TECHNICAL ARTICLE SERIES

Three Sump Pumps Survive 18 Years of Corrosive Service

ARTICLE # TL-129

INDUSTRY: Wastewater Industrial

ENTITY: Dyno Nobel

SOLUTION(S) PUMPED: Nitric acid, Sulfuric acid, Glycerine

PUMP TYPE(S): SUMP-GARD Thermoplastic Vertical Pump

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At Dyno Nobel, nitroglycerine-contaminated wastewater is collected in outdoor sumps, which are sealed and equipped with Vanton polypropylene sump pumps. To minimize potential explosion risks from accumulated nitroglycerine, the pumps have been customized to ensure complete drainage of the hazardous fluid when the pump is removed for maintenance.

Three Sump Pumps Survive 18 Years of Corrosive Service

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Submerged in acidic wastewater for years, these polypropylene pumps are still thriving

When estimating the potential life of severe-service process pumps, design engineers often think in terms of years, not decades. Back in 1977, Dyno Nobel (Carthage, Mo.) —owner of the last remaining dynamite plant in North America —selected sump pumps to handle the acidic wastewater from its nitroglycerine manufacturing facility, the firm opted for pumps constructed of thermoplastic rather than metal. After nearly two decades of continuous service, the three plastic pumps from Vanton Pump & Equipment Corp. (Hillside, NJ) continue to function as expected and to date, they have required no major repairs or replacement.

The Dyno Nobel facility produces nitroglycerine using the traditional raw materials of nitric acid, glycerine and sulfuric acid. The wastewater from the manufacturing process contains small amounts of these raw materials, as well as traces of nitroglycerine, a powerful explosive. This corrosive wastewater drains to sealed, outdoor sump tanks. From there, it is pumped to the facility's wastewater-treatment system.

The three Vanton pumps handling the acidic wastewater in the sumps are constructed entirely of virgin polypropylene. Each pump has a capacity of 50 gpm at 120 ft head, and is driven by a 7.5-hp, 3,600-rpm motor.

Aside from the motors, which are installed on top of the sump cover, the majority of each pump's body, including the polypropylene support column, is house inside the sump, with the impeller and casing continuously submerged in the corrosive wastewater. The 5.6-in.-dia impeller on each pump is driven by a 36-in.-long shaft. The shaft is constructed of stainless steel to ensure adequate stiffness, but it is isolated from contact with the wastewater by a polypropylene sleeve, which is welded to the impeller. The sleeve bearings are made of reinforced polytetrafluoroethylene, or Teflon. All other wetted parts are constructed of solid, homogeneous virgin polypropylene.

The polypropylene construction provides two important benefits in this application. First the material is inert to chemical attack by the nitric and sulfuric acids in the wastewater. In addition, the smooth, crevice-free surface of this thermoplastic pump reduces the potential for small amounts of waste nitroglycerine to accumulate in the pump. This minimizes the risk of potential explosion when the pumps are removed for inspection or maintenance. Any nitroglycerine remaining in the pump could create a hazard for maintenance workers.

To further reduce potential hazards during pump maintenance and inspection, all sections of the pump casing that could retain fluid have

had notches or drain holes cut. This guarantees that when the pump is lifted out of the sump, all liquid —including trace amounts of nitroglycerine —drains out of the casing and stays in the sump. Even the Teflon sleeve bearing has been customized with spiral grooves to facilitate drainage.

These pumps operate in an of-off mode, based on wastewater levels in the individual sumps, and they move this aggressive waste to the onsite treatment plant 24 h/d, seven days per week. Despite continuous exposure to acidic waste, these pumps have flourished for more than 18 years, requiring limited, routine maintenance.

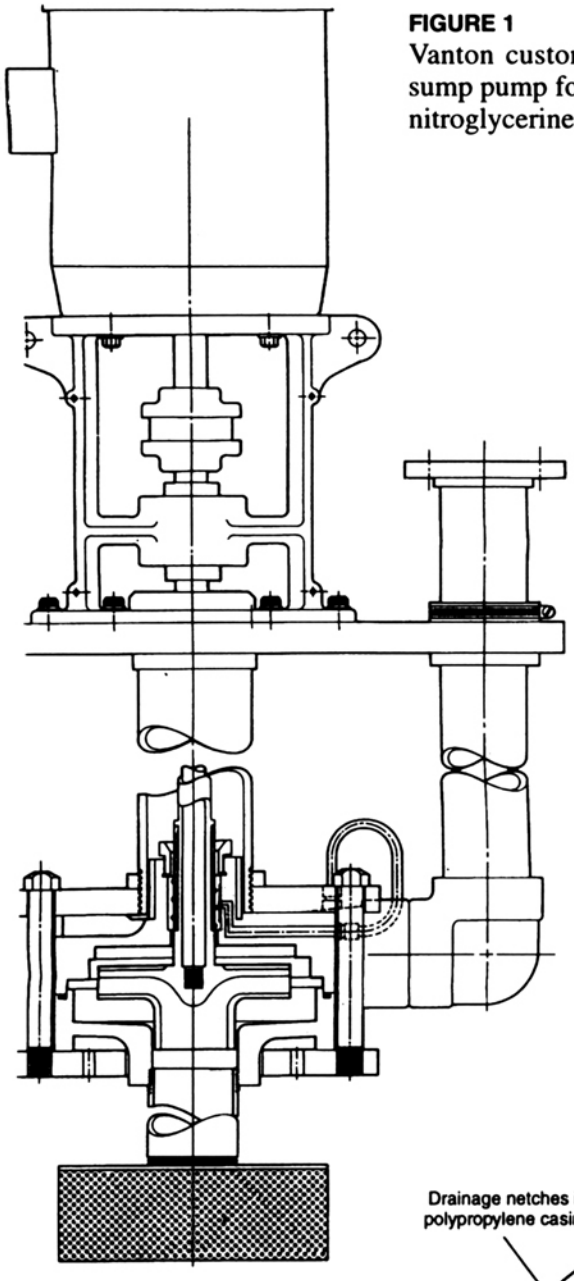

FIGURE 1
Vanton customized Sump-Gard® polypropylene sump pump for handling corrosive and hazardous nitroglycerine.

FIGURE 2
Isometric cut-away of wetted end to show critical drainage passages.