

PRESS RELEASE

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Smart Condition Monitoring helps pharmaceutical manufacturers drive for world class OEE scores



As pharmaceutical manufacturers look to boost productivity and minimise downtime, frequently now with the goal of moving from batch production to continuous operation, Neal Welch, Life Science Sales Manager, Automation Systems Division at Mitsubishi Electric highlights the importance of smart condition monitoring technologies.

As a tightly regulated sector with huge financial incentives to keep production lines running, manufacturers in the pharmaceutical industry typically experience less unplanned downtime than those in other sectors. Indeed, pharmaceutical manufacturers as a whole can point to fewer hours of unscheduled downtime than the equally high value automotive industry, and fewer also than the similarly regulated food and beverage sector.

This has been the case for some time, surveys conducted as long ago as 2004 by downtime expert Don Fitchett highlighted not only this push for manufacturing excellence within pharmaceuticals, but also pointed out how extensively companies were tracking their downtime, with standardised metrics in place to report it. This was hardly surprising given that almost 90% of them cited that downtime was either extremely or very important.

However, monitoring unplanned downtime is not the same as preventing it. And the component failures or bottlenecks that are prime causes of downtime can also impact on production line performance and on product quality. Combined with availability, these three key performance indicators are at the heart of measuring Overall Equipment Effectiveness (OEE),

as defined by the simple formula:

$$\text{OEE} = \text{availability} \times \text{performance} \times \text{quality}$$

Fast forward, then, to today, and statistics highlight an average OEE score within the pharmaceutical sector of 60-70%, some way short of the score of 85% that is generally considered as world class. So while the pharmaceutical sector is ahead of the curve in acknowledging and tracking its downtime, it would appear it is not yet truly on top of maximising availability and boosting line performance.

Pharmaceutical manufacturers are acutely aware that they need to increase machine availability and reduce unscheduled downtime in order to respond to global competition and minimise costs. But the traditional techniques for helping to predict downtime in order to manage maintenance and to help maximise reliable production have typically been either expensive – such as using out-sourcing experts to analyse machinery and interpret the results of complex algorithms – or highly subjective, relying on the experience of in-house engineers who are intimate with production lines and can ‘hear’ or ‘feel’ impending component failures.

The move to continuous production, from batch production is another trend in pharma manufacturing that is also creating an environment where production systems are even less tolerant of breakdowns or equipment variability. Traditionally a drug would be manufactured in stages, with lab tests carried out at each stage to confirm the attributes of the compound in production. Test regulations now however allow for real-time testing to be carried out on-machine during a continuous production process. So when the production process doesn't stop, then reliability must be 100%.

Condition monitoring developments

In recent years, condition monitoring technologies have become mainstream – components that could be easily retrofitted to motors and rotating machinery to detect impending problems. From the outset, these opened up new possibilities for preventative maintenance, ensuring that components could be detected as nearing the end of their working lives and swapped out during scheduled maintenance. No longer would manufacturers be caught unawares by catastrophic failure. No longer would there be the problems of huge losses in productivity caused by



PRESS RELEASE

29/06/2017



downtime of a prime asset, with lost productivity running into perhaps tens of thousands of pounds, not to mention the emergency repair rates.

Today, though, we can go even further, with new generations of 'smart' technologies opening up the possibility not simply of preventative maintenance within pharmaceutical production, but of predictive maintenance. Key developments in sensor technology enable the continuous monitoring of many more machine parameters, cost-effectively, from large prime movers right down to smaller systems.

As an example, the Smart Condition Monitoring (SCM) solution from Mitsubishi Electric provides an integrated approach to monitoring the condition of individual assets, and enables a holistic approach to be taken to monitoring the asset health of the whole plant. These SCM systems can be operated continuously and can be relied upon to give a simple but effective warning prior to significant failure.

The 'smart' capability of the system and sensors comes from a combination of local, on-machine warnings – perhaps using the familiar traffic light system – and through having information from multiple sensors transferred over the plant network to PLCs and then on to HMIs, PCs or mobile devices for in-depth monitoring, advanced warning and more detailed analysis.

Maximising OEE

The SCM system supports a number of functions that aid in predictive maintenance, including bearing defect detection, imbalance detection, misalignment, temperature measurement, cavitation detection, phase failure recognition and resonance frequency detection. Linking multiple sensors into the control system enables the controller to analyse patterns of operation that are outside the norm, with a series of alarm conditions that provide alerts that attention is needed.

SCM doesn't simply help to predict when a key component is nearing the end of its life, to enable replacement to be scheduled rather than being surprised by catastrophic failure. It also enables companies to see production trends, such as aspects of the line drifting out of tolerance. If unnoticed or left unchecked such trends could cause a stoppage resulting in the need for operator intervention; perhaps not catastrophic failure, but costly and

accumulative of downtime nonetheless.

Even if such trends would not ultimately result in full process downtime, there is the possibility that they would eventually impact on product quality. Without an SCM implementation, the first a company may know about this is when a batch of products fails a critical QA inspection, meaning wasted product after all the value has been added.

Thus we can see that smart condition monitoring techniques impact positively on all three aspects of the OEE equation (availability, performance and quality), helping pharmaceutical manufacturers in their drive towards world-class OEE scores.

Enabling continuous production

SCM can go further, by providing an essential tool to assist the pharmaceutical industry with the move from batch production to continuous production. This shift to continuous production requires increased running time between periods of scheduled maintenance, and is dependent upon the ability to reliably monitor the condition of the operation.

The SCM system addresses this requirement because, along with indicating a developing problem on a machine or line, it is also able to give meaningful detail about what the problem is and how serious it might be. And by providing a complete and holistic overview of the workings of the plant's assets, it can also enable a model-based fault detection and identification system to be implemented, with an active fault diagnosis framework.

We can see, then, that SCM offers many benefits to the pharmaceutical sector. It provides reliable monitoring of individual machines and complete production lines, with intelligent process monitoring to deliver a full service built around machine diagnostics. Further, it offers easy installation and intuitive operation, with a system that is readily expandable. Using the 'smart' approach, condition monitoring can be easily integrated into the plant system architecture, starting with as much or as little is required, and growing the system as appropriate to provide the most comprehensive overview.

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With over 90 years of experience in providing reliable, high-quality products to both corporate clients and general consumers all over the world, Mitsubishi Electric



PRESS RELEASE

29/06/2017



Corporation is a recognized world leader in the manufacture, marketing and sales of electrical and electronic equipment used in information processing and communications, space development and satellite communications, consumer electronics, industrial technology, as well as in products for the energy sector, water and waste water, transportation and building equipment.

With around 124.000 employees the company recorded consolidated group sales of 39.3 billion US Dollar* in the fiscal year ended March 31, 2014. Our sales offices, research & development centres and manufacturing plants are located in over 30 countries. Mitsubishi Electric Europe, Industrial Automation – UK Branch is located in Hatfield, United Kingdom. It is a part of the European Factory Automation Business Group based in Ratingen, Germany which in turn is part of Mitsubishi Electric Europe B.V., a wholly owned subsidiary of Mitsubishi Electric Corporation, Japan.

The role of Industrial Automation – UK Branch is to manage sales, service and support across its network of local branches and distributors throughout United Kingdom.

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