In GOOD condition

Condition Monitoring provides critical information to optimise scheduling of downtime, labour and materials while boosting productivity and reducing costs. Simon Lovegrove writes this exclusive for *Australian Mining*.

Condition monitoring as the name suggests is essentially a maintenance practice where the condition of industrial plant and equipment is monitored for early signs of component damage or impending failure.

Ideally, conditioning monitoring is used as a tool to gain specific information about the different aspects of plant and equipment in an effort to increase or improve the reliability of that item of equipment.

Within the Australian mining industry nearly all equipment operators have established some sort of condition monitoring program for the various types of mining equipment which they operate.

These condition monitoring programs are generally utilised in an attempt to predict the likely causes of equipment failure and allow the equipment to be repaired in a scheduled manner that minimises the interruption to the mining process. However, are these condition monitoring programs really working as they should, and are they capable of providing so much more to the business?

A successful condition monitoring program depends on the people and the culture in an organisation.

REASONS FOR REACTIVE CONDITION MONITORING:

- **An unbalanced focus on short-term production demands often at the expense of long term maintenance initiatives which consume a lot of the mines resources, time, and opportunity for improvement.**
- **A lack of internal resources that are dedicated to pursuing excellence in condition monitoring and proactive (reliability focused) maintenance practices.**
- **A lack of realisation by many organisations that further improvements to the profitability of the business are possible through enhanced condition monitoring practices. They are simply not aware that an improved condition monitoring methodology is capable of delivering more to the business.**
- **A lack of appreciation that system improvements and organisational change are just like any other business investment and that is, they all initially require some sort of financial commitment.**

CONDITION MONITORING – WHAT TO WATCH:

- **Other types of equipment like civil structures (steel & concrete), roads, tanks, pipework, pressure vessels, hydraulic or pneumatic systems, all have characteristics or parameters that can be monitored to determine their individual condition or level of performance.**
- **The quality of consumable items used on a mine site like fuel, oil, water, grease, compressed air, and electricity can also be monitored to prevent equipment deterioration, waste, or identifying possible sources of contamination.**
- **Process computers or machine management and control systems are also a great source of information for monitoring plant performance. Things like motor amps, pressure, flow, temperatures, engine revolutions, travel speed, load (tonnes), cycle times, etc, all provide information about specific equipment characteristics that when monitored, can significantly add to the level of diagnostic and preventative maintenance capabilities of the business.**
- **Even the environmental conditions like dust, mud, moisture, or product spillage, in which the mining or processing equipment may be operating should also be monitored and controlled as applicable.**

Status

Generally, the Australian mining industry has accepted a simple form of condition monitoring that involves checking only the basic parameters of the mining or processing equipment (most likely vibration, oil, and thermal analysis), and then screening the resulting data for information that may suggest a change in plant condition, a component defect, or impending component failure.

Maintenance personnel must then react to this information and repair or replace the deficient equipment in a manner which minimises the amount of unscheduled production losses related to that particular item of equipment.

Although most mining operations that have adopted this approach to condition monitoring have done so in the belief of obtaining improvements in the reliability and therefore productivity of their equipment, they are still very much functioning in a 'reactive' maintenance mode rather than from the preferred 'preventative' or 'proactive' maintenance approach. That is, they only react to the condition monitoring information to rectify the fault and do little towards predicting the cause of the damage and actively preventing the reoccurrence of this type of equipment failure in the future.

It is possible for the Australian mining industry to advance to a more proactive maintenance approach that looks to eliminate the number, type, and severity of equipment defects that in turn result in financial losses for the business.

By adopting a progressive change towards performing maintenance tasks that are based on proactive condition based maintenance principles, mining operations are likely to be rewarded with some key benefits.

With mining operations working towards a safer industry by implementing initiatives aimed at achieving 'zero harm, incidents, or injuries' then by default these same operations must also work towards 'zero equipment failures and unplanned downtime', as reducing the number of equipment failures also reduces the risk of injury to those that operate and maintain this equipment.

Making improvements

To achieve increased financial returns through an improved maintenance approach, mining organisations will need to advance their individual condition monitoring programs to fully utilise all of the data that is available. They must also accept and rely upon the information that these programs are providing.

It appears that for the majority of mining operations in Australia only part of the available data on the condition of mining assets is collected. From that data collected, we only utilise it to predict component failures and miss the opportunity to use this data to improve ongoing equipment reliability by preventing similar modes of equipment failure.

Establishing a successful condition monitoring program depends upon the people and the culture within the organisation that use and rely on it. By providing the appropriate level of skills development and training for all personnel, working within the organisation will provide the greatest opportunity for improvement and reward.

It may not seem important, but basic condition monitoring and inspection skills development is essential for all maintenance trades and production personnel as it will begin to engage the workforce and initiate a cultural change from one of "repairing machines before they fail" towards one of "improving the reliability of machines so that they don't fail". This is a key area for improvement that initially requires all production and maintenance personnel to recognise the importance of using the human senses (look, listen, feel, and smell) when inspecting and working with their equipment.

A site-based condition monitoring co-ordinator can provide leadership to the program and responsibility for initiating change

Furthermore, by supplying a higher level of condition monitoring training to maintenance planning, engineering, and supervisory personnel should also produces a better commitment to the condition monitoring program and aid in implementing the recommended maintenance actions that have been produced as a result of the condition monitoring program.

