

# FUTURE FILTRATION

SILICON CARBIDE CERAMIC MEMBRANES

## PRE-FILTRATION FOR REVERSE OSMOSIS

### IMPROVE YOUR RO OPERATION!

It is well-known that the performance of a RO system depends on the quality of the pre-filtration. This is due to the following facts:

- Improved pre-filtration in terms of more efficient removal of suspended solids results in **longer operating intervals** of the RO system before the need of chemical cleaning. The reduced number of chemical cleaning cycles means **prolonged lifetime** for the RO membranes and **reduced operating costs**.
- Efficient removal of suspended solids, results in reduced fouling of the RO membranes. This reduces concentration polarization which again improves the quality of the RO permeate. An increase of the RO capacity is often seen when improving the pre-filtration step.

### SiC MEMBRANES - THE HIGH PERFORMANCE AND ROBUST MEMBRANE ALTERNATIVE

The robust SiC membranes are ideal in scenarios with bio fouling potential, since the SiC

membranes can be cleaned with any chemicals (pH 0-14), strong oxidizers (e.g. ozone) and have a high mechanical strength which enables high pressure back flush.

The temperature resistance is an operational advantage to assure both efficient cleaning and to assure membrane selectivity (integrity) at higher temperatures.

Feed containing oil? – no problem! The SiC membranes can handle high oil concentrations (+100,000 ppm oil).

### REDUCE YOUR CONSTRUCTION COSTS!

The high flux potential of SiC is achieved due to the high porosity of the individual layers, low contact angle to water and large pore sizes in support/carrier.

High flux rates lead to compact membrane installations and reduced installations costs, i.e. reduced number of pipes, valves, instruments and building square meters.

High flow capacities are achieved at very low pressures, and thus **reducing your energy costs**.



PORE SIZE- MICRON	FLOW RATE AT 0.2 bar TMP	LMH L/(m <sup>2</sup> .h)
0.04	6 m <sup>3</sup> /h	3,000
0.1	8 m <sup>3</sup> /h	4,000
1	20 m <sup>3</sup> /h	10,000
3	> 25 m <sup>3</sup> /h	> 12,000

Pure water flux achieved with CoMem Conduits OD146x865 mm (8.02m<sup>2</sup>) at 25 °C

## PRE-RO CASES

### Filtration of scrubber water

#### CHALLENGES

Wet scrubbers are widely used for cleaning exhaust gases thus reducing air pollution. In this process harmful particles are transferred from gas phase to the scrubbing solution. The liquid solution contains high amounts of heavy metals which must be removed to meet discharge limits as they pose a threat to the environment and health of human beings.

Scrubber water is challenging due to:

- Fluctuating concentrations of heavy metals
- Relatively high temperature
- Acidic or alkaline feed water
- High fouling potential due to scaling

#### INSTALLATION OF UNIT

A membrane pilot unit from LiqTech was installed at a Danish power plant. The objective was to evaluate a potential commercial solution in recovering the scrubber wastewater for reuse as RO feed water.

#### RESULTS

Type of membrane	(1 pcs) CoMem Conduit OD146x865mm. ID3mm. 0,04 micron target pore size
Capacity per element	3,7 m <sup>3</sup> /h
Flux	500-700 LMH/bar
TMP	0.6 to 0.8 bar
CIP interval	Daily
CIP time	1 hour
Permeate (SDI)	2.7
Reduction of heavy metals	Cadmium (88% removal) Lead (75 % removal)
Recovery rate	>90%

Table 1: Filtration of scrubber water



MultiBrain unit which was used for the pilot test



From the SDI measurement: Permeate (left), feed (right)

#### CONCLUSION

It has been confirmed that SiC ceramic membranes successfully can treat scrubber wastewater to meet RO feed requirements. Due to this achievement, the customer recovers the wastewater otherwise charged at 5 €/m<sup>3</sup> treatment costs and in addition reduces water costs for the supply of city water for the RO. The operating costs will be reduced significantly and the return of investment for the membrane system is attractive.

### Other cases of Pre-RO



LiqTech  
International A/S  
Industriparken 22C  
DK-2750 Ballerup

Phone: + 45 4498 6000  
Fax: + 45 4498 6061

info@liqtech.com  
www.liqtech.com



Textile Waste Water, Egypt: LiqTech's SiC membranes used for UF stage.  
Capacity: 70 m<sup>3</sup>/h.



Degassed Pig Manure, Denmark: LiqTech's SiC membranes used for UF stage.  
Capacity: 12 m<sup>3</sup>/h.

A detailed version of the case story is available at: [www.liqtech.com](http://www.liqtech.com)