MEMJET® - Converting waste water to drinking water

An increasing shortage on high quality drinking water is expected in the forthcoming century, this leads to intensive research on new water resources. One way of providing these resources is the use of innovative membrane systems in the field of communal wastewater treatment, as shown on the conventional waste water plant of the community St. Peter o. Judenburg/Austria. The plant was put into service in April 2002.

Rebuilding the plant

The wastewater plant was built in 1989 as a ventilated pond purification plant.

Two ponds have been put out of service, the remaining lagoon has been equipped with an ejector aeration system.

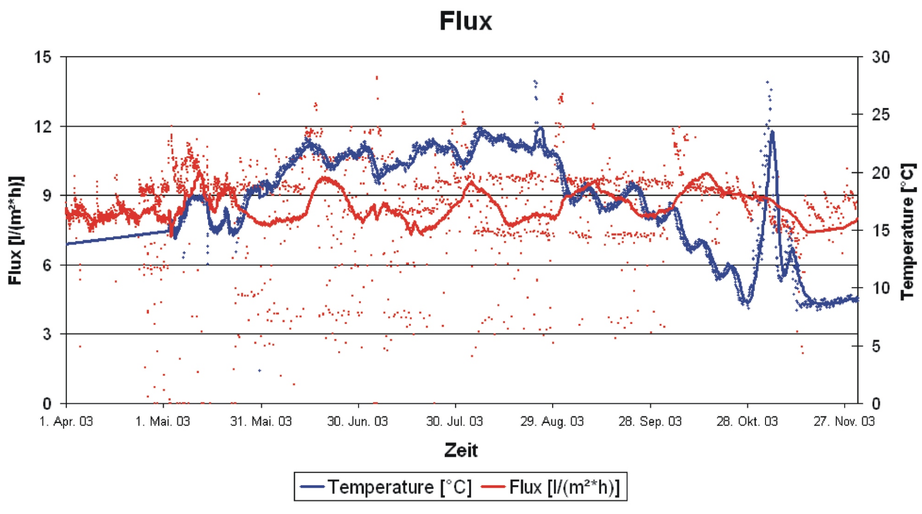
The WWTP has been equipped with a MEMJET membrane filtration system.

The modules have been situated in an existing basin used as fixed-bed nitrification in the original plant design.

Close look at the polyethylene hollow fibre membranes (0.4 μm).

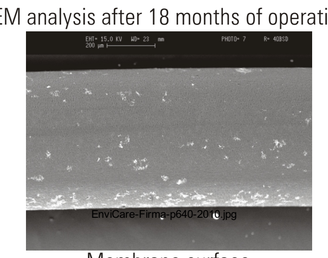
MEMJET® membrane filtration system - Microfiltration

The MEMJET® process unites three membrane modules at a time, with single membranes horizontally oscillating in the wastewater. The motion is strengthened by a coarse-bubble ventilation situated below the modules. The modules consist of polyethylene hollow fibre membranes with a nominal pore size of 0,4 μm.The operation mode is intermittent, which allows back flushing with permeate.

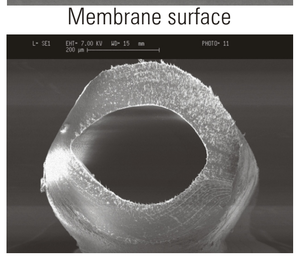


Operational data of the microfiltration plant. Membrane filtration plant operates at stable flux.

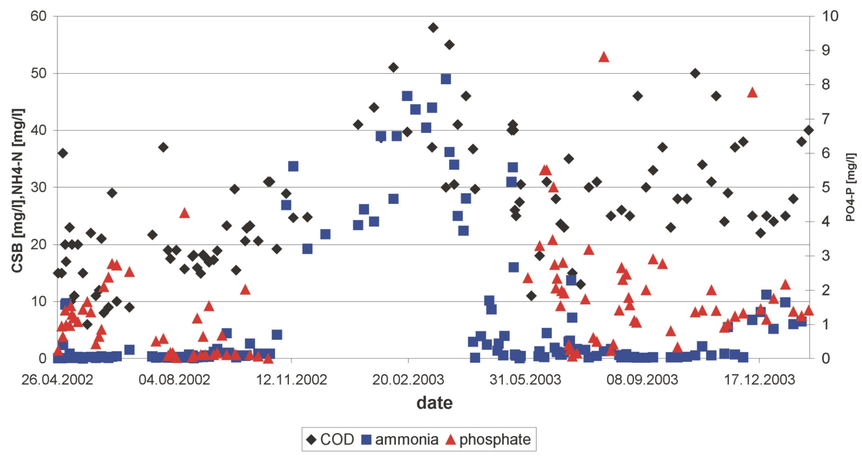
SEM analysis after 18 months of operation:



