

**Water filtration comes to a new era!**

**Ceramic membranes proof to be the best solution!**

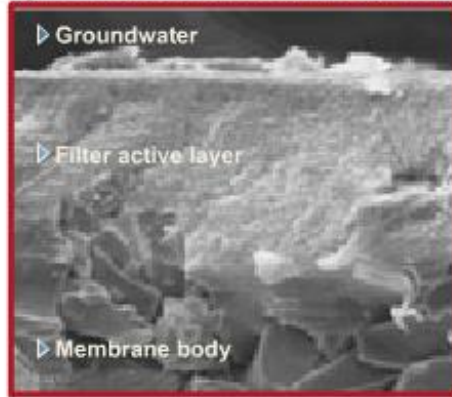
2012/09/10

2. Hamburger Wasserforum

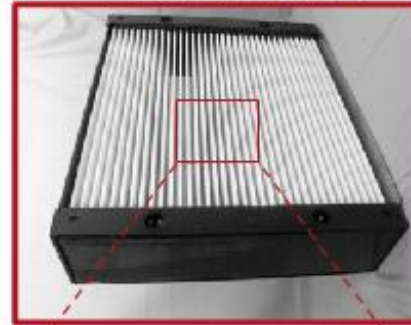
Lutz Bungeroth

# 1. CFM-Systems® membrane designs

Asymmetric membrane structure



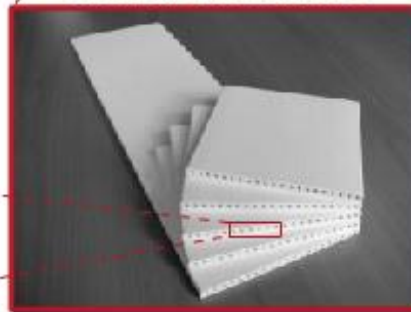
Filtration module



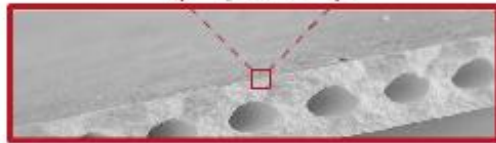
Filtration tower



Several membranes



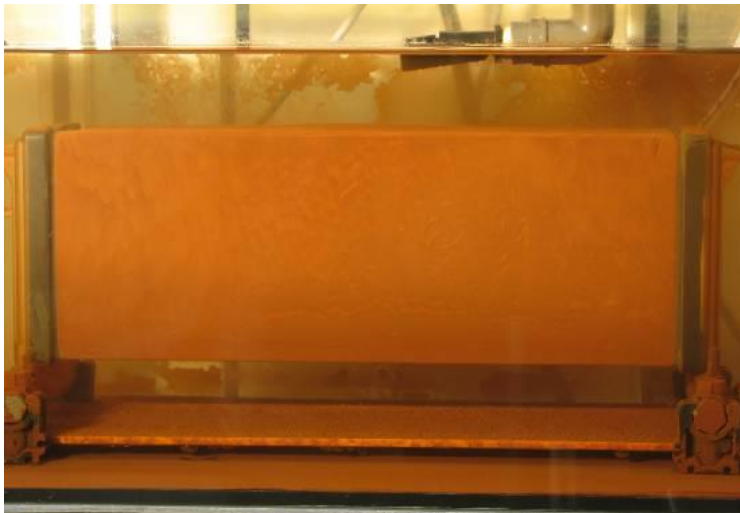
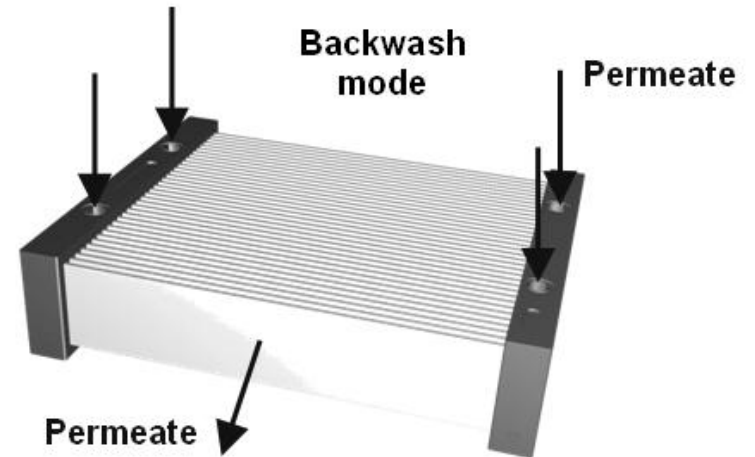
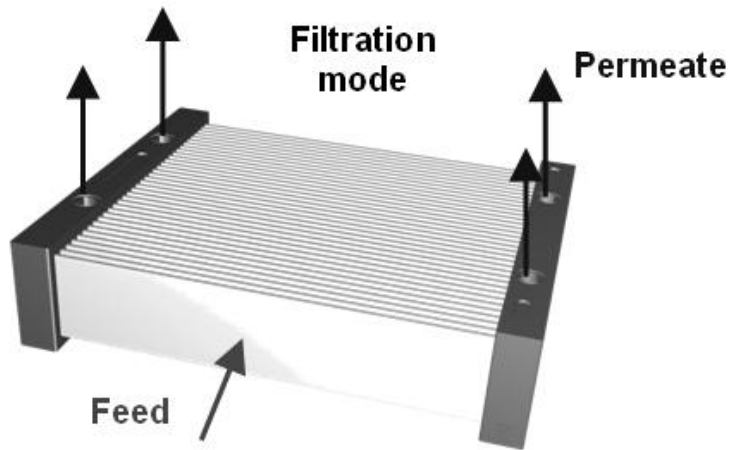
Single membrane plate



