Case Study 01.2016

The Pump Peoples

A Modern Gorman-Rupp Solution for Lima's Aging Lift Station Problem

Gorman-Rupp overcomes rehabilitation obstacles in providing flexibility and cost-efficiency for the City of Lima's below-ground sanitary lift stations

An urban oasis nestled in the heart of Ohio's rich farmland, the City of Lima is also the county seat of Allen County with a sewer-service population of approximately 48,000.

The Problem:

In March of 2013, the city's Long Term Control Plan (LTCP) initiated an EPA-approved, 24-year, \$150 million project to replace or rehabilitate the municipality's wastewater treatment plant operations, including lift stations.

Many of the existing Lima collection system pump stations consisted of below-ground steel dry wells installed in the 1970's with direct and/or flex-coupled horizontal and vertically mounted pumps, with electric motors. These dry pit pumps required considerable maintenance, were difficult to disassemble and access when clogs occurred and over time, had become inadequate for keeping up with the city's increasing sanitary sewer and combined storm water requirements. These stations also serviced over 251 miles of sewer lines, 20 combined sewer overflow (CSO) sites and 32 sanitary sewer overflow (SSO) sites.

The City of Lima and its contract engineering firm, URS Corporation (Columbus, Ohio), had determined early on in the planning phase that replacing all 24 of the 31 stations were not financially feasible. Since most of





Early below-ground pump stations were constructed of either steel or fiberglass with only the manhole/ entrance hatch exposed.

the existing below ground steel cans were in relatively good condition, due to cathodic protection and protective coatings, it was determined that the stations would be rehabilitated with all new pumps, motors, valves and piping components instead.

With the goal of freeing up space within the belowground dry well structures, the decision was made to locate new pump control panels above-ground in weathertight enclosures.

The Solution:

Lima's Utilities Department had Gorman-Rupp pumps installed at some of their stations for many years and had found that they were extremely reliable and virtually trouble free. Hence, they assisted in alerting the local representative for Gorman-Rupp, Mr. Randy Keefe of The Craun-Liebing Company (Cleveland, Ohio), of this forthcoming project. After reviewing the proposed hydraulic requirements for the various stations, Mr. Keefe was able to recommend Gorman-Rupp pumps that met the flow rate and head requirements for all of the potential station retrofit sites. The Gorman-Rupp solution would have to also address any potential installation challenges, fit within the available space, allow for ease of maintenance and meet the available budget.

The plan presented to the engineer was to upgrade the Lima collection system stations with a Gorman-Rupp package consisting of v-belt driven Super T Series[®] and Ultra V Series[®] self-priming pumps. The pump



The pump-over-motor v-belt configuration provided a smaller overall footprint making it easier to place, assemble and install the packages while increasing the work area for station operators and maintenance personnel. assemblies were to be manufactured, built and tested at Gorman-Rupp's plant in Mansfield, Ohio. This design would allow for the pump and base to be disassembled above-grade in as few pieces as possible and lowered into the station can for re-assembly and installation.

A key objective throughout the project was the ability to fit the pumps and bases through the 36" diameter entrance tubes of the below-ground cans. Enter Gorman-Rupp Engineering and an innovative "bolt together" pump-over-motor (POM) vertical v-belt base design. This design would allow for the pump and base to be disassembled above-grade by the installing contractor, in as few pieces as possible and lowered into the station can for re-assembly and installation. Once installed, the POM bases allowed for a smaller vertical footprint (see photo) to facilitate superior working area for the operators.

Product Package/Station Specifications:

Beyond the synergistic POM pump/base package, Mr. Keefe along with Gorman-Rupp's Engineered Systems Group saw several design benefits that would add longterm value to the City of Lima, including:

Full Diameter Impellers:

Gorman-Rupp's standard v-belt and sheave coupling arrangement between a standard off-the-shelf 1750 RPM motor and the pump impeller shaft, allowing full diameter impellers to be used in all pumps.

This is unlike flex-coupled pumps and motors where the motor speed is varied either through a variable frequency drive (VFD), which can be very costly; or, a fixed speed motor is used with the impeller trimmed by the manufacturer to meet the application condition point. In the latter case, each impeller becomes specifically required for that particular pump and is not interchangeable with other like pump models in the collection system – unless they share the same diameter impeller.

