

# Nordkanal Wastewater Treatment Plant

**Application:** Wastewater discharge in a sensitive environment

**Capacity:** 12.6 MGD (47,700 m<sup>3</sup>/d)

**Location:** Kaarst, North Rhine-Westphalia, Germany

**Commissioned:** December 2003



## Challenge

Throughout the world, any areas that discharge poor quality treated wastewater effluent into the water supply will ultimately produce a negative impact on the environment. Such was the case with the small community of Kaarst, located just west of Düsseldorf.

Nordkanal is a small artificial canal originally built by Napoleon in the early 1800s to connect Germany and The Netherlands. The canal is currently used as a receiving creek for the effluent of the Kaarst sewage treatment plant, before it flows to a larger body of water. The performance of the conventional wastewater treatment plant in Kaarst needs improvement. The Ministers of Environmental Affairs from both Germany and The Netherlands finally es-

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tablished that the continuous pollution of this water was increasingly detrimental to the environment.

Owned and operated by Erftverband, the existing Nordkanal wastewater treatment plant was outdated and already operating at peak capacity. The plant employed conventional activated sludge technology, which included primary clarification, nitrification/denitrification, and sedimentation tanks.

## Solution

As a requirement to improve the overall quality of the canal, the new plant had to produce 'bathing water quality' effluent, a new standard for specific wastewater treatment plants in Europe. Specifying total coliforms < 500/100mL, fecal coliforms 100/100mL, and salmonella 0/1000mL, it was determined that this new discharge criteria would be best met with membrane bioreactor (MBR) technology to treat the water.

When looking for a proven MBR technology to employ in the upgrade, Erftverband looked at some other municipal wastewater plants in the area, all of which successfully incorporated technology from GE Water & Process Technologies. After extensive piloting using various membrane technologies, the ZeeWeed\* MBR system was again selected as the method of choice for wastewater treatment.

By replacing the conventional plant with a ZeeWeed MBR, the quality of the entire canal is being restored. This body of water will soon be a highly desirable destination, complete with a waterfront bike trail, and in demand for such water sports as canoeing and kayaking. The ZeeWeed MBR consistently exceeds the bathing water quality requirement, and is dramatically improving the environment in the City of Kaarst.

At the commissioning of the plant in December 2003, the Nordkanal WWTP was the largest operating UF MBR system in the world.



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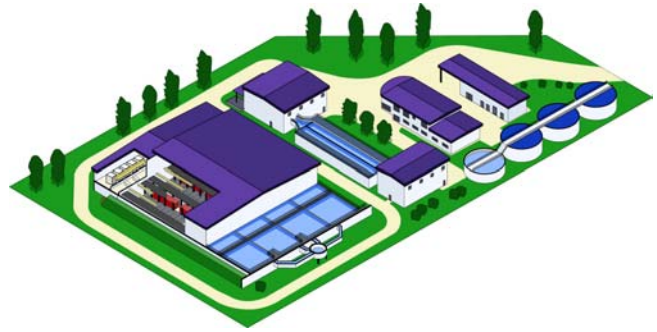
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With a nominal pore size of 0.04 µm, ZeeWeed ultrafiltration (UF) membranes are the key to effective wastewater treatment. The reinforced hollow-fiber membrane acts as a physical barrier, preventing suspended solids and colloidal material from being released in the final effluent. In addition, by placing the membrane fibers directly into the bioreactor tank, the plant footprint now occupies a small fraction of that required for a plant using conventional technology to meet the same capacity and discharge criteria.

## Process Overview



Raw water is collected and passed through a 6 mm (0.2 inches) step screen. The influent then passes through aerated sand and grit removal, followed by a 0.5 mm (0.02 inches) micro-screen. Primary sedimentation is not required, which drastically decreases the overall footprint.

After ferric chloride is added, the wastewater then flows by gravity to an anoxic zone, where most of the denitrification occurs. The mixed liquor then flows to an aerobic/anoxic zone, and then to a final aerobic zone for nitrification. The final aerobic zone also contains the ZeeWeed membranes. Filtration is achieved by drawing effluent through the surface of the hollow-fiber membrane under a low pressure vacuum of -1 to -8 psi (-6.9 to -55 kPa). Once drawn through the lumen of the membrane fiber, treated water is conveyed to the main effluent discharge pipes.

System Summary	
Membrane Type	ZeeWeed 500
Process Train	8
Total Membrane Cassettes	192
ZeeWeed Process Footprint	3,400 ft <sup>2</sup> (320 m <sup>2</sup> )

Typical Treated Water Results		
	Raw Water	Treated Water
BOD (mg/L)	300	< 3
COD (mg/L)	600	< 20
TSS (mg/L)	350	Not Detectable
Turbidity (NTU)	N/A	< 0.05

## Process Flow Diagram