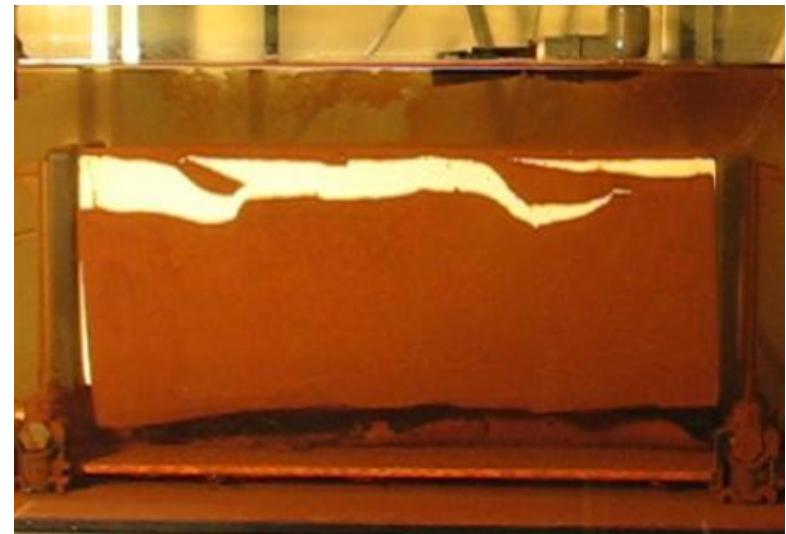
**Membrane plate distance: 7.0 mm/0.276 Inch**

**Process options: High-pressure backwash and sprinkler mode for targeted cake layer removal at minimum daily ratios.**

## 2. CFM-Systems® membrane functions



**Cake-Layer on Membrane-Surface**



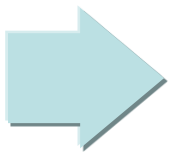
**Self-Cleansing easy due to Nano-Layer with Lotus-Effect**

### 3. CFM-Systems® newbuild with maximum performance



## Filtration Rack Design

Rack design information	Description
No. of modules	4x14=56 (fixed number)
No. of filtration towers	4 (fixed number)
Filtration capacity	Up to 85 m <sup>3</sup> /hr = 2,040 m <sup>3</sup> /d
Required tank footprint	LxW = 3.0x0.9 m = 2.7 m <sup>2</sup> Equal to 32 m <sup>3</sup> /hr per m <sup>2</sup> footprint (approx. 3 - 4 times higher to gravity sandfilter)
Required tank volume	LxWxH = 3.0x0.9x3.0 m = 8.1 m <sup>3</sup>
Applicable for	New build plant with capacity > 30,000 m <sup>3</sup> /d; Replacement of existing MF/UF membrane system



