



Technical Talk

By Mark Chisnall

Remote Monitoring and

Proactive monitoring of equipment and control systems, can lead to increased plant efficiencies, reduced unplanned downtime and operating and maintenance costs.

As today's manufacturers continue to seek new methods and tools that can enable them to do more with less, many leading-edge companies are turning to innovative monitoring and diagnostics tools that can dramatically enhance and improve a company's existing maintenance, repair and operation (MRO) programmes. Often referred to as "remote monitoring and diagnostic systems," such technologies can help companies cut overall production costs, improve quality, minimise downtime and increase operational efficiency.

Thanks to the Internet, new intelligent monitoring tools, and high-speed plant floor and telecommunications networks, manufacturers today can collect and analyse data from every corner of a plant, providing the ability to monitor and protect plant - even from remote, offsite locations. Forward thinking manufacturers realise that capturing, analysing and effectively using condition and operating information from machines can significantly reduce and even prevent unplanned downtime, enabling managers to make informed production decisions. In short, remote monitoring systems can provide an important strategic and competitive advantage that can improve profitability.

But deciding on whether or not a remote monitoring system is right for a particular company is no easy task. Complicating the issue is the fact that there are many variables to consider when deciding how to implement such a system, from the technology to use to the people that will monitor and analyse the system.

Avoiding downtime is critical

Manufacturers know all too well the high costs of premature or unexpected equipment failure. Unplanned downtime can be extremely costly, particularly in environments such as flour and feed mills, where a single hour of unplanned downtime can cost thousands of pounds. At the same time, most manufacturers can't afford to stop production just to identify potential or developing equipment problems.

What should be monitored?

When implementing a remote monitoring and diagnostics program, manufacturers should first determine what equipment to monitor based on their type of process and the role of that equipment in the process. The next determining factor is the type of information that needs to be collected, monitored, and analysed from that equipment: machine conditions, operating data or both.

Machine condition is normally associated with mechanical and rotating devices and includes lubricant state, vibration, alignment, wear, moisture, and component temperature. Condition based monitoring involves regularly collecting information on these parameters from selected machines to determine when an undesirable change of state occurs and how corrective action can be triggered.

By determining when a machine condition deviates from an acceptable state - and learning how to prevent such conditions, manufacturers gain a proactive and predictive maintenance tool that helps minimise machine damage, unexpected breakdowns, and product quality issues.

For example, advanced condition monitoring technology can accurately predict when a machine's oil is degrading and should be changed.

So, instead of routinely changing the oil for a piece of equipment according to a regular maintenance schedule, a manufacturer can now potentially save time and money on maintenance by changing the oil less frequently, on an as-needed basis. While such savings may seem small on a per-machine basis, they can quickly become significant when calculated for all affected equipment across the facility.

Operating data such as line speed, pressure, input/output voltage, process temperature and flow rate can be remotely collected and monitored through the electronic control system of the machine.

This information can be used to immediately notify maintenance personnel or an outside support service when a fault has occurred or a pre-defined process variable has deviated outside of the acceptable operating range. The problem can then be diagnosed and corrective action or maintenance activities performed to maintain quality and minimise or prevent downtime.

The strategy of monitoring and predicting machine problems in advance is a significant shift in maintenance philosophy and resource allocation, from reactive to proactive activities. To properly implement a proactive system, manufacturers need to invest and commit to not just fixing a problem, but also identifying its root cause. Such a process means more than just knowing that the bearing in the motor needs to be replaced on a regular basis, or the line speed must be constantly adjusted. It means uncovering why the problem is consistently happening. Is it simply a lack (or excess) of lubrication? Or is a system component prematurely failing? A remote monitoring and diagnostics program can help uncover and solve such mysteries.



Diagnostics

Evolution of plant floor monitoring technologies

Once it has been determined what to monitor, the next step is to determine how to monitor it. Computer diagnostic technology first entered the manufacturing production process with the use of self-evaluating devices that could send "help needed" messages when a machine encountered a problem.

Today, remote monitoring and diagnostics technology has evolved considerably, and the Internet and a wide range of network and telecommunications technologies have made their way to the plant floor. When used in conjunction with these communication technologies, accelerometers and probes mounted directly on plant floor equipment, and the control systems on that equipment, can send plant floor information throughout an organisation, virtually eliminating the need for manual data collection.

Best of all, these technologies allow companies to cost-effectively implement a truly remote, real-time process monitoring and asset optimisation program that can potentially be accessed from almost anywhere in the world.

Because of the wide range of remote monitoring technologies that are now available, selecting the best approach for a given situation requires a thorough understanding of exactly what needs to be monitored, the costs associated with a specific monitoring technology, the skill level of plant floor personnel to implement and utilise the technology, how quickly information needs to be collected and analysed, and the goals the program should achieve.

Immediate and proactive response to problems

Scalable to organisations of almost any size, remote monitoring and diagnostic tools can be tailored to fit virtually any plant floor application that utilises intelligent devices (e.g. controllers, drives, sensors). Whether a manufacturer needs periodic predictive maintenance, continuous evaluation of critical machinery or as-needed response, remote monitoring and diagnostic tools can provide quantifiable benefits.

One of the underlying strengths of a remote monitoring program lies in the immediate and proactive response it allows. Through a remote monitoring and diagnostics program, information can be continuously collected from rotating equipment (e.g. rollers, dryers and gearboxes), control systems, and drives to identify even the smallest changes in operating variables or conditions, allowing problems to be identified and corrected well before they become visibly apparent.

Such remote monitoring systems can also help identify the root cause(s) of consistent failures or inefficiencies. For example, in applications where a pump is not performing to expectations, the problem can often be traced to a faulty pump seal. But a pump seal failure is often a symptom of something else, such as misalignment, overpressure or high temperature. By monitoring the right machine conditions and operating data, companies can identify the source of a problem that may otherwise be very difficult to detect.

Getting the most from external remote monitoring experts

Many manufacturers are looking outside their organisation for assistance in non-core competencies, including remote monitoring and diagnostics programmes. This strategy can help manufacturers focus on key goals, such as product development and faster delivery, while outside vendors find ways to reduce equipment downtime and improve efficiency.

Outsourcing remote monitoring and diagnostics of critical machinery can also provide specific cost advantages, particularly in situations where machine performance is crucial but in-house monitoring is not practical because of limited resources. Even large companies that have in-house remote monitoring and diagnostics programmes have found that employing external experts to analyse data and recommend corrective actions minimises gaps in staff expertise and on-going training requirements.

In some cases, the remote monitoring service provider may even offer Web access to the same data they are collecting and monitoring offsite. The Web site can include the ability to view current operating conditions, store and review support incident and trending reports, and download current software versions or machine settings in the event of unexpected file loss or damage.

When integrated with a computerised maintenance management system, such status reports can trigger work order requests directly to the facility via fax or e-mail. In summary, sophisticated monitoring and diagnostic technologies will greatly improve the ability of manufacturers to reduce long-term operating costs and increase uptime and asset availability.

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Please contact Mark if you have any questions on plant Automation or if you require a specific subject to be considered for future publication.

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