MONITRAN
SENSING THE FUTURE

WALKING THE EFFICIENCY LINE

HUW FINNEY, HEAD OF ELECTRONIC ENGINEERING AT MONITRAN, ADVISES ON HOW VIBRATION MONITORING CAN AID EFFICIENT, PREDICTIVE MAINTENANCE

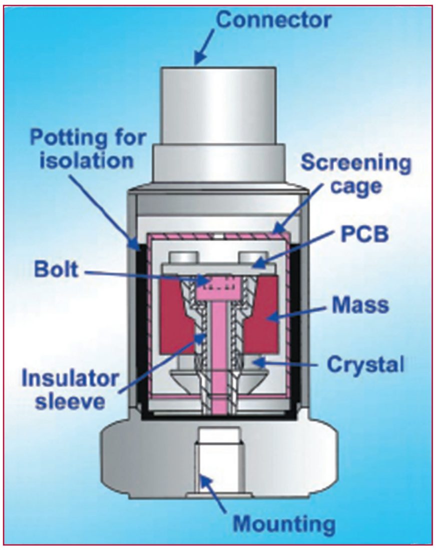
It is a fact of modern (engineering) life that UK-based manufacturing processes, and the machinery and equipment needed for those processes, are being pushed to their limits by pressure from the Far East. Similarly, the machinery and equipment in industrial processes (for example in water treatment and chemical plants), power stations and wind farms is also working harder than before.

These pressures make the high availability of machinery and equipment top priorities, and companies are increasingly turning to predictive maintenance in order to improve overall plant and process efficiency.

The costs of not undertaking predictive maintenance are well known and can be catastrophic. They include equipment failure,degradation in the quality of the product or service provided, infringement of health and safety regulations and ultimately the possibility of personal injury and consequent litigation. In addition, there are the financial aspects associated with inefficient or non-functioning equipment to be considered.

However, while many companies do undertake predictive maintenance, most have trouble walking the fine line between doing too little (and experiencing failures)and over-maintaining – doing maintenance at set intervals irrespective of whether or not the equipment needs new lubricants, bearings and so on.
In short, over and under-maintaining costs money.

To make walking this line easier, manycompanies employ condition monitoring techniques to provide an indication of wear and tear. This allows maintenance intervals to be extended while affording the peace of mind that comes from knowing that early warnings will be provided before equipment fails.



Sound advice

The easiest conditions to monitor are typically temperature and electrical current. Both can provide valuable feedback and initiate local reactions when necessary, using thermal trips and circuit breakers respectively. However, where machinery and drive trains are concerned, monitoring temperature and current drawn alone may not provide sufficient intelligence.

Mechanical failures may occur without motors and pumps becoming overloaded – hence there may not be a significant rise in temperature or current. However, as most of us know from years of driving vehicles, the earliest indication of a problem tends to be audible.

Hence, noise and vibration monitoring are starting to play increasingly important roles in predictive maintenance. Essentially, vibration (whether audible or not) is a form of energy loss, so, if a pump, motor, gear-box, drive train or servo-valve vibrates more than usual then the component is either being overloaded or its sub-components such as bearings and teeth, are probably failing.

Monitoring vibration (this 'leakage of energy') is neither as difficult nor as costly as most assume, as vibration sensors and associated signal conditioning hardware are an extremely cost-effective alternative to having equipment fail.

Vibration sensors are typically electronic devices, employing either piezoelectric or piezoresistive technology. Of these two technologies the former is more prevalent in plant monitoring applications. The structure of a typical sensor (without cable) is shown in figure 1. Circuitry within the sensor converts the charge into a voltage for output to monitoring systems.

Mechanically, both the inner screening cage and outer case of a vibration sensor tend to be welded stainless steel. Sensors are typically available with either a top connector, welded to the outercasing, or flying leads (which are sealed into the top of the sensor's case using high-strength epoxy). Both variants see the actual sensor hermitically sealed.

As a piezoelectric vibration sensor has no moving parts it offers long-term reliability and stability. Sensors offered by most manufacturers, Monitran included, have wide frequency and dynamic ranges, and the output signals can be integrated to provide velocity and displacement values.

While vibration monitoring can be done as-and-when-required, thanks to the availability of portable measuring equipment, predictive maintenance is best realised through the use of permanently located sensors.

As for the top-level, 'efficiency benefits' associated with including vibration monitoring as part of a predictive maintenance strategy, it's best to cite an example. Within the last few years, Corus Strip Products, which prepares coal for injection into blast furnaces, incorporated hardwired vibration monitoring (on an ad-hoc or continuous basis) and was able, within the first year, to reduce its third party maintenance costs to a staggering one eighth of what they had been previously.

Conclusion

The use of permanently installed sensorsprovides a cost-effective way to reduce or eliminate unscheduled down-time. Further, servicing intervals can be extended because maintenance can be done when parts start to wear, as opposed to replacement at their expected minimum service life.

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