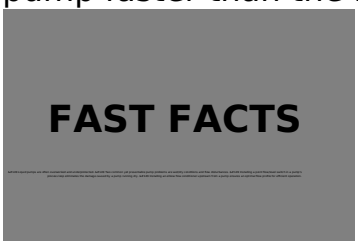
How to Protect Your Pump and Keep It Longer

If liquid pumps are an important part of your process, you should make the investment to protect them from dry running conditions and flow disturbances

'Nothing can damage a liquid pump faster than the buildup of heat from dry running conditions.' By Don Lundberg



In today's complex and frequently rugged process plant environments, liquid pumps are often overworked and underprotected from adverse operating conditions. Many pumps run nearly non-stop 24 hours a day over multiple shifts. Poor operating conditions can reduce pump performance, require extra maintenance, shorten pump life and increase costs. Losing a pump unexpectedly can be an expensive or even dangerous problem in a chemical plant. The consequences of pump failure can range from the loss of product in sensitive pharmaceutical batch control applications to damage to nearby equipment from pressure buildup of material that isn't moving. There can even be safety hazards when a pump fails to shut down and literally burns up in the presence of combustible materials. It really pays to protect and care properly for pumps. Two common problems that negatively affect pumps are wet/dry conditions and flow disturbances, both of which are preventable. Nothing can damage a liquid pump faster than the buildup of heat from dry running conditions, which occur when liquid stops flowing into the line or pump. When liquid isn't there to provide cooling, heat can destroy a pump's bearings. If repair is even possible, it is going to be a very expensive proposition. For proper and efficient operation, a pump requires a stable upstream flow profile in the pipeline before liquid enters it. When elbows, valves or other pieces of equipment are installed too closely to a pump, they can create swirl and velocity profile distortion in the pipeline. These disturbances can result in excess noise and cavitation, resulting in reduced bearing life. Installing a point flow/level switch in a pump's process loop eliminates the damage caused by a pump running dry. Point flow/level switches are capable of detecting not only low flow but also dry running. This capability allows the control system or operator to take corrective measures before the pump bearings are overheated and fail.

Among the many types of point flow/level switches available are those that offer dual alarm capability. One alarm detects low flow between 0.01 and 3 feet (0.003 and 0.9 meters) per second and can be regarded as a pre-warning signal for the control

system or operator, who then can decide to keep the pump running or shut it down. The second alarm occurs when the feed line to the pump is running dry. It is an emergency signal to shut down the pump immediately. In this case, the bearings have gas instead of liquid as a heat transfer medium, causing the temperature of the bearings to rise very quickly. The flow switch prevents permanent damage to the pump's bearings, but an overhaul of the pump is required to prevent more damage. The flow switch is a dual-function instrument that indicates both flow and temperature or level and temperature sensing in a single device. Available in either insertion or in-line styles for pipe or tube installation, a single switch measures and monitors flow or level and temperature simultaneously. Installing an elbow flow conditioner upstream from a pump ensures an optimal flow profile for efficient operation. Isolating the effects of velocity profile distortions, turbulence, swirl and other flow anomalies in the pipeline can result in a repeatable, symmetric and swirl-free velocity profile with minimal pressure loss. Creating a relatively more benign operating environment helps increase pump life. The conditioned flow stream enters the pump's impeller in a uniform and equally distributed pattern, optimizing pump efficiency and extending bearing life while at the same time decreasing noise and cavitation.

If the chemical plant is short on real estate with confined and non-ideal pipe configurations, an elbow flow conditioner eliminates all upstream straight run requirements for pumps, compressors, flow meters and other critical process equipment. Tab-type flow conditioners have been successful in these applications. Other flow conditioning technology choices, including tube bundles, honeycombs and perforated plates, also can be considered depending upon the specifics of the application. The elbow flow conditioner's profile conditioning tabs produce rapid cross-stream mixing, forcing higher velocity regions to mix with lower velocity regions. The shape of the resultant velocity profile is "flat" and repeatable regardless of the close-coupled upstream flow disturbances. Incorporating anti-swirl mechanisms in the design eliminates the swirl typically seen exiting 90-degree elbows. The result is a flow stream that enters the pump in such a way that it maximizes the efficiency of its operation and reduces stress. In addition, the tapered design of the anti-swirl and profile conditioning tabs makes them immune to fouling or clogging. *Don Lundberg is senior engineer, Fluid Components International, 1755 La Costa Meadows Dr., San Marcos, CA 92078, which specializes in critical flow, level and temperature process instrumentation solutions. Questions about this article can be addressed to Lundberg at 760-744-6950. Additional information is available at www.fluidcomponents.com.*