Maintenance, Reliability & Asset Optimisation 2018

YOUR COMPLETE GUIDE TO OVERALL EQUIPMENT EFFECTIVENESS SOLUTIONS

Asset optimisation solutions that give you an edge
Early Detection System for Oil on Water and Land

Oil spills and or leaks bring with them tons of pain for the guilty party with respect to government fines, environmental issues, negative publicity, costly clean up and product losses. To mitigate this pain one needs to continuously monitor for leaks, spills and or illegal dumping of oil.

ROW (Remote Optical Watcher), is an Autonomous non-contact sensor for detection of oil on water and land. ROW is highly accurate, easy to maintain, finds oil spills early so you can respond before things get out of hand.

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**SCALABLE SYSTEM:** ROW networks can be deployed to monitor every critical point across multiple sites to provide a full overview of your facilities in real-time.

**TIME IS OF THE ESSENCE:** An hour could mean the difference between a simple scoop-up job and an ecological disaster. ROW detects oil spills earlier and more reliably than any manual system ever could. Can you afford not to install ROW?

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Complete Process Control Solutions
Our cover

Festo’s technical experts and efficient technologies ensure that machines and systems have shorter downtime, consume fewer resources and less energy. This leads to increases in the sustainability of production processes and overall company productivity. See this issue’s cover story on page 4 for more on the company’s vast array of engineering solutions for productivity improvement.

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The best approach to reliability depends on the plant and equipment

The profitability of asset-intensive manufacturing companies hinges to a large extent on maximum plant availability with minimal (zero) unplanned downtime. But what is the best approach for the maintenance manager to take in order to achieve this? Every type of plant is different, and their approach will also be constrained by the level of available personnel, the budget, the age of plant assets, and the typical manufacturing cycle. The traditional ‘preventive maintenance’ approach still has its place, but new research indicates that only a small percentage of equipment shows the age-related failure patterns best served by this method. As it turns out, the majority of plant assets can be operated more efficiently using strategies like predictive or prescriptive maintenance, both of which place the organisation higher on the maintenance maturity curve. However, the move up the curve raises some important questions. If the plant is running well today, is it running the same as yesterday? How do you know? The answer is through some sort of measurement. In response, the variety of sensors available to monitor plant operations have multiplied in number, particularly over recent years, and the software available for data analysis has increased in complexity and functionality, which can also be accessed remotely. The combination of these can now give plant owners the operational information they need to enable optimisation of each stage of the process, along with advance warning of any possible equipment deterioration.

The challenges for the plant manager then become to identify where best to allocate the available budget for monitoring so as to provide information on maintenance related issues, and which plant operations could benefit the most from closer scrutiny to identify methods of improving performance. There are specialists in, and equipment for, many different types of plant and machinery. So the decision becomes whether the identified monitoring can be incorporated into the existing automation using a cots (commercial-off-the-shelf) solution, or whether it needs to be separate. If separate, then can these systems be managed by in-house staff, or do they need support from a specialist external operator? (See page 10 for advice on how industrial organisations can improve their asset management strategy.)

Off-the-shelf systems can provide immediate benefits There are many examples of easily installed solutions designed to solve common (and often costly) reliability related issues. For instance, it is almost impossible to detect a jammed or leaking steam trap in real-time as it requires a plant walkthrough, and even then problems can easily be missed. No surprise then that many companies have invested in retro-fit steam trap monitoring technology connected to the control system via an industrial wireless network. Such systems are available from Emerson (www.instrumentation.co.za/54239n), Spirax-Sarco and Armstrong. Another area where advanced warning is a benefit is in the condition of bearings on heavy-duty rotating machinery like pumps, fans and centrifuges. With sensors fitted on the housing, any high-velocity vibration accompanied by an increase in temperature can indicate bearing deterioration. Suppliers like SKF (www.instrumentation.co.za/55967n) and Schaeffler, provide simple Go/No-go alarms, as well as multi-sensor monitoring platforms for equipment as big as wind turbines, all backed by their bearing know-how. Some machines require continuous monitoring, but there are also wireless (self-powered) versions of these sensors that can be moved and placed around the plant as required.

The IIoT puts it all within reach
The ideas of advanced condition monitoring have been around for years, but were always limited by the need for plant-based specialists to analyse the data and detect the changes. Now, thanks to Smart Sensors and Big Data analytical software affordably connected via the Industrial Internet of Things, equipment analysis has become easier with many suppliers offering to monitor their machinery remotely as a service. Some even offer to monitor overall plant performance providing regular reports and recommendations, along with guarantees of maximised productivity and reduced operating expenses. What we aimed for in this Industry Guide was to present as many as possible of the modern methods and technologies available to optimise overall equipment effectiveness through reliability. Hopefully you will find a few ideas in here to help you identify the best options for your own plant.

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Festo’s technical experts and efficient technologies ensure that machines and systems have shorter downtime, consume fewer resources and less energy. This leads to increases in the sustainability of production processes and overall company productivity.

Energy efficiency as an interdisciplinary topic
At Festo, energy efficiency is not just seen as a short-lived topic of discussion, but as a significant factor for sustainable competitive advantage. For many years, the company has been actively promoting all-round energy efficiency as is demonstrated by various research projects on this topic and the Scharnhausen Technology Plant.

