

Industrial water reuse with integrated membrane system increases the sustainability of the chemical manufacturing

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ABSTRACT

The DECO water treatment facility (built and operated by Evides Industriewater B.V.) is using an integrated membrane system to produce demineralised water for the production facilities of Dow Benelux B.V in Terneuzen, the Netherlands. The system consists of large-scale continuous microfiltration (CMF) unit and two-pass reverse osmosis (RO) unit with FILMTEC™ membranes. It is the first time in the Netherlands that domestic waste water is re-used in such a large scale for industrial use. This is an excellent example of a full scale process which was adjusted to preserve scarce fresh water resources in the region. The main goal—to minimize the environmental impact and to maximize water recovery through water recycling loops, thereby supporting the chemical industry movement to improve sustainability. This paper discusses the operational experience of the first 18 months operation with wastewater. The plant was started in 2000 and was originally designed to desalinate estuary water, due the lack of fresh water in the region. The water source was challenging due to high chemical and biological variability, which lead to operational difficulties like biofouling and high maintenance costs due to corrosion. In 2006 the plant was re-engineered to treat municipal waste water originating from the nearby city of Terneuzen. Re-engineering consisted of new RO membrane design, low pressure feed pumps and process automation adjustments. The DECO plant uses fouling resistant membranes (BW30-400/34i-FR) with a thick feed spacer. The spacer reduces the fouling potential and facilitates cleaning. In addition, the plant is using frequent preventive cleanings, which is only possible with robust membranes. These actions have led to stable operation in terms of permeate flow and the good quality of the produced permeate (<10 µS/cm). This case shows that operational problems caused by the biologically active wastewater can be eliminated by a good plant design (membrane selection) and good operational practices. The facility reports significant savings, 20% increase in the system recovery and 50% reduction in the operational cost (OPEX) with the implementation of the waste water treated system. The savings in OPEX are mainly related to energy costs and decreased use of chemicals for water treatment. In addition, the environmental impact is reduced as the city's waste water is no longer discharged to the sea, but given another life as process water.

Keywords: RO; Municipal waste water; Industrial water; Integrated membrane system; Water reuse; Fresh water; Sustainability

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