

FEDERAL REPUBLIC OF GERMANY

Practical experience gained with combined activated sludge and membrane process

For some years now, the combined activated sludge and membrane process is used in Germany for the treatment of waste water not only of industrial, but also of municipal origin.

Compared to conventional waste water treatment, the combined activated sludge and membrane process mainly presents the following advantages:

- Small-sized construction because the activated sludge tank volume can be clearly reduced. Secondary settlement and final filtration become unnecessary;
- Disinfection of the effluent because the membranes are effective as barriers;
- Flushing out of activated sludge from the waste water treatment plant into the receiving water body is avoided. The receiving water is not affected by bulking sludge which might develop during the activated sludge process.

This process technology is fascinating because the waste water gets rid of nutrients and is disinfected to a great extent in a single treatment step without causing turbidity.

First findings resulted from semi-industrial tests carried out at the University of Stuttgart, Institute for Hydraulic Engineering in Municipal Areas, directed by Mr. Prof. Krauth. The technical universities of Aachen, Hannover and Darmstadt also have worked on this subject. The University of Kassel studies the combined activated sludge and membrane process as a possible rehabilitation measure for existing waste water treatment plants.

First findings resulting from large-scale tests were made by the water associations in North Rhine-Westphalia, which are submitted to special law. The big water associations in this land look back on a long tradition in the development of new waste water treatment processes. In 1925 the

Ruhrverband (Association of River Ruhr) for example had succeeded in building the first activated sludge plant in Germany, and in 1999 the Erftverband (Association of River Erft) has built the first large-scale plant on the Continent for the treatment of municipal waste water using the combined activated sludge and membrane process. The construction of this innovative waste water treatment plant with a capacity of 3 000 inh. has been supported by the land North Rhine-Westphalia. Moreover, the Ministry for Environment and Nature Conservation, Agriculture and Consumer Protection of North Rhine-Westphalia has given financial support for a research and development project of the Erftverband which aims at

optimising the combined activated sludge and membrane process of the Rödigen waste water treatment plant. This project is now in its second year.

As interim results of these extensive studies the following can be retained:

- Besides a fine screen and an aerated grit chamber/grease trap as pre-treatment measure, the combined activated sludge and membrane process needs sieving of the waste water with the help of rotary screens for example with a mesh size of maximally 0,5 mm;
- The rate of mixed liquor suspended solids (MLSS) should be 12 g/l. Higher rates seriously interfere the operation of the membrane filters, lower rates diminish the advantage of space-saving waste water treatment;
- An oxygen transfer factor (alpha value) of 0.6 has been determined at a MLSS rate of 12 g/l;
- The design flow has to be determined at 20 l / (m² x h) at a waste water temperature of 5°C. This finding applies to the hollow fibre capillary membrane of the company Zenon (Canada) used at the Rödigen waste water treatment plant;
- For chemical purification it is necessary to provide an external flushing tank which ensures a flushing water temperature of 35 - 40 °C and enables chemical purification with citric acid and sodium perchloride;

The permeate quality at Rödigen in Germany (photo: DHV Water).



