Ozone treats polluted groundwater

Xylem's turnkey containerized solution

BAYERNOIL Raffineriegesellschaft mbH is an association of refineries consisting of OMV AG (45 %), Ruhr Oel GmbH (25 %), Agip Deutschland GmbH (20 %) and Deutsche BP AG (10 %). The company operates the biggest refinery in Bavaria and ensures the supply within this part of Germany.

BAYERNOIL produces high quality products as liquid gases, fuel, diesel, heating oil and bitumen from 12 million tons of crude oil per year. With 830 employees at three different sites, located at Ingolstadt, Vohburg and Neustadt, Bayernoil is economically quite important for the area.

In earlier pumping trials Bayernoil had identified three contaminated main locations in its premises that showed groundwater and soil pollution with aromatic compounds. Mainly benzene, o-, m- and p-xylene and mesitylene were detected in average concentrations of 5 mg/l and peaks up to 13 mg/l.

In order to meet the allowed discharge limit set by the Bavarian authorities efficient treatment of the contaminated groundwater was absolutely needed prior to discharge into the Danube river.

"Especially the ozone molecule's unique characteristics promised efficient treatment"

Project Evaluation and Pilot Phase
Bayernoil investigated into different potentially suitable treatment technologies as activated carbon adsorption, stripping and various oxidation technologies. After thoroughful comparison of predicted invest and operation costs, Bayernoil decided for an ozone based solution. Especially the ozone molecule's unique characteristics to react very quickly and specifically with carbon double bonds without leaving by-products to dispose, promised efficient treatment.

In the ground water was further studied and various treatment tests performed. The tests confirmed the earlier assumptions and provided detailed data for large scale design.

Project Details
The WEDECO ozone system is designed for treating a maximum flow of 2400 m³/day and produces up to 13 kg/h from LOX at ozone concentration of 13 wt%. For efficient ozone dissolution a venturi-injection followed by a pressurized reactor was chosen.

XYLEM'S SCOPE OF DELIVERY INCLUDED:

- Closed loop pressurized reaction system (including booster pump, injection, reaction tank)
- Closed loop cooling water system
- Complete process control system
- On-site installation including complete piping and cabling

The treated water is mixed with the discharge from the biological treatment plant and subsequently discharged to the Danube river.

Project Economics

Since putting the system in operation in July 2006 the ozone system has treated average flows of 1200 m³/d with peak flows up to 2160 m³/h at average ozone dosage of approx. 20 g O3/m³ meeting the customer's requirements and discharge limits.

"Xylem was considered as the right partner for Bayernoil due to its extensive experience in oxidative water treatment"

Depending on the actual waste water composition and pollutant concentration the ozone system can be operated from 5 to 100% offering highest flexibility and minimized operation cost.

Due to the high efficiency Bayernoil considers to utilize the available spare ozone capacity for future applications i.e. sludge oxidation and cooling water treatment inside their facilities, while treated water can be further reused.

Parameter	Unit	Discharge limit	Treatment results
BTEX	mg/l	0.05	< 0.01
Benzene	mg/l	0.01	< 0.004
COD	mg/l	80	< 80
Phenol index	mg/l	-	non detectable

Table 1: Treatment results of ozone system

Xylem was considered as the right partner for Bayernoil due to its extensive experience in oxidative water treatment, the ability to verify the specific solution in Xylem's lab and the proven capability to deliver projects of the needed complexity as a turnkey solution.

The installed WEDECO system fulfils the discharge limits and meets the client's expectations for operational flexibility and ease of operation.

BAYERNOIL Raffineriegesellschaft mbH

Container installation and reaction tank

WEDECO Ozone generator and injection system

xyleminc.com

Xylem Water Solutions Herford GmbH
Boschstr. 4 – 14
32051 Herford, Germany
Phone: +49 5221 930-0