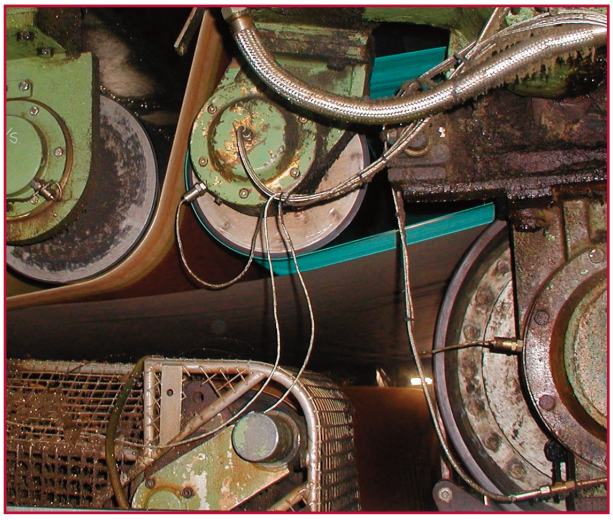
PREDICTION MAINTENANCE

ANDY ANTHONY, MONITRAN'S OPERATIONS DIRECTOR, EXPLAINS HOW VIBRATION BASED CONDITION MONITORING LEADS TO HIGH AVAILABILITY OF MILL MACHINERY.



TWO STUD MOUNTED ACCELEROMETERS ATTACHED TO ONE OF THE MACHINES AT ST REGIS' KEMSLEY MILL.

Mass production in any industry is most profitable when production lines can be kept running. However, the need for maintenance dictates that machinery must be shut down and serviced at regular intervals. Also, unscheduled maintenance can require the shutting down of a production line with little or no notice. Accordingly, mills can only endeavour to get as close to 24 hours a day, seven days a week as possible but this is where vibration based condition monitoring (CM) can lend a hand.

The paper making industry is heavily dependent on the use of rollers, motors and pumps, to say nothing of their associated gears, bearings and mechanical linkages. Experience shows that as these parts suffer wear, or sometimes as a result of incorrect installation or overloading, their respective vibration levels and patterns change.

Using accelerometers it is possible to monitor the vibration levels and patterns of key mechanical elements, and set alarms to warn of an impending need for repair or even a shutdown before breakage occurs. Also, even without alarms being raised, the vibration signatures can be used to predict trends, which can assist in the forward planning of work for scheduled maintenance shutdowns.

CM in action

A keen advocate of vibration based CM is St Regis, a UK manufacturer and recycler of paper. At the company's Kemsley Mill, CM plays a crucial role in predictive maintenance.

Per annum, Kemsley Mill produces approximately 560,000 tonnes of paper, predominantly for the packaging and plasterboard sector. The mill has three machines, designated PM1, PM3 and PM4, of which the last two are the newest with PM3 able to run at up to 900 metres per minute.

Each machine is shut down for maintenance purposes once a month. This lasts for about 12 hours, during which time various maintenance functions are carried out including felt or wire changes as necessary. However, it also makes sense to change any other parts which may have worn – and that intelligence regarding which parts those may be is provided courtesy of vibration analysis (VA).

Between them the three machines, each of which is about 200 metres long, have in excess of 800 accelerometers permanently mounted at strategic points. Each sensor is a piezoelectric device which outputs a current in the 4 to 20mA range, and the signals, which correspond to levels of vibration, from all sensors feed into multi-channel, processor based conditioning units (which poll the sensors one by one).

Alert and alarm limits are set and, if exceeded, are investigated to determine the cause. In addition, trends are closely monitored as a rising trend coupled with alarm levels broken would be a clear indicator of a developing problem.

These two elements (alarms and trends) raised by vibrationanalysis are crucial to the mill's implementation of predictive maintenance; as they help the engineers of each machine target and prioritise which bearings, pumps, motors or other components to work on during the monthly shutdown.

Not only is this a practical use of the shutdown time but it also minimises the risk of unscheduled shutdowns which, with lines running at up to 900 metres per minute, represent a significant financial loss – to say nothing of delaying customers' orders.

Savings scheme

To build an efficient predictive maintenance schedule, engineers must have data available on the mechanical integrity of the mill's machinery. Collection, storage and, most importantly, interpretation of the data allow the building of historical trends which, when displayed graphically, can be used to produce failure curves.

Regarding the collection of data, the signal conditioning is best performed as close to the sensors as possible. Some of the most recent developments in this area have been to facilitate the signal conditioning of groups of sensors (say 16) and then to convey the readings digitally from the sensors over a serial bus.

In practical terms this means users can run three or four wires (carrying digital signals that are relatively impervious to electrical noise) from a multiplexing unit to the control room rather than using the many multi-wire cable looms that would otherwise be required. Moreover, some manufacturers' products can be daisy chained together to create networks of any size.

In addition, products are now coming to market which can wirelessly upload signals to a web based portal. Data can be viewed via these portals on a PC and, if necessary, alarm limits can be set for the respective condition monitoring units. Also, SMS text messages (which can be written by those with administrative rights over the portal) can be assigned to certain sensors or processors if an alarm is triggered. The SMS messages can then be sent to the mobile phones of technicians and engineers.

In summary, vibration based CM and the ability to share and use the intelligence derived from it means that mills can get close to the aforementioned 24 hours a day, seven days a week. Yes, there is obviously a cost, but any equipment which has the ability to keep downtime low and reduce the risk of catastrophic failures is almost certainly going to pay for itself in the long run.

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