

HARRISON WESTERN

Protecting Watersheds and Reclaiming Polluted Water By Gary Chandler

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orldwide demand for water is doubling every 21 years and the World Bank reports that 80

countries already have water shortages that threaten health and economies. Agriculture and other industries are all competing with a growing global population for limited fresh water resources.

Mining companies and oil and gas producers, in particular, are feeling the forces of tighter water supplies and tighter discharge regulations that are part of the growing watershed-management trend around the world. As a result of the growing pressures, significant progress has been made in technologies and best practices for conserving, purifying, recycling, and desalinating water in an effort to increase freshwater availability and quality.

HW Process Technologies (HWPT), for example, has been solving water pollution problems around the world for decades. The quiet giant from Colorado got into the water treatment business by helping many of the world's largest mining companies to successfully treat mass quantities of mine water. Because of HWPT, these mining companies are able to reclaim millions of gallons of clean water, while reclaiming valuable metals and chemicals from wastewater.

HWPT also developed successful water treatment solutions for oil and gas production for both produced water and "frac" water. The custom-designed systems can improve various industrial processes that rely on fluid and chemical management.

HWPT was founded in 1988, determined to solve the environmental concerns associated with water management in the mining industry. Because mine water discharges are high-impact problems, HWPT sees responsible water management as part of their clients' "social-license-to-operate." The water treatment systems offered by HWPT have proven superior in performance and economy relative to traditional chemical precipitation systems.



HWPT's powerful systems process more than 10,000 gallons of industrial-grade wastewater per minute at one installation. In the water-intensive mining industry, for example, high-volume and high-performance are critical because the potential impacts of mining on the water environment include:

- Seepage of contaminated water from mine tailings and closed mine operations
- De-watering of active mining operations
- Recovery of valuable metals and solvents otherwise lost through wastewater discharge

HWPT has already installed numerous custom water treatment systems for mining companies, oil and gas developers, and government agencies around the world. Although the company is based in Colorado, all of its installations so far have been

dollars of returns by producing usable water, and capturing valuable metals and chemicals.

Although the company is continuously improving its systems and expanding their applications, one of HWPT's first, large mining installations showed an immediate payback. When commissioned, the challenges that HWPT confronted at this open pit copper mine in Mexico included:

- Dewatering the pit and reducing the volume of acid leach solution;
- Increasing copper concentration in the leach solution for enhanced recovery;
- Reducing acid costs by recovering acid and avoiding the cost of neutralization with lime; and
- Recovering large volumes of clean water for mine use.

The breakthrough system recovered 2.5 million gallons of clean

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outside of the United States. Even though HWPT's clients are reclaiming millions of gallons of clean water every day, the systems also reclaim many thousands of dollars worth of valuable minerals and chemicals from the water treatment process. This protects the watershed and also protects the bottom line by allowing efficient and environmentally responsible operation.

As operational and environmental pressures on mining, oil, gas, and other industries continue to rise, HWPT's proprietary EMS® water treatment systems are more important than ever. For example, one client was forced to shut down mining operations completely for several months due to water-discharge problems. HWPT's engineers immediately installed one of its high-performance systems to replace a competitor's failed reverse osmosis membrane system and the mine was producing again. Elsewhere in the world, a large mining company credits HWPT for tripling gold production by increasing the mine's water treatment capability. That system is generating millions of

water and 28,000 pounds of copper each day. The system increased copper production 14 percent by recovering copper otherwise lost in the mine wastewater. With current copper prices and water prices factored in, the company realized a 200 percent return on its total investment each day. Capital investment in the EMS® system was recovered in 1.7 years. Some of HWPT's clients have recovered their investment in just four months.

Specific water quality problems in mining that are addressed by HWPT systems include salinity and acidification. The mining process exposes heavy metals and sulfur compounds that were previously locked away in the earth. Rainwater leaches these compounds out of the exposed earth, resulting in acid mine drainage (AMD) and heavy metal pollution that can continue long after the mining operations have ceased. Similarly, rainwater on piles of mining waste (tailings) can transfer pollution to freshwater supplies. Plus, huge pools of mining waste are often stored in containment ponds. If a dam leaks or bursts, entire watersheds can be contaminated.



HW Process Technologies is based in Lakewood, Colorado, but all of its installations are outside of the United States. Above, the company loads one of its systems into an Antonov 125, the largest operating cargo aircraft in the world, for delivery to a client in Europe.



Mine waters are notoriously tough to treat because of the volume and the complexity of the waste streams. HW Process Technologies installed and operates the largest membrane treatment system in the global mining industry. This unit treats millions of gallons per day, while reclaiming tons of usable metals and chemicals from the waste stream at this site in South America.



