Abstract

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WASTEWATER REUSE - THESSALONIKI

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1 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.

First of all the original wastewater plant, built in 1989 as a ventilated pond purification plant (see left pic.), had to be converted. Two of the three existing lagoons were put out of service, while the remaining lagoon was equipped with a ejector aeration system and a partition wall to create a separate settling basin. In this area sludge is collected and recirculated, the excess sludge is removed with the primary sludge.

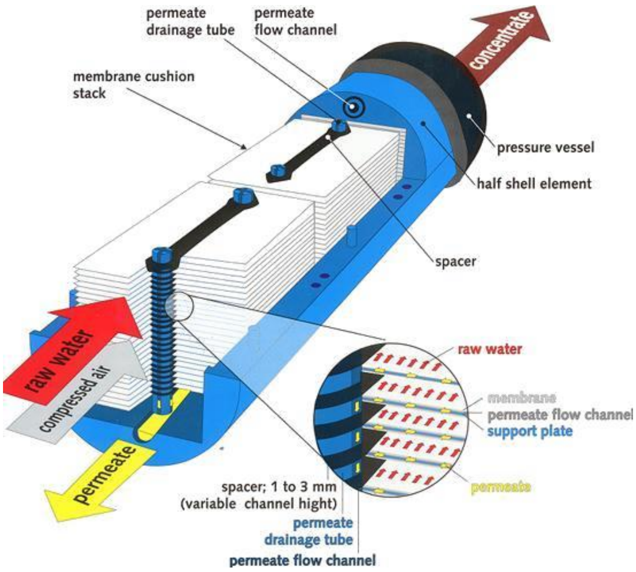
Furthermore lagoon 1 acts as a rainwater buffer basin. To guarantee the stipulated values the whole year (in particular in winter with air temperature below –20°C) the WWTP was equipped with a MEMJET® membrane filtration system, situated in an existing basin used as fixed-bed nitrification in the original plant design. The microfiltration unit consists of polyethylene hollow fibre membranes with a nominal pore size of 0,4 µm which are able to retain pathogenic germs. The MEMJET® process unites three membrane modules at a time, with single hollow fibres oscillating horizontally in the wastewater. The motion is strengthened by a coarse-bubble ventilation situated below the module. The operation mode is intermittent, which allows back flushing with permeate. Due to the design of the plant there is no denitrification possible. Firstly the volume of the MBR is too small to denitrificate in the anoxic areas and secondly the necessary easy degradable carbon is already consumed in lagoon 1.

The following advantages are obvious. Energy consumption of the plant is equal to a conventional WWTP. Most of the dissolved organic matter is degraded in the nitrification basin (MBR).

The basin is due to of technical matter constantly aerated by the coarse bubble system.

Ammonia and dissolved organic matter are degraded nearly complete and the stipulated values can be guaranteed throughout the year. Other important advantages are the low cost expansion of the existing plant, no extra space is needed and any kind of receiving river/lake/groundwater can be used because the permeate is free of solids and there are no pathogenic germs and bacteria in the permeate.

For a case study the permeate of the MBR was 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 confined to a certain extent. The nanofiltration unit uses flat module membranes out of polyamide situated in a pressure tube. Experiments on the pilot plant proofed that a constant excellent permeate quality is essential for the operation of the nanofiltration. The chemical and microbiological values of the so produced pure water were validated by an officially approved laboratory after 6 weeks of stable operation without chemical cleaning or pre-treatment.

Summarizing it can be stated that the production of drinking water meeting the Austrian legal limits is feasible as long as the MBR System is able to degrade nitrogen to a high degree, thus a separate and controlled denitrification step is unavoidable.

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