

# Pump prediction

Modern non-invasive motor condition monitoring equipment is proving its worth at Wessex Water. Brian Tingham talks to operational services manager Dave Durkin

If you've tried and failed with vibration-based condition monitoring of pumps or any other large electrically-driven plant – or, for that matter, haven't tried it, but know you need to do something – you could do much worse than installing Artesis' rather different predictive maintenance system.

So says Dave Durkin, head of operational services at Wessex Water (the top performing water and sewerage company last year), following a very successful 18 month trial of that company's Motor Condition Monitor (MCM) technology, about which he openly admits he was initially very sceptical.

"I've been around a while, and I've had a lot of people coming to me with a box of tricks that will do this or that, but this salesman was very persistent," says Durkin. "He also seemed to know what he was talking about. And we had a very real application on large borehole pumps, which are many metres underground.

"Equipping them for vibration monitoring isn't easy and anyway, in our experience, that can be expensive and variable, in terms of data quality. Most of all, though, you don't want a borehole pump to fail unexpectedly, because then you've

got major customer service risks while you deal with a significant unplanned event."

So Wessex Water installed the MCM equipment into motor control cabinets for six pumps, including two borehole pumps, which, as Durkin points out, proved three immediate benefits. First, as the equipment lives in the motor starter panel, there were no problems around accessing the plant itself. Secondly, since it monitors both electrical and mechanical parameters through the one interface, it can detect any of the wide range of potential failure modes that can occur with this kind of plant. And thirdly, because it comes with GPRS, Wessex Water could have instant remote access to the plant condition data – although, in this case, the Artesis team delivered detailed condition and performance reports.

## Catastrophic failure

Proof of the pudding came one year into the trial. "We got a first level warning that there were early indications of problems with one of the borehole pumps about a month in advance. We decided to leave it and see how it developed. Then, a couple of weeks before it failed, we got another call from Artesis that the pump status had elevated, due to an impeller-related problem," explains Durkin.

"We planned to take the machine apart before catastrophic failure. Unfortunately, we weren't quite able to reorganise the water network without impacting our service levels and the pump failed

The Artesis motor condition monitoring system installs in a motor control panel



## How it works

Originally developed under a NASA contract, the Artesis MCM (motor condition monitor) uses mathematical modelling to automatically establish a benchmark for each item of plant, after which it continuously monitors the machinery for deviations likely to mean faults.

If a fault is detected, the system provides a diagnosis of mechanical and electrical problems, and indicates the severity of the fault – all without human intervention. Importantly, its fault detection works on a 'traffic light' system, with green meaning normal, amber, an early fault condition, and red, approaching failure.

It is this unambiguous early warning approach that makes the difference – saving significant maintenance costs, preventing secondary damage and avoiding unplanned plant downtime.



**Dave Durkin, head of operational services at Wessex Water**



two days before we were due to remove it. However, in retrospect, the event proved that the MCM works and also provided a good mechanism to calibrate it against the rate of pump degradation,” he adds.

**Critical pumps**

Durkin talks of some 15,000 submersible sewage pumps across Wessex Water’s network and several hundred borehole pumps – the latter being the easiest to make the case for the equipment. “Borehole pumps are critical to us and our customers, and planned installations are much more desirable than having one fail and needing unplanned replacement on Easter Sunday,” he explains. Current thinking, he says, is around retrofitting MCM systems and/or building them into the design standards for new borehole pumps and other critical machines.

“We’re now going through a process of exploring MCM on other plant with more complicated drivelines. We’re thinking about large screw pumps, centrifugal blowers, some large

submersible sewage pumps and a CHP [combined heat and power] engine that’s quite troublesome,” says Durkin.

His advice: think about the cost/benefits. “You need to consider the

type of plant, where you’re installing it and the implications of unplanned mechanical failure – not only in terms of damage to the plant item itself, say a pump, or secondary damage to associated equipment, but also the cost and consequences of process downtime. Then the judgement is, what’s the value of knowing early that something minor is going wrong, as opposed to catastrophic failure being the first you hear of it?”

That’s what enables you to intervene at the right time and plan for that intervention. But there’s another point: Wessex Water’s trial pump failed within a couple of days of Artesis’ predicted date. And with that degree of accuracy, the doors start to open on rethinking the common practice of installing fixed standby plants.

As Durkin puts it: “If you know you can get a very reliable indication that something is going to fail, and that it’s a once every five or 10 years event, maybe you can do away with standby plant. Maybe you can plan and make provision to keep your machine or process flowing, without that additional, significant cost.” **PE**

**Pointers**

- Motor condition monitoring kit is installed in the motor control cabinet, so there are no plant access problems
- MCM monitors electrical and mechanical parameters, so it can detect a wide range of plant failure modes
- Remote access is available for engineer assessment
- These devices are self-learning, without human intervention
- The system automatically diagnoses plant problems and provides instant indication of severity