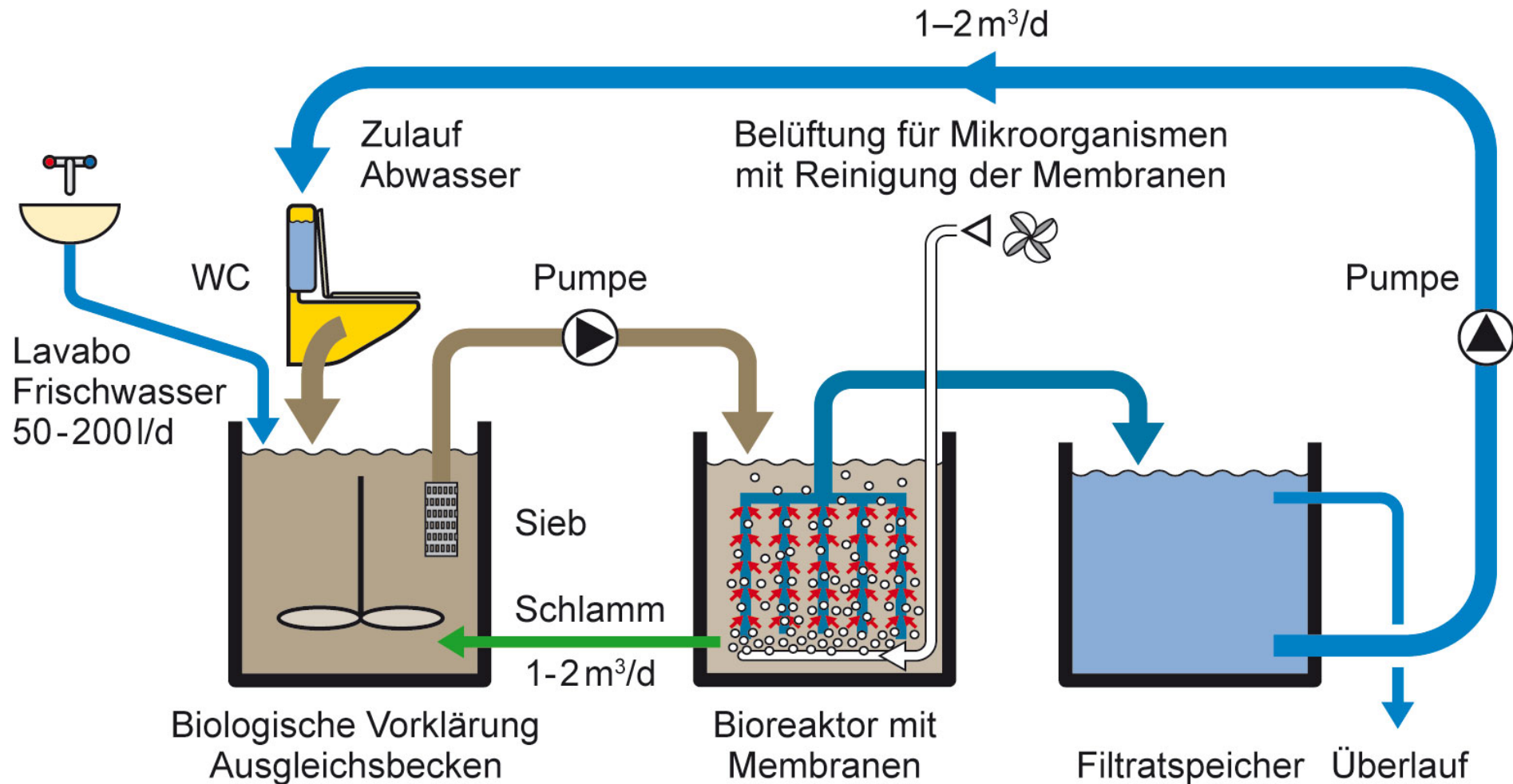
Most highly located plant in Europe

Hohtälli ob Zermatt: 3 286 m above sea-level



Most highly located plant in Europe

Hohtälli ob Zermatt



Most highly located plant in Europe

Hohtälli ob Zermatt



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Future of membrane filtration in Europe:

- **legislation for sensitive areas, application of effluent limits based on combination of effluent and water quality standards**
- **reuse of membrane filtration effluent (permeate)**
- **water shortage - possible side-effect of *global warming***

„New Water“ in Singapore

Drinking water made of WWTP effluent

