DONALD LYON, *MANAGING DIRECTOR OF MONITRAN, EXPLAINS HOW PREDICTIVE MAINTENANCE (PM) STRATEGIES ARE MOST EFFECTIVE WHEN THEY EMPLOY VIBRATION-BASED CONDITION MONITORING (CM) TECHNIQUES*

A FEELING FOR WHAT'S LIKELY TO FAIL

Whilst the adage that 'prevention is better than cure' is well known and respected within the industry, particularly where plant equipment is concerned, standing by these words requires walking the fine line between suffering the occasional failure of a machine and over-maintaining equipment.

Predictive maintenance (PM) is the tool that helps us walk this fine line. Knowing what is wearing (or failing in some other way), and how fast this is taking place, enables repairs to be undertaken as and when necessary, thus maximising the life of good components. It also facilitates the timely removal of parts which have worn unexpectedly fast.

Unexpected component failure is therefore minimised and, by extension, so is machinery, line and plant failure. PM also enables best use to be made of human resources (labour), by ensuring advance order and delivery of necessary components ahead of the start of the maintenance programme. However, accurately predicting if, how and when any particular component or machine is likely to fail requires a clear under-standing of all the circumstances.

Most failures in plant are associated with moving parts, such as motors, gearboxes, pumps, roller bearings, valves and so on. These are the parts at the beginning of the 'domino chain'. If these fail then conveyors stop, rollers come to rest, fluids cease to be pumped, essential cooling fails and the knock-on effects start with potential local or plant-wide ramifications.

All of the above parts can be placed under a condition monitoring (CM) regime and, as most of the components in question are either directly or indirectly driven by electric motors, the easiest parameter to monitor is electrical power. This can be misleading, however, because an increase in absorbed power can be difficult to detect and analyse, particularly at the onset of a potential failure. For this reason many a PM strategist turns to monitoring temperature levels.

But once again, whilst it is undoubtedly a valuable indicator, temperature cannot be trusted in all applications. In fact it can even be dangerous when used on machinery with high ambient temperatures as, by the time the temperature has risen sufficiently to raise an alarm, the equipment may already have reached a high enough temperature to start a fire.

However, as most of us know from years of driving, the earliest indication of a mechanical problem is often in the form of vibration (in the form of noise or just a feeling in terms of how a piece of machinery such as a car is responding). Accordingly, vibration-based CM is playing an increasingly important role in PM strategies.

Getting the shakes

Essentially vibration (whether audible or not) is a form of energy loss, so if a pump, motor, gearbox, drive train or servo-valve is vibrating more than usual then the component is either being overloaded or its sub-components, such as bearings and gear 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 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 is shown in figure 1. Circuitry within the sensor converts the charge into a voltage for output to monitoring systems.

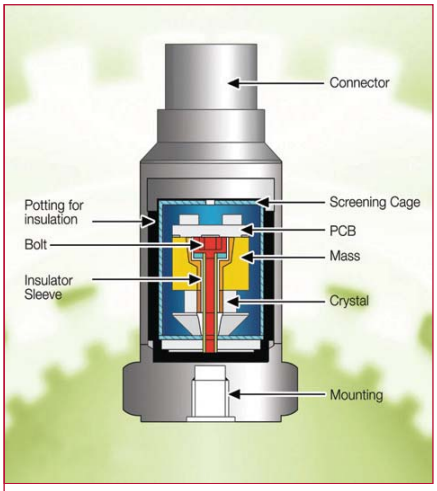

Fig 1: *The piezoelectric vibration sensor*

Although vibration monitoring can be carried out as and when required with portable measuring equipment, predictive maintenance is best implemented through the use of permanently located sensors.

As for the top-level, 'efficiency benefits' associated with including vibration monitoring as part of a PM strategy, it is perhaps best to cite an example. Within the last few years Corus Strip Products, which prepares coal for injection into blast furnaces, has incorporated hardwired vibration monitoring into its plant. The results have been dramatic. After only a single year of the regime being in place, Corus has managed to shrink its third party maintenance costs to just one eighth of the previous level.

Article reproduced with thanks to EMS magazine

MONITRAN LTD

Tel: +44 (0)1494 816569
Fax: +44 (0)1494 812256
Email: info@monitran.com
Web: www.monitran.com
Registered in England No. 2054040
VAT No: 9B442 4883 40