Standard solution for large scaled plants (new build)  $\geq 8$  MGD  
Standard solution for direct replacement of existing MF/UF membrane system

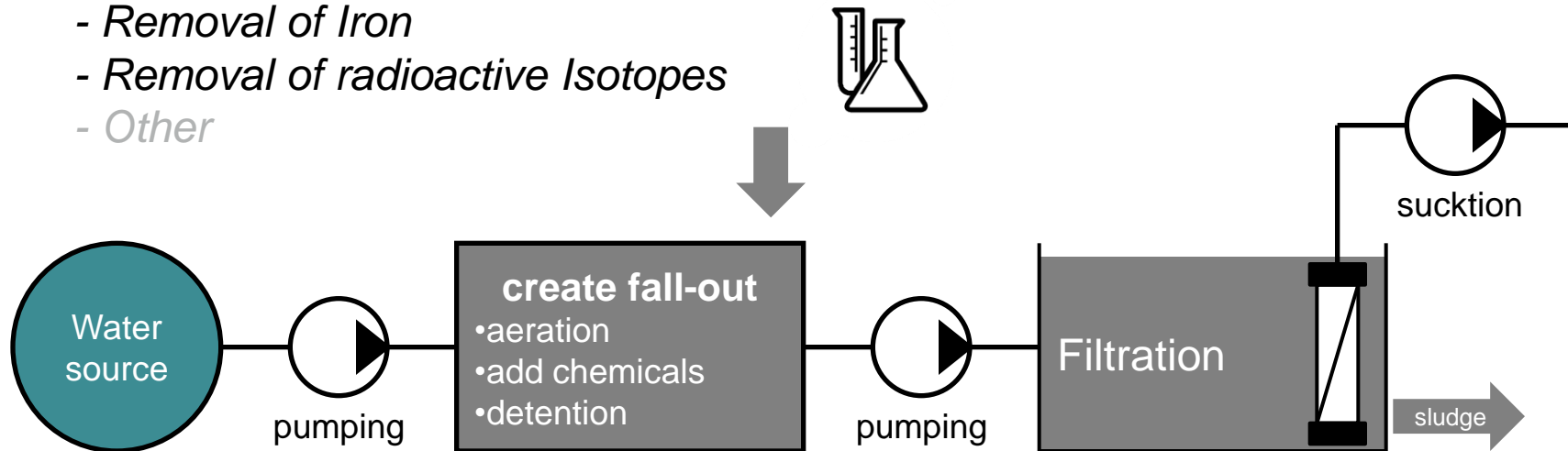
## 4. targets of filtration on ground- and surface water

