Treating the root of the problem

Dealing with mining waste water presents a number of challenges, Sean McKinney writes.

Successfully treating mining effluents presents major challenges for water treatment companies, who are frequently faced with remote sites and extreme environmental conditions, significant fluctuations in water quality, and a variety of contaminants.

Each mine requires a tailored wastewater treatment system to ensure the treated effluents (which can also be from tailing processes or mine dewatering) meet site-specific conditions and the required quality to allow reuse of the water within the mine.

"Ensuring sustainability of water supply is an important factor for any mining operation," Nirosoft Australia regional manager Ravid Levy said.

Nirosoft provides water and wastewater treatment applications.

"Water must be considered and treated accordingly for each individual requirement," he explained.

Levy pointed out that wastewater quality fluctuates significantly from mine to mine.

Mining effluents may contain many different types of contaminants, including those such as extreme pH values, heavy metals, suspended solids, organic materials, dissolved solids, and high conductivity.

Each mine requires a tailored treatment system for particular contaminants.

Devising an appropriate treatment solution must be based on sound quantitative data on wastewater quality and flow regime.

"Conducting a feasibility study, while drawing from our experience in similar challenges around the globe, provides our engineers with vital information which goes into the development of a tailormade solution, customised to site-specific conditions and client requirements," he said.

A typical industrial or mining wastewater treatment plant could include any combination of the following treatment stages: gravity clarification for the settling of large solids; dissolved air flotation for the removal of oils and grease, coagulated solids, and organics; and multimedia filtration for the removal of residual TSS and turbidity.

These stages are usually followed by a high quality pre-treatment such as ultra-filtration membranes which optimises the performance of reverse osmosis (RO) desalination.

"Multiple RO stages may be required in order to achieve maximum recovery and minimise the amounts of brine disposed to evaporation ponds or the environment," Levy said.

"Treated effluents can be reused in a variety of applications such as process and rinse water, dust suppression, irrigation and onsite landscap-

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12 Kathleen Street Welshpool, Perth WA 6106 (PO Box 591 Belmont WA 6984) • Australia • T +61 (0)8 9470 2500 • F +61 (0)8 9470 2555
info@normet.fi • www.normet.fi

ing, as well as discharge to surface waters or aquifer reinjection."

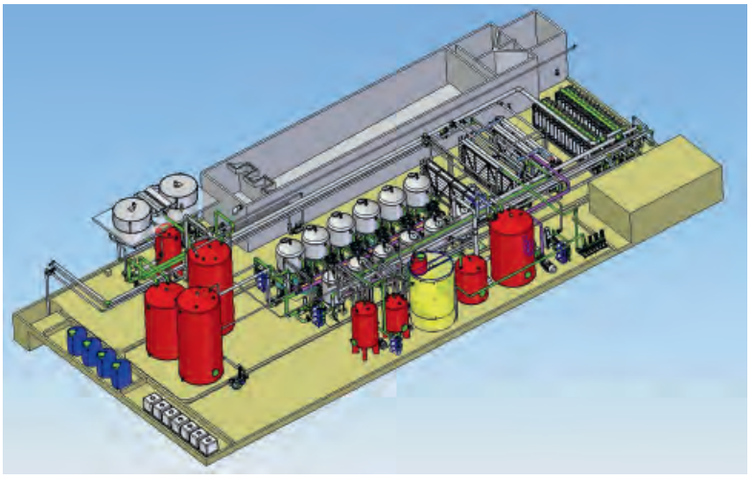
The company has designed and supplied treatment systems which allow recycling of water fit for a wide variety of applications including mining, oil and gas, power, agriculture, and manufacturing industries, as well as potable water supply and municipal effluents recycling.

Nirosoft's two decades of experience in developing skid-mounted, trailer-mounted, and containerised systems, using membrane and other advanced purification technologies, plays a valuable role in developing solutions to meet the specialised needs of the mining industry.

In 2008, the company developed a wastewater and tailing treatment system for the Collahuasi copper mine in Chile, the country's third-largest copper producer. The open cut mine and its processing plant which handles copper and molybdenum ores are located in Northern Chile, approximately 60 kilometers south of the city of Iquique.

The ore processing leaves large volumes of contaminated and saline effluents which used to be discharged to the environment after only minimal treatment.

The wastewater has high levels of TDS, chemical oxygen demand (COD), hardness and total suspended solids (TSS), as well as high concentrations of sulphate, silica, iron and other heavy metals.



A multistage plant allowed for proper waste treatment at the copper mine.

The raw wastewater fluctuates greatly, which make the water extremely challenging to purify.

"In order to handle these effluents and maximise water reuse while reducing discharge to the environment, Nirosoft designed, built and commissioned a multistage treatment plant," he said.

"Installation of the plant was a key condition posed by the local environmental authorities to allow expansion of the mine's operations."

The treatment stages include coagulation, flocculation, settling, dissolved air flotation (DAF), multimedia and granular activated carbon (GAC) filtration, and an integrated membrane solution which combines pressurised hollow fibre ultra-filtration (UF) followed by a three-stage seawater reverse osmosis (RO) membrane process.

"In order to maximise overall system recovery, the backwash water of the pre-filters and UF membranes is fully recycled to the feed buffer tank, prior to the clarifier and DAF," he explained.

The raw wastewater flow of 216 m3/hr (~5 ML/day) is treated to produce approximately 170 m3/hr (~4 ML/day) of desalinated product water which represents a recovery rate of approximately 80% for the entire process. The treated water is then reused for process, woodlot irrigation and dust suppression.

During its nine years of operation in Australia, Nirosoft has provided water desalination systems for communities located in remote regions, coal seam gas water desalination, process water for industrial and energy generation operations, and effluents recycling systems.

"Developing effective systems for the treatment of mining effluent requires extensive knowledge and experience with similar systems and a wide variety of technologies – systems that meet the most stringent engineering, environmental and regulatory standards and requirements," Levy stated.

**Sean McKinney is the Business Development Manager for Nirosoft Australia.*

• **Nirosoft Australia**
03 8862 6405
australia@nirosoft.com
www.nirosoft.com