MAINTENANCE TECHNOLOGY
THE SOURCE FOR RELIABILITY SOLUTIONS

Design Influences Rotary-Gear Pump Maintenance

By Bobbie Montagno, Pulsafeeder Engineered Products, August 10, 2016

Smart-sensing technology contributes to the predictive maintenance of wastewater and other facility pumps.

Pumping infrastructure represents an enormous investment for large processing facilities. In any given plant, thousands of pumps are needed to move liquids from point A to point B.

Some of the primary applications for which rotary-gear pumps are used in refineries and chemical-processing plants involve treating wastewater to be reused for cooling towers, boiler feeds, or to dilute chemicals that are required for other processes. For these applications, harsh chemicals such as bleaching chemicals, cleaning agents, and corrosion inhibitors are dispersed on a high-volume, continuous basis. Over time, this can take a toll on the pumping equipment, establishing the need for proper maintenance programs.

The cost of maintenance

In most plants, annual maintenance costs for pumping infrastructure can range from 2% to 5% of the replacement value of the infrastructure. At first glance, that range seems minimal. But the delta between 2% and 5% can equal millions of dollars (or in some cases, tens of millions) throughout the life of the plant. Total maintenance costs must also be measured beyond the physical expense of the parts, the tools, and the engineers who wield them. Maintaining pumps in a chemical plant, refinery, or wastewater facility directly affects uptime, which in turn affects the bottom line.

Pumps that run regularly, feature wear items, and handle hazardous and corrosive chemicals will inevitably require maintenance. This can be a blessing and a curse.

Plant managers who get it right, in a preventive and predictive fashion, can streamline operations and maximize uptime. Those who let maintenance slip into a reactionary or "run to fail" approach can hinder operations

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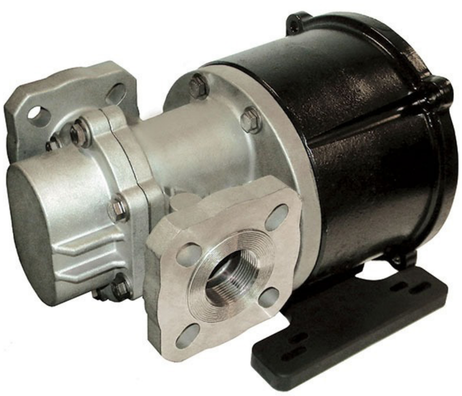

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and create ripple effects that shorten the life expectancy of equipment.

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Predictive maintenance

Predictive maintenance requires a long-term view. It involves planning, scheduling, condition monitoring, analysis, and spare-parts management. Predictive maintenance for pumps is aided by smart-sensing technology that can alert engineers to dry-run conditions, temperature changes, increases in vibration, or decreases in pressure.

Today, sensors are readily available and their value (and deployment) will continue to expand as wireless communications connect plant infrastructure to maintenance personnel using tablets and smart phones across the Industrial Internet of Things (IIoT).

Predictive maintenance can also be done without advanced communications technology. Readily available information and historical pump performance can be used to schedule the replacement of wear parts with minimal disruption to plant operations and minimal investment in sophisticated cloud-based controls.

Short-term reactive maintenance

Although predictive maintenance is always the goal, sometimes reactionary maintenance becomes the reality. When budgets are cut, maintenance is often considered a quick fix to address short-term financial constraints.

Reactive maintenance provides short-term savings, until equipment fails. When a failure occurs, the response relies on the skills of the on-site team and the availability of spare parts. If either fails to meet expectations, substantial losses can result from downtime and lost production.

Design impact

Maintenance starts with a simple design. Some pumps are designed for a limited life, and purchasing decisions are purely based on cost. Other pump designs seek to provide reliability over a longer life, while balancing the anticipated cost of repairs. Rotary-gear pumps are often deployed to pump harsh and aggressive chemicals, so sealless designs are easier to maintain because there is no leak point for the harsh chemicals to damage the pump or surrounding equipment.

When it comes to rotary-gear pumps, the number of spare parts should always be considered. Maintaining a sufficient inventory of gears, shafts, O-rings, and liners is critical. Spare-parts kits should contain every part that a pump requires, and kits should be easy to procure (with just a single part number). If tied to a proper design, spare parts should be simple and easy to install. Some pumps feature symmetrical parts that only fit in one way, making parts replacement mistake proof, and keeping time to repair at a minimum.

Access to the inner workings of a pump is another important design feature that affects maintenance. If the pump's gears are not readily accessible, then engineers need to decouple the motor, close the valves, and remove piping at the suction and discharge ports of the pump. Pumps that feature a front pull-out design can be repaired in place. This minimizes downtime by eliminating the need to lock-out/tag-out the pump, and move it to the repair shop.

Maintenance ROI

Maintenance costs for a single repair will always be insignificant, compared with the costs associated with lost production and process restarts. The true return on investment associated with maintenance should be connected to a plant's uptime. The simpler the equipment is to maintain, the faster it can be done. This gives plant operators more flexibility to schedule maintenance between shifts or whenever it is most opportunistic (or least disruptive).

Although the demographics for engineering staffs continue to change, the loss of vast experience is gradually being offset by new technology that can sense issues and alert engineers to problems before they occur. This type of sensing technology, coupled with simple designs, intuitive access, and fewer parts to maintain, forms the cornerstone of preventive-maintenance programs that keep plants up and running, and also provides management with the data it needs to make better decisions for capital budgets and long-term infrastructure improvements.

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