### Common treatment targets:

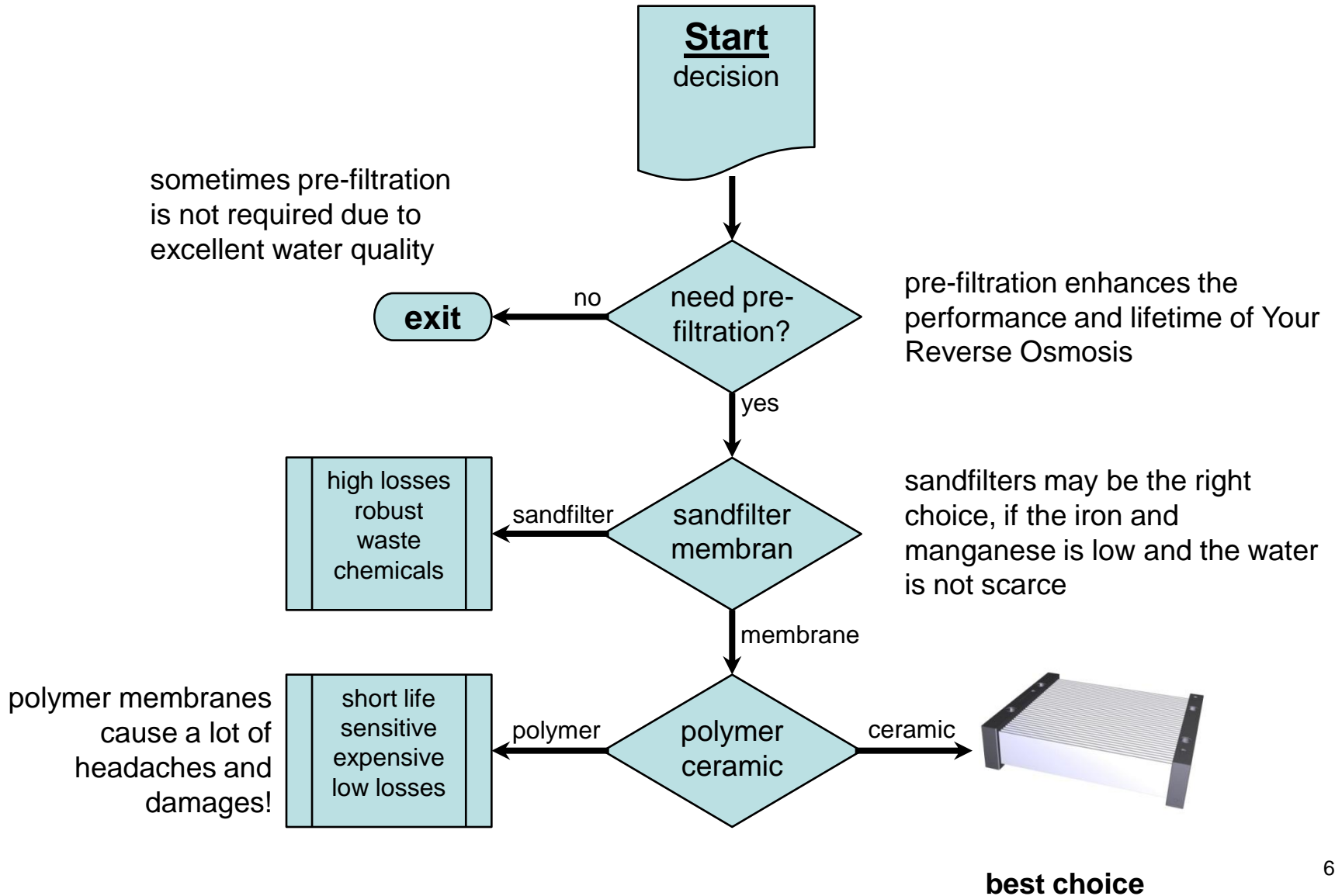
- Removal of germs, bacteria, algae (disinfection step)
- Removal of suspended solids
- Reduction of TOC and other compounds

Depending on raw water characteristic additional removal targets might be required

- Removal of Manganese
- *Removal of Iron*
- *Removal of radioactive Isotopes*
- *Other*

