Water & wastewater

Packaged systems for water demands

Packaged pumping systems offer ease of installation, single source responsibility and a streamlined manufacturing process. This article discusses the best way to use them to satisfy the demands of municipal distribution systems, industrial process systems, non-potable and water reuse systems and domestic water booster systems.

Packaged pumping systems

Packaged pumping systems have increased in popularity due to the benefits associated with them. Installation typically involves simply lifting it off the delivery truck, setting it into place and connecting the piping and power to prepare for operation. Single source responsibility means there is only one company to call if there is a service issue. Issues are solved quickly and end-users eliminate the need to consult with multiple vendors in an attempt to determine which company to call. This ultimately reduces service downtime and eliminates the need to deal with multiple vendors.

“One manufacturer means one number to call anytime technical support is needed,” says municipal sales engineer Bob Wedell of Metropolitan Industries, who oversees the design and manufacturing of packaged systems for the municipal, industrial and commercial markets.

Finally, packaged systems are manufactured in a controlled environment which allows for testing of a system prior to job-site delivery and a reduction of fabrication timelines. This controlled approach minimises start-up problems in the field and allows for system testing.

Municipal water distribution

For years, municipalities have relied on water mains to bring treated and disinfected water from the source to our homes, through a distribution network. This network may be comprised of reservoirs, pump stations, water towers and storage facilities. In order to ensure there is clean, drinkable water at an adequate pressure to keep the supply system working properly, water districts employ pump stations which pressurise water to run our household plumbing devices (toilets, sinks, showers, etc) as well as provide water for cooling, industrial needs and fire protection.

These pump stations can be packaged and delivered as a complete unit. Typical designs include a large steel base with pump and control components pre-installed. Base and components are eventually housed in any material of the customer’s choosing. Organisations such as the American Water Works Association help to create standards that are used when designing the various components in such a system.

When sizing a packaged pump station for a distribution network, flow and pressure are the two main elements, but there are also many other variables which factor into how a pump system is designed and ultimately operated. The size required varies directly with the number of users or volume of water required. Designers will engineer these systems for the total ‘peak demand’ of that segment of the community. For instance, factors such as usage (flow)

Figure 1. This packaged pump station pressurizes water which supplies household plumbing devices, and provides water for cooling, industrial needs and fire protection. (Photo courtesy of Metropolitan Industries).
will affect pump and pipe sizing; topography will affect the pressure required; a water tower will affect pressures and the volume of water needed to be stored in order to fight a fire. Monitoring requirements may vary from system to system, but the dynamic nature of the system will make it very important to monitor these change conditions, to react appropriately, and to prevent these changes from causing water hammer and wide pressure swings which often result in water main breaks.

Whether the system is pumping from a reservoir or directly boosting the pressure ‘in-line’ within the piping network, there is a need for pressure and flow monitoring instrumentation, locally and remotely. Motor and valve controls needed at the pump station and level monitoring of towers and reservoirs also directly interface with the pump system. SCADA systems are used to collect data and automatically make system adjustments to keep the water pressure constant. They also serve as a means to allow operators to be more proactive in the regular maintenance of the equipment throughout their systems.

Whether the system is 50 gallons per minute (GPM) or 25,000 GPM, it is possible to pre-fabricate or package these elements, to provide the end-user with a product designed with complete system responsibility in mind.

Processed industrial systems

Factory prefabricated pumping packages can be applied in many different types of industrial process water applications. Water transfer, level control, recirculation and pressure boosting are just a few examples. Typical skid mounted packages include pumps, motors, valves, package piping and a factory pre-wired and integrated control system. Specifiers may also consider systems with complete factory prefabricated buildings to protect the equipment and provide a controlled environment in which to perform maintenance and service.

There are many important variables to be considered when selecting which equipment is best suited for these types of applications. Reliability and efficient operation are keys to making the right choices. The properties of the source water and demands of the process must be taken into account when selecting the construction materials for the pumps, valves and piping. It is imperative that all wetted parts be researched for compatibility to assure safe and reliable operation. In addition, these types of centrifugal pump applications can often take advantage of variable speed control strategies. Simplicity, precise process control and maximum efficiency will be realized when variable speed control is specified.

Non potable, water reuse systems

Wastewater treatment plants often need a non-potable water service to satisfy demands throughout the treatment process. For example, wash down water at bar screens, belt filter presses and clarifier spray water can all be served with a non-potable source. Reuse water reclaimed from the final effluent of the plant can serve as the source for these non-potable demands as well. Potable water mains are also a choice to supply water for these applications but it is important that the potable water source be protected from cross contamination. When back flow protectors cannot be used, protected water systems often employ an air gap break tank to effectively decouple the non-potable loads from potable water mains.

Seal water systems requiring a source of clean water to pressurize stuffing boxes on large sewage pumps is another example where an air gap protected potable water source can be used. Many different types of pumps are suitable for these types of applications. End suction, vertical multi-stage, vertical turbine and split case pumps are all sound choices. Selecting the most suitable pump is a matter finding a unit which is a good hydraulic fit, simple to maintain and efficient to operate.

Factory prefabricated pumping packages are available for both water reuse systems and protected water systems as pictured above. Typical packages would include pumps, motors, tanks, package piping and controls. (Photo courtesy of Metropolitan Industries)

Domestic water pressure

When the water pressure provided by a municipal water system is not sufficient to satisfy the demands of end-users in tall buildings, it is often necessary to have horizontal equipment within the structure designed to increase the pressure provided by the systems. These types of prefabricated systems are engineered to satisfy the potential peak flow demands of the facility and are often provided with multiple pumps on a single structural steel fabrication with electronic controls, wiring, piping, valves, and multiple safety-devices. These packaged systems are designed based on the calculated increase in pressure required to deliver pressurized water to the highest or furthest point-of-use in the facility. Multiple electronic sensors are often installed at remote locations within the facility. These sensors allow the controls to optimize the operation of the system, and enhance the energy-efficiency of the equipment. In certain regions of the country, the design requirements of these types of systems are regulated by local, national, or international code requirements.

Conclusion

This article discusses the benefits associated with packaged pump systems which are ease of installation, single source responsibility and streamlining of the manufacturing process. This can be applied to the municipal, industrial, non-potable, water reuse and domestic water booster system markets.

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