Membrane surface



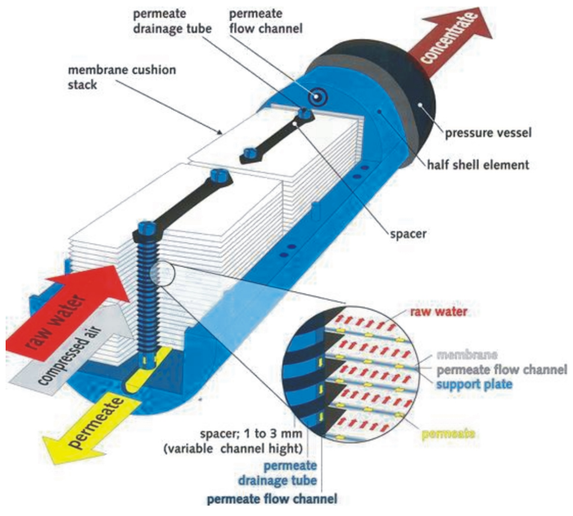
Cross section of the membrane



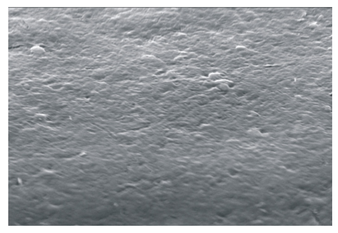
Operational data of the microfiltration plant. Membrane filtration plant operates at stable flux.

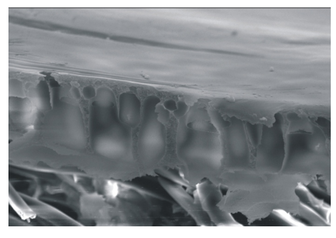
Drinking water production - Nanofiltration

For a case study the permeate of the MBR has been fed into a nanofiltration unit to produce drinking water regarding to the values of the Austrian guideline on drinking water. This second filtration unit acts as a second barrier for pathogenic germs and bacteria, furthermore polyvalent ions and greater molecules are retained to a certain extent. Experiments on the pilot plant have shown an excellent permeate quality, the chemical and microbiological values of the so produced pure water have been validated by an officially approved laboratory.

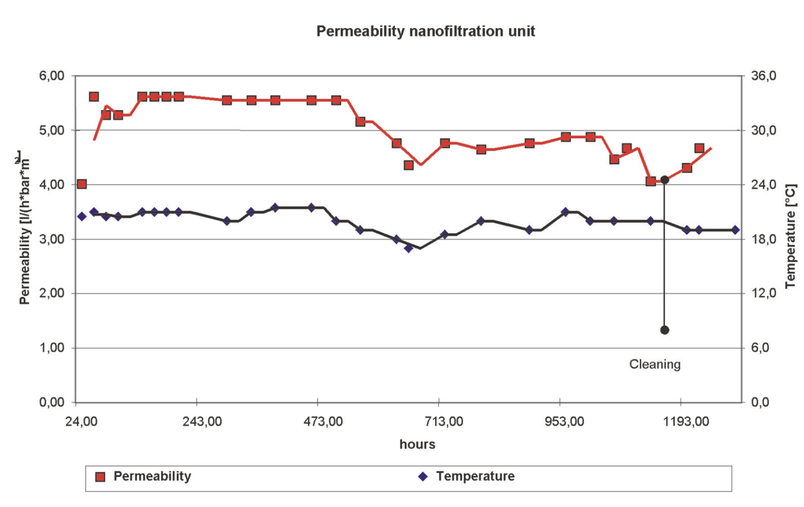


Schematic drawing of the nanofiltration module, flat membranes out of polyamide situated in a pressure tube.





