Pumping Power

Failure Goes Down the Drain

Diaphragm pumps have been the preferred medium for the transfer and supply of abrasive slips and slurries for more than two decades. Moreover, their portability and design simplicity ease the work of stone, clay and glass process professionals. A good example can be seen at the vitreous china production facility of a major manufacturer of ceramic toilets, sinks and lavys. The plant has the capacity to mold, glaze and bake 3,000 of these a day. Requiring thousands of gallons of slip, the facility's transfer pump is the heart of the operation. Unfortunately, the company's 12-member maintenance team was coping daily with chronic heart failure. Ingersoll-Rand's ARO diaphragm pumps were adopted to solve the problem. There are now 85 two- and three-in. port diaphragm pumps working 24/7 with optimum mean time between failure &#151 in some cases, nine months. They keep production moving from the rail cars and tank trucks that deliver the base liquid slurry through a maze of holding, mixing, filtering, adjusting and distribution tanks and totes. The company's former pumps typically required swap-out every 24 hours for diaphragm replacement. To understand pump downtime and mean time between failure &#151 or MTBF &#151 it's important to realize that there are three key components involved in the function of a double diaphragm pump. One is the air valve that shifts the diaphragms. Second are the diaphragms. Third are the checks that alternately open and close, permitting the side-to-side passage of fluid. These three were the cause of the plant's 14-year, 24/7 maintenance malaise. Because the pumps operate on cold, often wet compressed air, adequate exhaust porting is essential. Without it, ice begins to form on the air motor. In continuous operation, as this plant's pumps are, ice would build until the shift valve froze and the pump would stop. Previous solutions to the problem included pouring water over the valve housing, placing a space heater by the pump and even hitting the pump with a hammer. These were discarded when ARO's "quick dump" air valve was employed. It shunts cold, wet exhaust air away from the shift/pilot valve, avoiding the icing problem. Typically, the old diaphragm pump's shift valves, operating under 35 pounds-per-square-inch, would lose their pressure signal and lock up. The ARO valve &#151 an "unbalanced" air valve that keeps continuous pressure at one end of the valve &#151 eliminates lockup even under low inlet pressure. The slurry and slip that make up sanitary ceramics contain a mixture of ground glass, clay and other materials. While there are diaphragm elastomers that can stand up to the destructive properties of these materials &#151 along with constant cycling &#151 it's as much the diaphragm's design as its material composition that determines MTBF. At one point in the plant's pump maintenance schedule, diaphragms failed daily. Repair time and a large shelf supply of diaphragms were the order of every day. With the new pumps, convoluted diaphragms are pre-formed to anticipate the abrasion and pressure points that wear down and break through traditional diaphragm designs regardless of their material

composition. Design also plays an important role in the seats and checks that lift and re-seat with every pump cycle. If the pump's checks don't seat properly, the continuous action of lifting and seating will cause the ball to wear unevenly, weaken and break. In this case, the checks in their former pumps would break and send pieces of the fragmented ball down the line with the slip. This problem was eliminated with the new diaphragm pumps. **Information: www.arozone.com**

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