# Sensing the way to protect progressing cavity pumps

**When it comes to efficiency and versatility, progressing cavity pumps (PCPs) have many advantages. They provide highly efficient, accurate metering of viscous fluids, while simultaneously being highly resistant to wear from abrasive fluids, and capable of transferring shear-sensitive products without damage. However, like many types of pump, dry running is a potentially dangerous problem. David Lee UK Field Sales Manager for Robbins and Myers discusses several different sensor-based systems which can deactivate the pump if it runs dry.**

The simple alignment of what appear to be complex geometric components — a single external helix, high strength steel rotor and a double internal helix stator moulded in tough, abrasion resistant elastomer — is the key to PCP performance. The relationship between the two helices produces a series of sealed cavities which move along the pump as the rotor turns, carrying the chosen material. The continuous seal compression fit between the rotor and stator helices moves the material in a steady, non-pulsating flow that is proportional to the rotor speed.

To protect against dry running — a potentially serious problem for many types of pump — some of the latest models incorporate one of several sensor-based systems to deactivate the pump if it runs dry.

## The common sense approach

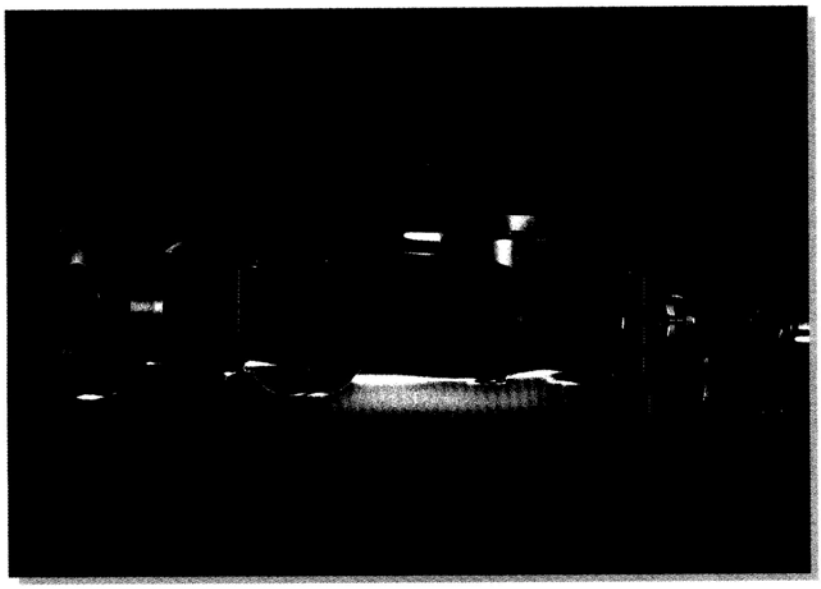
The three most commonly used dry running detection systems all employ sensors to detect changes from preset conditions within the pump and trigger pump shutdown.

Presence/absence detectors deactivate the pump if there is no fluid in the suction intake port for a preset period of time. The ring-shaped sensor can be deployed between two standard flanges or mounted directly to the PCP suction pump flange. Occasional failures, sometimes due to fluid build-up on the sensor, and the high cost of these detectors when compared to other types, has led to them falling out of favour recently.

Stator temperature probes consist of a thermistor sensor and sleeve and an electronic temperature regulator. The thermistor is inserted between the rotor and stator to measure the temperature. If there is no fluid passing through the pump, the resulting friction between the rotor and stator will produce heat. When the temperature reaches a preset level, the thermistor will trip the regulator, to trigger the shutdown of the pump. Since it can take several minutes, and even the shortest time running dry can wear the stator, stator temperature probes may not always be the best way of detecting dry running.

## Non intrusive sensor

A third type of sensor, the non-intrusive pressure sensor comprises three main components: a sensor, a pressure switch, and a control box. The sensor fits between two standard pipe flanges and detects pressure across the whole pipe circumference. This ensures the accuracy of pressure readings regardless of material settling, coating or bridging in the



An example of a Robbins &Myers' PCP — able to handle a large throughput and run at high pressure.

pipeline. A liquid -filled gauge allows visual monitoring of pressure. A low pressure limit is set to prevent dry running.

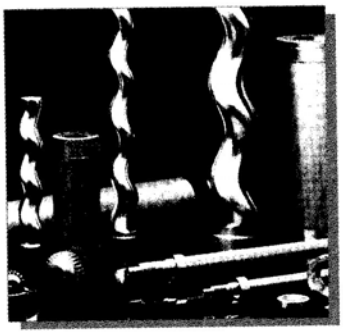
To set an appropriate pressure sensor limit, the pump operator must know the level of static pressure and friction pressure in the system. Static pressure is generated when the pipe is filled with liquid. It is not affected by the size or number of pipe fittings, or the viscosity of the fluid, and is present whether or not the pump is operating. Friction pressure is generated by the flow of liquid and varies with the viscosity of the liquid and the number and size of pipe fittings. When the pump is operating and liquid is flowing, the gauge shows the total pressure. This is the sum of the static pressure and the friction pressure.

To prevent running dry, the pressure switch low limit should be set between static pressure and total pressure. Should the pump run dry, the pressure will revert to static pressure automatically switching off the pump motor.

As the name suggests, pressure sensors can also guard against failures caused by high pressure. In common with dry running sensing, if a preset pressure limit is exceeded — in this case the maximum safe operating pressure — the pump is closed down. Pressure sensing/ switching has proved to be a fail-safe way of avoiding both dry running and high pressure conditions for both PCPs and other positive displacement pumps.

## All round package

Other features which enhance the overall PCP package are the system's ability to handle large throughput and run at high pressure. They are self-priming, and combine low net positive suction head with high suction lift capacity. In addition, the pump flow can be reversed and the discharge pressure is not speed dependent. It is easy to see why the all round PCP package is proving so popular in many pumping applications. ■



The finely machined internal parts of a PCP, featuring the external and internal helixes which provides the key to performance.

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