

Smart Condition Monitoring aims to end downtime for the Food and Beverage Industry

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Predictive maintenance is the best answer to minimising the risks of equipment failure, however, monitoring practices in the past have been expensive, problematic and at worst, unreliable. The solution is to switch to what Mitsubishi Electric offers to as ‘Smart Condition Monitoring’, a system which can connect to rotating equipment and provide plant-wide 24-7 monitoring.

Using a Smart Condition Monitoring (SCM) system, operators can now easily gain access to the status of rotating equipment. The system can raise the alarm to predict failures in advance and provide information on recommended actions to take, all allowing for more cost effective asset management, which in-turn helps to continually avoid unplanned production downtime events and the associated excess maintenance costs.

Example: If a mixer or a refrigeration unit fails in a food or beverage processing plant the drop in productivity alone can cost thousands of Euros per hour, which is often compounded by the further cost of wastage and unplanned maintenance. Such units should be considered ‘primary assets’ – assets which if unavailable, can bring whole sections of a plant to a total standstill. Preserving the efficiency of these primary assets is therefore paramount to meeting KPIs and ultimately achieving profitability.

Traditional methods of condition monitoring have involved highly trained personnel running sophisticated algorithms on vibration pattern recordings to identify if a machine is due for maintenance or a defect is present. IR cameras can also be used to reveal hot-spots where excess vibration or friction creates an abnormal heat signature. Other, less sophisticated methods have involved listening devices or even holding a screwdriver to the machine to sense the vibration.

With recent developments in modern sensor technology, businesses can now engage in ongoing monitoring activity in a reliable and cost effective manner. As a result, it has never been easier to avoid the catastrophe of unplanned downtime - the nightmare of production and maintenance teams across the food and beverage industry. Smart Condition Monitoring relies primarily on developments in sensor functionality, networking and the use of smart controllers to provide continuous monitoring.

With advances in technology, a wide range of factors can be automatically monitored and cross referenced by an SCM, including vibration characteristics, operating temperatures, drawn current and shifts in operating parameters. The system utilises multiple smart sensors, physically attached to the asset (using glued, screwed or magnetic fixings), which feedback information via Ethernet to an advanced sensor controller which incorporates a Mitsubishi Electric PLC at its heart.

The solution can be used as a self-contained, stand-alone device (idea for feasibility studies or trials) or as a fully integrated system, allowing information to be transmitted across the factory for easy access via HMIs

on the shop floor, to PCs connected to higher level data systems, or to mobile devices over local Wi-Fi, the internet or mobile networks. The crucial data analysis is performed on board the PLC, so the system can be relied upon to transmit simple but accurate overviews or warnings to operators in real-time prior to any significant asset failure.

An intuitive graphical interface, as with many of the latest automation technologies, is vital for operators to diagnose potential issues without expert knowledge. Utilising the installation of HMIs configured to display basic parameters, the system can automatically create conditions and alarms with an associated text description. Diagnostics can be configured to display all data regarding an asset, or a general overview that can be simplified into a traffic light alert system displaying overall condition for ease of assessment. Thanks to an associated App, operators can also use a mobile device to monitor the status of equipment while on the go.

Once in operation, a Smart Condition Monitoring system can detect a wide range of potential issues. These include bearing defects from races or balls and rollers, motor imbalance, misalignment, instability, resonant frequencies, breakages, blockages and low levels of lubricant, temperature fluctuations and phase failure in power components. From these faults, the system can offer suggestions for future operation, more precise error identification and trend analysis.

By spreading sensors around the plant and including information from other automation systems, the reach of an SCM goes far beyond the more traditional methods that would typically concentrate on a specific power transmission component. This means that many smaller ancillary systems can also be connected economically, reaching out from primary

assets to take into account a more holistic and therefore far more effective, encompassing view of the production facility itself.

The importance of such systems has increased as production managers are now required to attain a reliable 'future' plant, with new approaches needed to allow for increased digitisation and ensuring the adaptability of processes for future technological development. These trends have seen the demand for condition monitoring systems increase over the last few years, which is not likely to slow down - given a number of market sources are predicting the industry will undergo compound annual growth (CAG) up to 7% for the period to 2020 [1].

The cost to the industry of not adopting an SCM approach is equally as daunting: a report [2] from international business analysts Dunn & Bradstreet indicates that 49% of Fortune 500 companies experience at least 1.6 hours of downtime per week, which is the equivalent of two working weeks a year. Downtime cost estimates for food producers vary wildly from hundreds of Euros per hour to tens of thousands, depending on the size and nature of the process, so, cumulatively it's clear the cost to the industry is huge [3]. As global competitiveness increases those with an advantage are likely to take the spoils.

By utilising a smart approach with regards to condition monitoring, proactive maintenance can become part of the plant system architecture, providing continuous access to the diagnostic information that operators require to safeguard assets. Maintenance policies can be safely amended to increase productivity, for example, relaxing set lubrication schedules and using the monitoring system to signal on-demand maintenance for whichever asset requires attention instead. Through

unparalleled access to diagnostic information, resources can be effectively channelled to improve efficiency. With total access available via a combination of smart devices, networking and the use of “smart manufacturing” principles - responses to alarm conditions can be faster, with both production and maintenance teams referring to accurate, predictive ‘live’ information.

For the food and beverage industry where profits or stock can be severely affected by unplanned downtime, an SCM system allows not only full condition monitoring to avoid failure but also the automation IT framework to synergise the use of maintenance resources in a cost effective and efficient manner.

Note:

See how Mitsubishi Electric is able to respond to today’s automation demands:

eu3a.mitsubishielectric.com/fa/en/solutions

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Image captions:



Picture 1: Thanks to recent developments in modern sensor technology, it has never been easier to avoid the catastrophe of unplanned downtime - the nightmare of production and maintenance teams across the food and beverage industry.

[Source: Thinkstock]



Picture 2: The Smart Condition Monitoring solution from Mitsubishi Electric offers comprehensive analysis on the health of individual machines as well as a complete overview on the health of the wider plant. The result is vastly improved predictive maintenance and optimised asset lifecycle management.

[Source: Mitsubishi Electric Europe B.V.]



Pictures 3+4: The SCM Kit from Mitsubishi Electric provides a plug-and-play solution for machine condition monitoring. SmartCheck sensors can be added to machines as and where required, with a simple teach function allowing the sensor and controller to learn the normal operating state of the machine, generating a memory map of key parameters.

[Source: Mitsubishi Electric Europe B.V.]



Picture 5: The SCM from Mitsubishi Electric analysis provides detailed diagnostics, offers suggestions for where additional measurements should be taken, and provides maintenance staff with more precise error identification.

[Source: Mitsubishi Electric Europe B.V., Thinkstock]

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*Exchange rate 112 Yen = 1 US Dollars, last updated 31.03.2017 (Source: Tokyo Foreign Exchange Market)

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