While a range of organisational structures and maintenance management systems can support a condition monitoring program, all successful condition monitoring programs must have a strong organisational champion or co-ordinator to take responsibility for the site's condition monitoring program. This will help ensure a standardised approach, manage the skill devel-

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opment of the workforce, and support business compliance with the current condition monitoring strategy.

A site-based condition monitoring co-ordinator can also provide leadership to the program and be responsible for initiating the changes and improvements necessary to develop and advance their site's condition monitoring program.

Understandably, if an organisation changes the approach to their condition monitoring program then realistically someone will have to lead the way.

Other initiatives could focus upon improving the quantity and quality of information that is distributed both internally and externally from the condition monitoring program.

As most mining organisations usually rely on some form of specialised assistance or contracted service provider to support the collection and/or analysis of the relevant data, there is a fantastic opportunity to improve the level of service provided. This is achieved by offering some basic and timely information about what both the mine production and maintenance departments have been recently doing. It is the mine's responsibility to ensure that the condition monitoring service provider is aware of any recent component changes, lubrication replacements or top ups, clean up activities (possibly leading to water ingress), adverse environmental conditions (rain, dust, or heat), or abnormal production duties (associated with increased wear).

All relevant information relating to the mine's equipment should be provided, so it can be used to confirm the data obtained and put confidence into the results of the condition monitoring program without the inefficiencies with re-sampling or retesting equipment to resolve any conflicting trend data.

Endeavour to assist with the long term drive towards improving equipment reliability through proactive based maintenance approaches by sourcing information that can be used to determine the cause of ongoing equipment failures. Whenever possible, investigate the cause of equipment failures and have defective components returned to the mine for post mortem review by the appropriate condition monitoring or engineering personnel. This will allow a mining operation to actively pursue and remove the causes of many equipment failures.

Begin to expand upon improvement opportunities within the business by realising that condition monitoring is not just about rotating equipment.

All of the available sources of information should potentially be included in the condition monitoring program to allow the business to get the 'Big Picture' with regard to the condition of its wealth producing assets.

If necessary, seek assistance from others to help monitor the progress and development of the condition monitoring program and provide an external perspective on the strengths, weaknesses, opportunities, or threats of that program. This will provide maintenance and engineering management with a guide allowing the program to continue developing.

As a final point of deliberation, consider condition monitoring and the wider maintenance program as an investment with measurable and worthwhile returns to the business rather than just a cost of operation.

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KEY BENEFITS FROM PROACTIVE PRINCIPLES:

- **Reduce the level of personal stress within the organisation that results from continued equipment failures and production losses which as a result could improve morale and contribute positively towards staff turnover issues.**
- **Improve the reliability and productivity of the mining operation which inturn leads to greater customer satisfaction, greater customer dependence and therefore increased product sales.**
- **Increase the operational life of the mining or processing equipment which can result in the deferral of future equipment replacements and capital investment decisions.**
- **Reduce costs associated with unnecessary "Fixed Time" maintenance practices by doing only the required maintenance activities (overhauls, replacements, services, etc.) when they are actually needed.**
- **Provide the business with information that can be used to eliminate equipment failures through Root Cause Analysis methodologies. This approach can be used to identify the appropriate corrective actions or improvements that are necessary to prevent the reoccurrence of specific types of component failures.**

Serious wrench injury

A FITTER has been seriously injured after a hydraulic torque wrench struck him in the head.

Two fitters were applying torque when the impact socket dislodged and the wrench ricocheted into the worker's head.

According to a safety report from the the Queensland Department of Mines and Energy (DME), the wrench reaction arm was not properly secured, and safety recommendations accompanying the tool were not followed.

The DME's report said the wrench instruction manual suggested that workers stay clear during operation and properly secure the wrench during use.

Despite queries from *Australian Mining*, the Department would not release details about the mine or when the incident occurred.

For all the latest safety news, visit www.miningaustralia.com.au, or sign-up to the free enewsletter.

Inspector of mines, Queensland DME
info@dme.qld.gov.au
www.dme.qld.gov.au

Portable grease gun

AN improved battery-operated grease gun from Macnaught now pumps at 100gm/min (free flow) – almost twice as fast as the original model.

Each fully charged 12V NiCad 1300mAh battery enables the compact and portable grease gun to dispense up to three 450 gm cartridges at 34500 kPa.

The gun has a 762 mm flexible extension. It can operate in temperatures up to 500°C, and can be connected to a bulk refilling or J2 grease pump system.

The grease gun can operate in temperatures up to 500°C.

The grease gun won a 2007 Australian Technology & Innovation Award from *Power Torque* magazine.

Macnaught Pty Ltd
1800 185 102
www.macnaught.com.au

Costly gasket

THE NSW Department of Primary Industries (DPI) has released a safety alert after a manifold gasket in an underground coal mine was damaged.

According to the DPI, the damaged gasket was detected during a code 'D' inspection, but incorrectly installed during the previous code 'D' inspection, meaning the system was unable to fulfil its duty for 2000 hours.

An investigation revealed the gasket was dropped during installation and although undamaged it was not aligned with the bolt holes.

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