The newly installed Gorman-Rupp pumps were equipped with full diameter impellers; therefore, each rotating assembly (including pump shaft, seal and



impeller) is interchangeable with each pump of the same series and size. As a result, fewer spare parts are required on-site by the municipality for maintenance, again reducing cost of ownership.

Flexibility of Pump and Motor:

This coupling arrangement also provides the owner/ operator with complete flexibility to change the ratio between the pump and motor, therefore adjusting the speed of the impeller can either increase or decrease the pump's performance capabilities.

This vital feature provides flexibility of the pump should the application conditions change with the addition of an apartment building or shopping plaza into the existing force main. Belts and sheaves are easy to maintain and readily available at most local hardware stores. Also, should the motor ever need to be replaced, Gorman-Rupp uses all NEMA frame type motors that can be replaced through any local motor supply house, or the Gorman-Rupp parts and service department.

Standardization:

Standardized design concepts on the Gorman-Rupp pump series streamlined the Lima collection system with common pump models – dramatically reducing spare parts for routine maintenance and providing operators and maintenance staff with a familiarity of pump operation. This also makes any potential troubleshooting consistent regardless of the pump's size or operating point – meaning that a larger 10" Super T Series[®] pump will operate identically to a much smaller 3" pump.

Conclusion:

Within a few weeks of submittal, prototype drawings and working models were created for proof of concept and approval for the URS Corporation. Additionally, to demonstrate Gorman-Rupp's capabilities, an invitation was extended to the Lima and URS staff to tour the company's 880,000 square-foot manufacturing facility and Engineered Systems operation in Mansfield, Ohio.



Fitting the pumps, motors and bases through the original 36" entrance tube was key to the success of each station. Each package was lowered into each can piece-by-piece and then assembled with common hand tools.

During this visit, principals noted the amount of local Ohio and U.S investment made by the company. All Super T Series[®] pump castings are made with 100% U.S. steel by foundries located within a 225 mile radius of the facility. Furthermore, all machining, manufacturing and assembly is done in-house on the latest CNC machines with quality inspections before and after each operation. For final assurance, each pump is tested to the customer's condition point prior to shipping.

Ultimately, the City of Lima and URS members agreed that Gorman-Rupp was the right company to partner with on such an important project – resulting in The Craun-Liebing Company receiving an order from Peterson Construction Company (Wapakoneta, Ohio) for nineteen total pump stations in April 2014. Of these stations, only six different pump models were used:



- (10) T3A3S-B's
- (8) T4A3S-B's
- (16) T6A3S-B
- (3) T8A3S-B's
- (2) T10A3S-B's
- (2) V6A60-B's

The Peterson Construction Company team received the first station for installation in June and completed the last installation on schedule in November 2014. Ultimately, the combination of full diameter impellers, pump/motor flexibility, hatch accessibility and standardization allowed the City of Lima to update sewer and storm water pump station systems for continued handling of the most demanding conditions for years to come.

About the Product:

Gorman-Rupp self-priming pumps are the world's leading choice for waste handling applications – spanning a myriad of industries including: steel and paper mills, mining operations, food processing plants, power plants, automotive factories, tanneries and wineries. Continuous improvements to head, flow and efficiency are continuously being made, and products such as the Super T Series[®] and Ultra V Series[®] pump models feature many added maintenance benefits to enhance serviceability. Gorman-Rupp's Super T Series pumps are available in a variety of sizes and multiple drive variations. Engineered to give you years of trouble-free operation, low lifecycle costs and minimal maintenance, all backed by a five-year guarantee.

Gorman-Rupp's Ultra V Series is specifically designed for handling solids and slurries featuring significantly higher head capabilities. The self-priming centrifugal pumps achieve up to 300% increased pressure and 40% increased flow over traditional self-priming, solidshandling pumps of the same size, while substantially increasing overall pumping efficiency.

About The Gorman-Rupp Company

The Gorman-Rupp Company is a leading manufacturer of pumps and pumping systems for the municipal, water, wastewater, sewage, industrial, construction, petroleum and OEM markets. The company's Engineered Systems operation also manufactures a full line of water pressure booster stations including pumps, motors, valves and controls – all housed in weather-proof fiberglass enclosures – meeting about any municipal water supply need.

Ultimately, Gorman-Rupp prides itself on manufacturing and delivering the right pump for the job.