HW Process Technologies' patented Engineered Membrane Separation systems filter out the components of an aqueous stream by applying pressure and flow across a semi-permeable membrane. These high-performance systems can treat thousands of gallons of polluted water per minute.



An engineered membrane system similar to the one pictured above recovered 2.5 million gallons of clean water and 28,000 pounds of copper each day at an open pit copper mine in Mexico. The custom designed treatment system increased copper production 14 percent by recovering copper otherwise lost in the mine wastewater.

Industry, labor, government, and environmentalists agree AMD is the number one environmental problem facing the mining industry. It is a common problem in all countries where mining started prior to environmental legislation. Many mines are reaching the end of their productive life and as a result, dewatering is terminated and re-watering results in the decant (overflow) of AMD. In addition, tailings dams and waste rock dumps are surface sources of AMD.

AMD devastates fish and aquatic habitat, is difficult to reverse with existing technology, and once started, costs millions of dollars annually to treat (continuing for centuries). The Iron Mountain mine in California, for example, has been closed since 1963 but continues to drain sulfuric acid and heavy metals into the Sacramento River. The mine's effluent streams are void of life and have a pH range of 0.2 to 1.5. The Equity Silver mine north of Vancouver, British Columbia will require treatment for AMD for at least 500 years.

Many benefits result from AMD neutralization and precipitation. For mining operations in positive water-balance environments, where site discharges are required, the treatment system can reduce mercury, arsenic, thallium, selenium, antimony and molybdenum in water to the double-digit parts-per-billion level or less.

HWPT's patented technology utilizes composite thin-film membranes with pore sizes different than the reverse osmosis membranes commonly used for seawater desalination. The pore size, membrane material, and operating conditions are all specifically engineered by HWPT to allow operation at lower pressures, maximizing the recovery of contaminants.

The feed stream is separated into a permeate solution and a concentrated solution. The permeate passes through the membrane, while the concentrate is held back with the thicker dissolved solids, organics and bacteria. A series of membranes can continue screening the permeate solution to remove various elements in a sequence that captures the smallest particles and chemicals last before releasing clean water.

EMS® systems can be designed to selectively screen ions such as aluminum, calcium, chloride, copper, gold, iron, magnesium, nickel, selenium, uranium, zinc, not to mention chemicals used in oil and gas exploration and production. The robust systems can be designed to reject



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sulfate, silica, organics, colloids and other contaminants as well.

For coal bed methane, the EMS® system can be used for the production of surface discharge-quality water under the most stringent environmental guidelines. In the oil and gas fields, the contaminated waters produced can be treated to recover potable water. As these wells age and become depleted, they typically produce more water.

HWPT is driven to succeed where other water treatment companies fail. After proving its technology in the toughest mining waters, the company is confident that its custom systems can clean up any water anywhere in the world.

HWPT already has a strong international presence, but countries such as China, India, and those throughout Southeast Asia, South America, and Africa present a number of opportunities to help numerous stakeholders. For example, HWPT systems can clean toxic waters from mines that are currently operating, and mines that are considered exhausted, but still discharging toxic waters. With proper treatment, these polluted mine waters can be cleaned up and safely used again.

Plus, industrial process waters around the world – previously considered too polluted to clean – can be treated and used for other purposes, while the reclaimed chemicals can be reused in the industrial process. Many countries also have highly polluted lakes due to policies that once allowed pollution in discharged waters. Now these countries must remove these pollutants to reclaim local water supplies and entire ecosystems.

International partners and suppliers will play a critical role as HWPT expands its network around the world. Emerging global alliances will help the company manufacture equipment and materials to exacting specifications at a lower cost. In fact, HWPT is exploring opportunities with two Chinese research institutes to keep its products on the cutting edge of treatment technology in industrial applications. HWPT has had a strong research relationship with the world-renowned Colorado School of Mines in Golden, Colorado for many years. These global alliances and others will help HWPT reclaim many millions of additional gallons of water around the world.

For more information about HW Process Technologies, visit www.harwest.com or call 1-800-638-8793. ▲

Turn Discharged Water Into A Liquid Asset

Turn discharged water into a liquid asset with our high-performance, high-volume industrial water treatment systems. We offer both environmental and process applications that pay for themselves by reclaiming valuable resources and clean water. We design, manufacture, install, and operate proprietary solution treatment plants for mining, oil & gas, and environmental remediation applications.



HW PROCESS TECHNOLOGIES INC

PROVIDING FOR THE ENVIRONMENTALLY RESPONSIBLE
DEVELOPMENT OF THE WORLD'S NATURAL RESOURCES™

After serving the global mining and energy industries for more than 20 years, we understand water discharge problems better than anyone. To find out more about water treatment systems that work in mining, oil, gas, and other industrial applications, visit www.harwest.com or call 1-800-638-8793.

Lakewood, Colorado, USA