Industrial Machining Applications with VFD

A major metal finishing company in Ohio has a joint venture between a United States Steel company and a Canada-based holding company with 40 companies that provide electroplating, machining of high-tolerance parts and assemblies and development of new finishes for steel work rolls that are used in steel and aluminum rolling mills. This major metal finishing company has seven locations in the United States. Its 50,000 square-foot plant in Ohio, employs about 50 people. Operations involve grinding, machining, and plating metal in the refurbishment of process rollers, which provide superior finishes on sheets of steel and aluminum.

The Challenge

Like many metal finishing operations, the plant flows a cooling bath—mostly water—over the cutting elements during the machining of steel rollers. Large amounts of metal shavings called grinding fines end up in solution as the coolant washes over the cutting surface; these fines must be removed in order to reclaim and reuse the fluid. Spent coolant is channeled from several work areas into a 250- to 300-gallon catch sump, from which the company had been using diaphragm pumps to move the coolant to a filter for reclamation of the fluid.

Because of the need to keep the coolant moving through the filter at a constant pace, with the grinding fines always in suspension, it is important that the sump maintain a constant three-foot fluid level. The company previously varied the air supply to the diaphragm pump to adjust the flow of fluid and maintain the sump’s level, but the pumps were noisy and difficult to regulate. Furthermore, the grinding fines were tearing the pumps apart, and the company was replacing pumps every

four to six months—a costly situation for a relatively small plant. The environment was so hostile to pumps that several companies declined to even submit a quote for new pumps.

The Solution

BJM recommended its SV22, a 3-horsepower recessed vortex impeller pump designed especially for solids-heavy sewage and industrial uses. The pump incorporates silicon carbide mechanical seals and an optional proprietary-design inverter duty motor with special “R”-class insulation. To further protect the pump from the destructive grinding fines, BJM worked with its distributor, Atlas Supply, to harden the impeller with a special coating. The pump is combined with the plants existing Automations Direct variable frequency drive (VFD) and an ultrasonic level control that is connected to the VFD to adjust the line frequency of the pump and thus maintain the constant three-foot level in the sump.

BJM engineering mapped out the system’s performance curve at various operating speeds, and based on this information, a “T” was added to the discharge line so that half of the fluid is now sent to the filter and the other half is recirculated within the sump for optimum hydraulic performance and to agitate the liquid, keeping the metal fines in suspension. While the line frequency to the pump normally ranges from 45 to 50 hertz, the SV22’s motor has the ability to go outside this range when required. Atlas Supply provided a mechanism to control the motor’s speed, which starts at 3,600 rotations per minute but must slow down by as much as 15 percent under heavy load to match the flow capacity of the filter. The system has been successfully pumping approximately 100 gallons per minute since the late winter of 2010. While the SV22 has been rebuilt once, the solution has halted this metal finishing plant’s frequent and expensive replacement of its pumps and prolonged the life of its filters.

BJM Pumps *[1]® is headquartered in Old Saybrook, CT and has been serving the industry since 1983.*

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