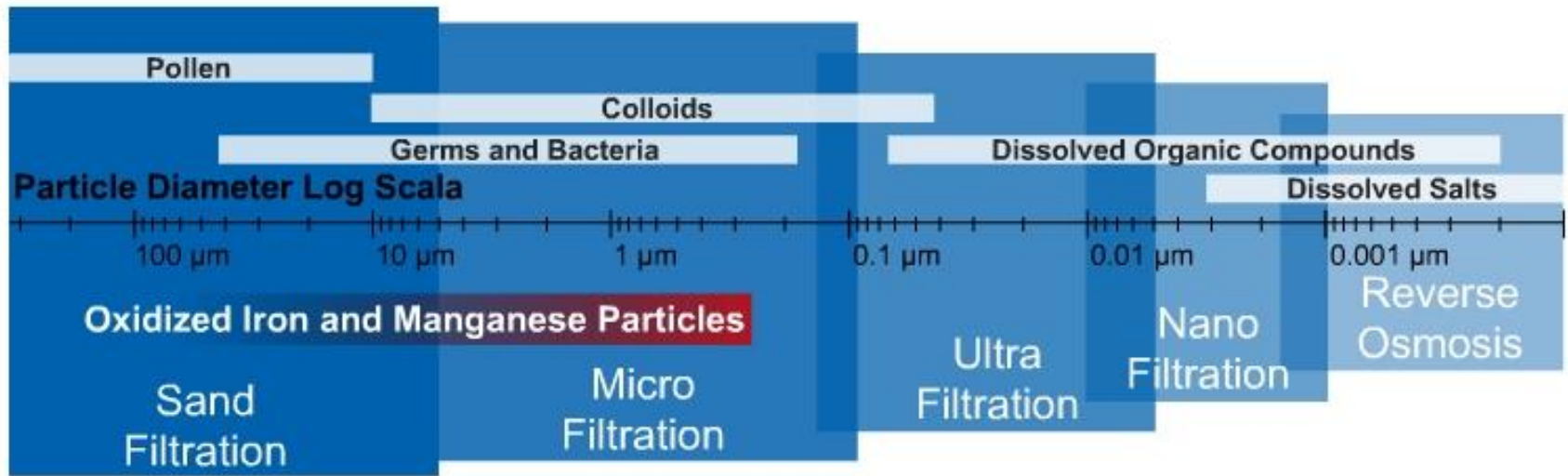


# 5. Decisions in Filtration



## 6. Classification of filtration technologies

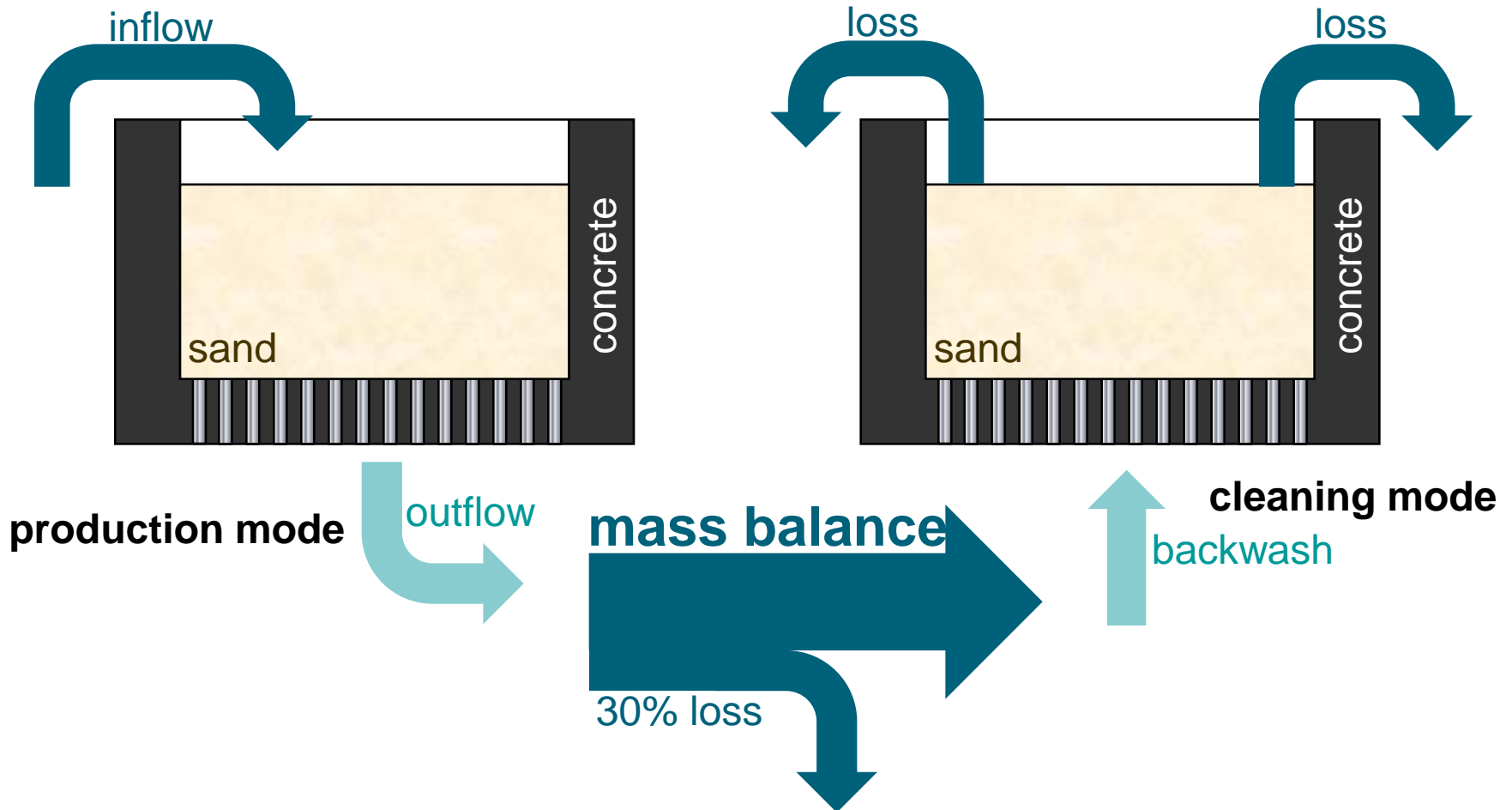
The best filter is the one who's pore size is small enough to hold back the targeted solids and as big as can be for highest flow rates!