SEM analysis of the membrane surface and the membrane cross section.



Operational data of the nanofiltration unit. Permeability is nearly stable over the whole operation time. Fist membrane cleaning action after 1.169 hours.

Wasserlabor der Grazer Stadtwerke
Nach LMG § 50 Abs.2 autorisiertes Labor für Trinkwasser und Mineralwasser
Wasserwerkgasse 10 , A-8045 GRAZ Tel.:(0 31 6) 887 / 1071 Fax: (0 31 6) 887 / 1078

TRINKWASSERUNTERSUCHUNG

Auftraggeber: DI. Dr.techn Mayr Bernhard, Wittekweg 9, A-8010 Graz — **Prüfbericht:** 02-1612

Bezeichnung der Probe	Probenahmestelle	Probenehmer
Permeat der Mikrofiltration	Ablauf Kläranlage	Buchmüller, Wasserlabor der Grazer Stadtwerke AG
Datum der Probenahme	Entnahmeart	Labornummer
5. September 2002	Direktentnahme	102743

Standarduntersuchung
nach Trinkwasserverordnung BGBl.Nr. 304/2001

Parameter		Messwert		Mes. Unc.			Verfahren
Temperatur	°C	**19,9**		+/- 0,2			DIN 38404 Teil 4
elektr. Leitfähigkeit bei 25 °C	µS/cm	**760**		+/- 10,0			ÖNORM EN 27888
pH-Wert (Laborwert)		**7,0**		+/- 0,1			ÖNORM M 6244
Sauerstoff	mg/l	**4,8**		+/- 0,2			ÖNORM EN 25814
TOC (organisch geb. Kohlenstoff)	mg/l	**0,30**		+/- 0,02			EN 1484
Färbung (SAK bei 436 nm)	m⁻¹	**0,67**		+/- 0,02			DIN 38404 Teil 3
Säurekapazität bis pH 4,3	mmol/l	**0,85**		+/- 0,05			DIN 38409 Teil 7
Gesamthärte	°dH	**8,5**		+/- 0,5			Ionenchromatographie
Carbonathärte	°dH	**2,4**		+/- 0,5			DIN 38409 Teil 7
Natrium	mg/l	**67,80**		+/- 0,5			Ionenchromatographie
Kalium	mg/l	**18,30**		+/- 0,2			Ionenchromatographie
Magnesium	mg/l	**7,50**		+/- 1,0			Ionenchromatographie
Calcium	mg/l	**48,80**		+/- 2,0			Ionenchromatographie
Chlorid	mg/l	**71,5**		+/- 1,0			ÖNORM EN 30304-1
Nitrat	mg/l	**169**		+/- 1,0			ÖNORM EN 30304-1
Sulfat	mg/l	**55,6**		+/- 1,0			ÖNORM EN 30304-1
Ammonium	mg/l	**0,96**		+/- 0,02			ÖNORM ISO 7150-1
Nitrit	mg/l	**0,170**		+/- 0,002			ÖNORM EN 27027
Eisen gesamt (gelöst)	mg/l	**0,05**		+/- 0,02			ISO/DIS 15586
Mangan gesamt (gelöst)	mg/l	**0,025**		+/- 0,003			ISO/DIS 15586
Phosphat (gesamt); PO4	mg/l	<	**0,02**				ÖNORM EN 30304-1
Bor	mg/l	**0,72**		+/- 0,05			ÖNORM M 6606
KBE bei 22 °C	pro ml	**0**					ÖNORM EN ISO 6222
KBE bei 37 °C	pro ml	**0**					ÖNORM EN ISO 6222
coliforme Bakterien	pro 100 ml	**0**					ISO 9308-1
Escherichia coli	pro 100 ml	**0**					ISO 9308-1
Enterokokken	pro 100 ml	**0**					ISO 7899-2

Validation of the chemical and microbiological values by an officially approved laboratory.

EnviCare® Engineering GmbH

engineering consultant for process technology A-8042 Graz, Eisteichgasse 20/36, Austria
Tel. +43-316-381038-0 Fax+43-316-381038-9

Www.envicare.at