

Clean, Clear And Clever

Municipal Wastewater as a Source for Process Water

New Solution – The reuse of wastewater protects resources thus resulting in environmental protection. That it is possible to combine sustainability with financially attractive solutions for municipalities, industry and water suppliers is demonstrated by the Dutch water specialist Evides Industry Water in its project for the reuse of effluents at the biggest chemical site of Dow Chemical in Europe at Terneuzen, The Netherlands.

The reuse of effluents for different purposes in all kind of industries is state of the art technology in many cases and is practiced successfully by Evides Industry Water since years. Located in the Rotterdam area, the company is the biggest supplier for water related services to the industries



As business development manager **Martin Braunersreuther** is the new contact person for Evides in Germany

in the Netherlands. Evides has had long term experience in treating ground water, surface water and infiltration water into drinking water and is responsible for the treatment and the safe discharge of municipal wastewater of approximately 1.7 million people equivalents (p.e.) and industrial effluents with an equivalent of 200,000 people. These wide ranges of experience offers the best opportunities for challenging reuse projects.

Limited Resources

Despite being surrounded by water, the fresh water yield is quit limited in the south west of the Netherlands. Most frequently, easily accessible water resources are influ-

enced by the tide and contain salts up to 30 g/l. To cover the demand for drinking water and industrial demand for fresh water, vast amounts of water are pumped by Evides through long distance pipelines from our reservoirs near Rotterdam to the south-west region. There the water is treated into drinking water quality. Such conditions make the settling of new and the expansion of existing water consuming industries in this region difficult.

Major Location of Dow Chemical in Europe

Since four decades, Dow operates three crackers near Terneuzen to produce ethylene, propylene, butadiene and benzene. Additionally, there are production facilities for polyethylene, ethylene glycol, polyurethane, epoxy resins, polycarbonate, latex and polystyrene. The total amount of products is about eight million tons per year. In processing, energy production and in form of



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steam, water is one of the main location factors for Dow.

Water Cycle

Because of the geographic conditions combined with Dow's huge water demand, already at an early stage, efforts were made to close the water cycles on site. By commissioning the locations water supply to Evides in 1999, these cycles have been continuously improved. Currently, more than 1,000 m³/hour of wastewater from different origins are reused. This includes the effluents of Dow's own wastewater treatment plant and the polishing of the condensates of different steam consumers on site. To cover the complete demand of demineralized, process and cooling water, Evides uses a variety of different treatment systems. Depending on the origin of the water the treatment steps starts with flocculation and filtration. In case of condensates and some effluents the water can be used without pre-treatment. Afterwards, the water is treated with membrane based technologies like micro filtration (MF) and reverse osmosis (RO) as well as with ion exchange technologies. Altogether, the total production capacity is 2,000 m³/hour.

Waste Water Of Terneuzen

Until 2006, a part of the water demand had been covered by treating seawater in a desalination plant. The design – based

on MF and RO – not only turned out to be cost intensive but also difficult to handle because of fluctuating salt contents, suspended solids and algae. Since Evides took over the water installations huge efforts have been carried out to lower the consumption of water, energy and chemicals. After savings up to 80% of these resources had been realized in most of the treatment steps, investigations into replacing the desalination step were started. The water specialists succeeded by discovering the effluent of the municipal wastewater treatment plant (wwtp) of Terneuzen as being a potential resource for the production of demineralized water for Dow.

In the past, the effluent from the classical activated sludge system had been rejected without further use into the North Sea. After extensive trials the decision was made by Evides to integrate this water into the supply concept for Dow. The existing installation for desalination was modified and has been used for the production of demineralized water. The water is pumped via pipeline to the location of Dow and there it is treated by MF as a first step. The capillary membranes prevent particles and bacteria from entering into the next stage, the RO unit. The low salt content and stable quality of the raw water are the main reasons that the process is financially attractive and technically easy to handle. In

2007, the process design received the Responsible Care Award by the European Association of the Chemical Industry (Cefic), and in 2008, the ICIS Innovation Award in the category of Corporate Social Responsibility.

Further Process Development

Based on the excellent results achieved with the reuse of municipal effluent, Evides looked into the possibilities for a further development with mem-

Biggest MBR in The Netherlands

This MBR project will result in the biggest MBR application in the Netherlands with an average capacity of 400 m³/hour and a peak capacity of 625 m³. It will be the first time that the Norit airlift MBR technology will be used for such a large scale. The airlift technology is characterized by placement of the membranes outside the aeration basins, which makes maintenance works much easier. Besides lowering the con-

“Water is one of the main location factors for Dow.”

brane bio reactor (MBR) technology. The combination of an increased water demand by Dow and the need for expanding the municipal wastewater treatment plant (WWTP) provided the option to combine a new technological approach within the re-use program.

Norit provided a MBR airlift pilot plant with which Evides had run extensive tests to gather technological information for the full-scale design. The result indicated that the MBR effluent can be used directly as feed source for the RO units. The investment to replace the MF, which would have been necessary due to the end of its life cycle, was saved. For the local water board – owner and operator of the WWTP – the MBR leads to an increase of treatment capacity and quality of effluents.

struction costs in comparison to other MBR technologies, the process is also characterized by low energy consumption. The project is an excellent example for the realization of economical and ecological advantages for all participants.

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Reverse osmosis (RO)