Sandfilters are not the solution to remove oxidized metal compounds due to large pore size structure. Micro- and Ultra-Filtration technologies are real barrier to remove metals and other suspended solids as well as germs and bacteria

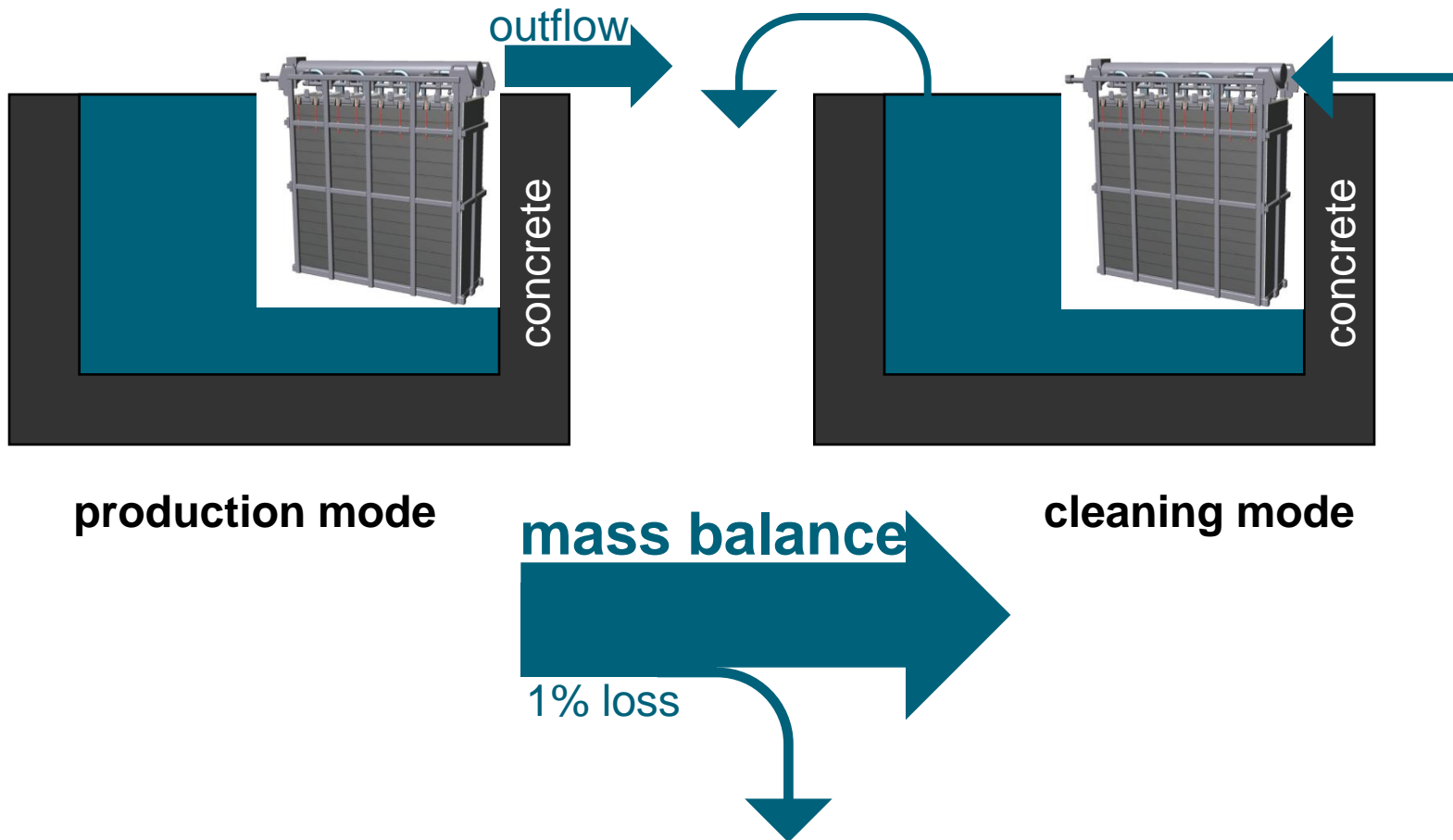
## 7. filtration by sand filters

Sandfilters create appr. **30%** losses of the precious water



## 8. filtration with membranes

**CFM membranes create only 1% losses of the precious water**

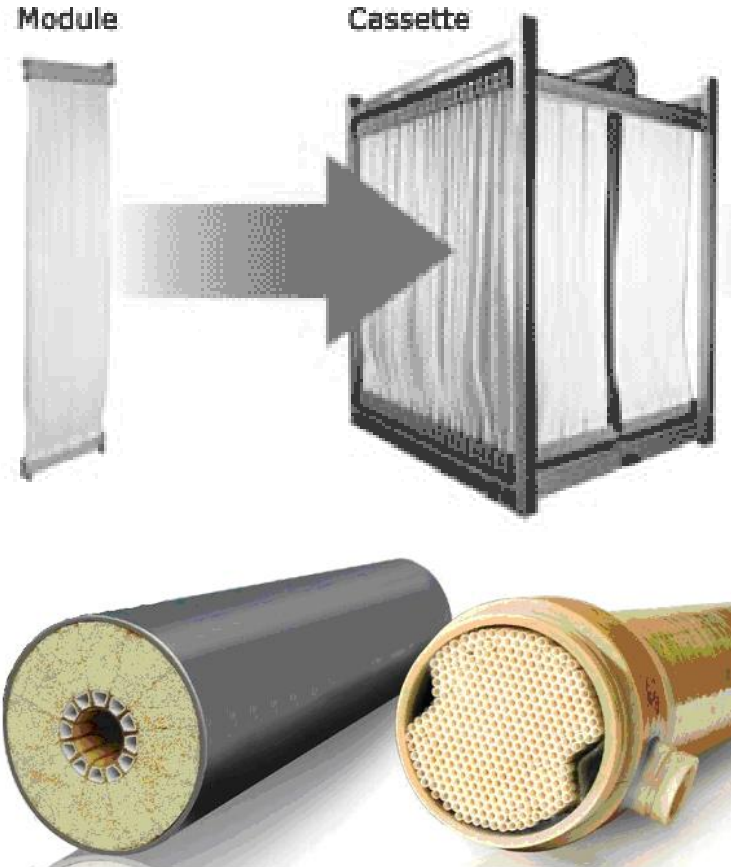


## 9. different membrane designs

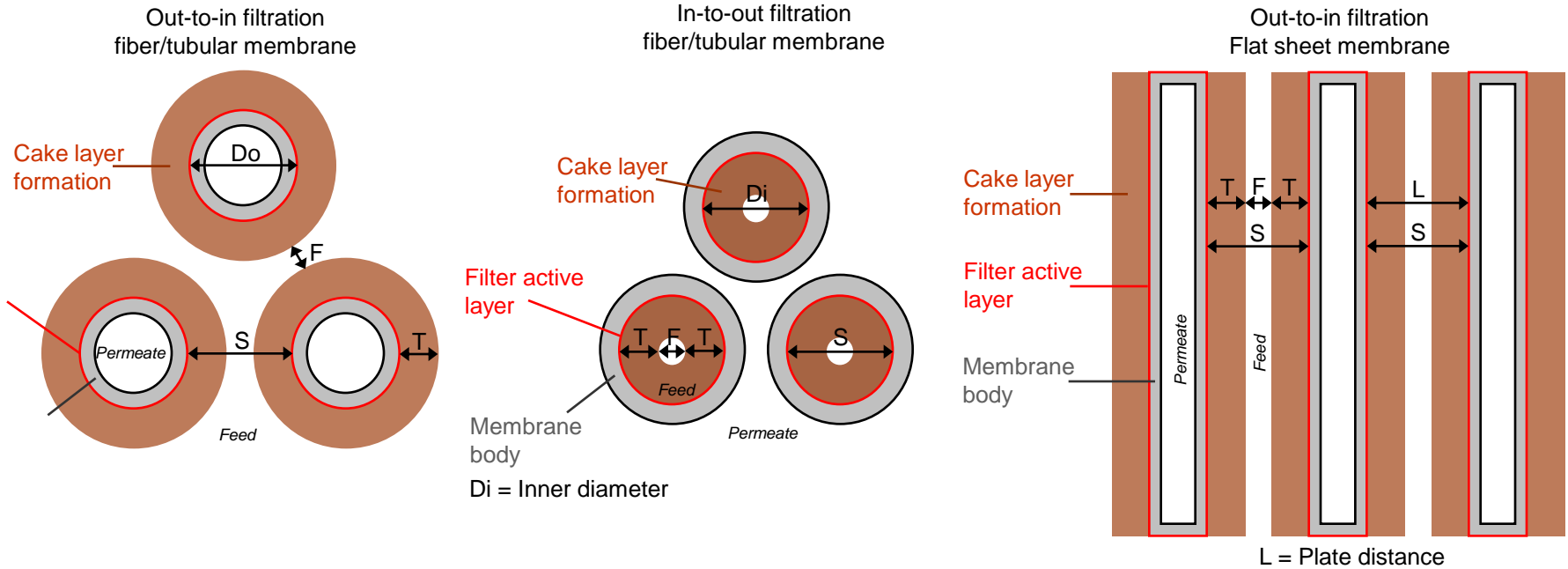
### Flat sheet membrane



### Fiber/tubular membrane



# 10. different membrane functions



**instead of spending much efforts on cake layer removal it is better to use the cake layer's benefits – if You can!