

Progressive Cavity Pumps Cut Maintenance Costs for Boric Acid Production

By Pumps and Systems Staff

A major producer of boric acid was experiencing high maintenance costs with the three progressive cavity (PC) pumps it had been using for the transfer of a slurry comprised of acid-dissolved solids at the final stages of its mine-related production process. During several years of operation, the pumps increasingly required more money and man-hours to keep them running at acceptable flow rates. By installing three new PC pumps, however, the company has eliminated the high costs of maintaining the old units and received a payback on the current pumps in their first 15 months of operation.

U.S. Borax Inc., Boron, CA, is an international producer of refined borax, a mineral used in a wide variety of products, ranging from agricultural chemicals to heat-resistant glass. At present, almost half of the world's borax (sodium tetraborate decahydrate) comes from the sodium borates mined at Boron in California's Mojave Desert, one of the largest borate deposits in the world.

The current mine was first developed in the early twentieth century. In 1980 a plant for producing boric acid from kernite, a sodium borate mineral with four molecules of water,

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was added, enabling the company fuller usage of the mine's kernite ores and strengthening U.S. Borax's position as the world's leading boric acid supplier.

Production of pharmaceutical and special quality grades of borax and boric acid, as well as a number of other products for industrial, agricultural and other specialty applications, takes place at the U.S. Borax facility located in Wilmington, CA, in the Port of Los Angeles.

At the boric acid plant, the processing operation is fairly straight-forward, according to Chuck Starker, senior mechanical engineer at the Boron facility. Kernite ore, he says, is transported by conveyor belt from the open pit mines to the plant, which is about a quarter-mile away. The ore is moved seven days a week, 24 hours a day.



Photo 1. This progressive cavity pump is one of three transferring boric acid crystals from cone/settler tanks to a vacuum belt for additional dewatering at Borax's Boron, CA facility.

The ore then goes through a primary crusher and is conveyed on a belt to a stockpile. It is reclaimed from the stockpile and put through a secondary crusher. At this point, the ore is dissolved in sulfuric acid. The resultant slurry is classified, a process that removes most of the solids.

The main stream goes through a filtration process, which makes it cleaner by removing fine insolubles. Vacuum crystalizers cool the liquor and the formed crystals are washed to purge any impurities. The clean crystals are transferred to three cone-settler tanks where liquid is pulled off the top.

At the base of each tank, a gravity-fed PC pump transfer the crystals to a nearby vacuum belt; here the solids are dewatered and

processed through rotary driers. The technical grade boric acid is then conveyed to the shipping department.

Starker points out that the PC units are used to meter the product rather than pump it through the process. It was the old PC pumps that were creating a major maintenance problem. In their last year of service, he says, the units were costing about \$65,000 per year to maintain, not including the extra man-hours required to keep them in operation.

The previous pumps were experiencing failure of the universal joints and the rotors because these parts were being attacked by the boric acid. The units were equipped with gear-type universal joints, and the boric acid was infiltrating the joint and dissolving the joint lubricant. Once the lubricant was dissipated, the joint quickly failed. The boric acid was also attacking the chrome plating used on the rotors. The plating was peeling off the rotor, leaving sharp edges that quickly destroyed the stators.

Looking for a solution to its pumping/transfer problem, Borax turned to

Cortech Engineering, Inc., a regional fluids-handling firm that supplied the plant with three seepex Type 35-6L PC pumps, plus an additional unit for use as a spare. The pumps are constructed with cast iron housings, Duktil®-coated rotors, and molded-to-size Hypalon® stators. The units run at between 33-150 gpm.

The seepex units were equipped with positively sealed and lubricated pin joints, which have a more positive sealing design and are easier to assemble than the gear-type universal joints. The seepex rotors are also coated with a proprietary coating, Duktil®, which diffuses into the base metal. The Duktil® coating is harder and less prone to being stripped from the rotor if the base metal corrodes.

In operation, the positive displacement pump's single external helix rotor turns within a molded double internal helix stator to form progressively moving cavities that create the pumping action. The pump's output is directly proportional to its speed, and its customized stator ensures an identical compression ratio along the entire length of the rotor/stator interface.

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As a result of the changeover, Starker observes that the seepex units have operated maintenance-free for more than fifteen months. "We perform routine maintenance on the pumps," he says, "as we do with other operating equipment, and that's all. The new pumps have easily paid for themselves in just over a year of operation."

For more information on the complete line of seepex PC pumps, circle number 400.

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