**

# 11. How plastic membranes fail everywhere

Sample: Pre-Filtration with Zenon ZeeWeed 1000 hollow-fiber polymer membranes in Saudi Arabia



- short lifetime of only 9 month due to hot water and aggressive chemicals
- huge efforts to be spent on service and repair
- very high operating costs due to loss of water and lots of chemical
- high replacement costs due to spare part pricing policy of vendors

## 12. CFM-Systems® performance comparasion with Zenon



	Polymer-membrane	CFM Systems®
Membrane-Material	PVDF, PTFE, PE, PES, PP	ceramic
Pre-Treatment by Oxidation	limited due to material	unlimited
Flux-Rate	40 – 120 l/m <sup>2</sup> h	350 – 450 l/m <sup>2</sup> h
Backwash-frequency	12–48 x per day	1x per day for 60 sec.
Production-rate	60 – 90 %	99.5 %
Trans-Membrane-Pressure	100-300 mbar	up to 600 mbar
Chemical Cleaning	weekly	Every 3 month if required
Fe/Mn-Removal	> 90 %	> 98 %
SDI	< 2 – 3	< 2

CFM Systems®  
Filtration Rack



Polymer  
Membranes



### 13. CFM-Systems® references in the MENA region

#### Buraydah WTP Membrane Replacement (2010)



Direct replacement of  
existing hollow fiber  
membrane system



Improved operation after first train replacement

- Stable operation at specified design capacity
- Increased filtered water quality
- Significant OPEX savings due to reduced power and chemicals



**proven technology for more than 2 years in Saudi Arabia**

# Thank you for your attention!



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