As a family enterprise with a long-term perspective, Festo has been living out energy efficiency for many years, both within the company and together with its customers. Energy efficiency is a competitive factor and must be established as a fundamental requirement of the production process.

Focus on the entire value chain
In keeping with this strategy, Festo focuses on the entire value chain in terms of energy efficiency – from engineering, via energy-efficient products, to the efficient design of systems and the energy-saving operation of machinery and equipment – in other words, ‘green’ production. This is also demonstrated by the ‘Experience Energy Efficiency’ exhibition at corporate headquarters in Esslingen-Berkheim (Germany), which makes the topic directly accessible through videos, interactive exhibits and exhibition modules, which demonstrate the company’s own products to customers and other interested parties. The focus is on a four-step approach that encompasses the interplay of intelligent systems design, energy-efficient products and solutions, sustainable services and sound vocational training.

Engineering strategy for the design of production facilities
The engineering strategy demonstrates how production facilities can be designed with a view to energy efficiency. With an electromechanical spindle axis and a pneumatic linear drive, a design object at the first station of the exhibition provides insights into the technical complexity. The significance of total cost of ownership (TCO) is shown on the basis of acquisition and energy costs for three different handling systems over an operating period of several years with different cycle times. The visitor can set the desired payback period for a pneumatic, an electrical or a combined handling system, and ascertain which of these represents the most economical solution for the specific requirements.

Energy-efficient automation
In the second part of the exhibition, Festo demonstrates how automation functions can be made energy-efficient using the company’s products and solutions. The centre of attention is a pencil-sharpening unit that informs the visitor by means of animated pictures of the twelve measures realised and the attainable economisation potential. Decentralised valve terminals located close to the drive units, for example, show how compressed air can be used in a more efficient manner using shorter tube lengths.

Services and further education
In the third part of the exhibition, the visitor learns how existing pneumatic units and systems can be improved via the Festo Energy Saving Services. The model of a compressor block demonstrates the operation of a screw compressor. Pulsating LEDs simulate the compressed air, current and heat. The fourth module from Festo Didactic is concerned with the connection between the acquisition of theoretical knowledge and its practical application. Here, visitors can see how control commands influence energy efficiency in an industrial unit.

Taking an integral view
On completion of the tour, one thing becomes clear: energy efficiency issues can only be resolved by means of an all-encompassing strategy. Festo can provide this comprehensive overview, since it offers not only the hardware, but also consultancy, engineering, measuring services and training. Close cooperation with customers and suppliers is decisive for long-term success with regard to energy efficiency in automation technology. Festo is thus engaging in an exchange of experience with leading research institutes and other enterprises. Together with partners from nine European countries, Festo is active for example, in the EU research programme EMC2-Factory, which sets
out to improve energy efficiency above all in energy-intensive production processes in the automotive, rail and aerospace industries.

The company sets store by sustainable networks: in a pilot project, the company together with a customer at the Hettich group, a manufacturer of functional furniture fittings, succeeded in reducing the energy consumption of a production plant by 30 percent using optimised pneumatics. This concept is now being implemented step by step at the customer’s facilities.

At its Scharnhausen Technology Plant Festo went even one step further when the facility earned an energy management system in accordance with DIN EN ISO 50001. This is a further example of how energy efficiency is being established as an issue of interdisciplinary significance throughout the enterprise.

**Training to minimise maintenance costs and increase productivity**

Another way that the organisation assists with maintenance and asset optimisation is by offering proper training through its Didactic division. One of the biggest challenges manufacturers face today are staff who are not properly skilled and cannot operate new machinery and technology efficiently. This can result in costly business disruption and productivity losses.

With more and more South African manufacturing companies competing on a worldwide scale, it is imperative that they partner with trusted suppliers that have a global footprint and can assist them with their training requirements.

**Ordering spare parts is easy**

Downtime is expensive. That is why it is important to identify and locate the causes of faults as quickly as possible and replace defective components without delay. Festo offers an online spares catalogue, which makes it easy to find replacement parts. However, Festo has taken convenience for replacement parts a step further by using its AutoID system.

**Automatic identification AutoID – always the right information**

AutoID is all about having one channel for all information. Being able to retrieve data using the Product Key, Logistic Code and LabelDesigner makes life as a purchaser, maintenance engineer or production manager much easier. Clients can find the pointer to the digital twin of their components on the product or packaging. Festo calls this digital simplicity, and it saves time and supplies important information in a flash.

The Product Key provides clients with precisely the information that describes their product. This helps them to locate documentation, customer order numbers, certificates, CAD data, circuit symbols, links to compatible device description files, commissioning software or to go straight to the product in the spare parts catalogue. The benefit is fast and unambiguous identification of the product.

The Logistic Code has valuable logistical information for goods inwards processes – without having to be online. The benefit is faster and error-free receipt of goods.

The LabelDesigner helps customers create bar code labels that can optimise their logistics and ordering processes. With their designation, the stored order quantity, product image, Festo part number and storage location, reordering becomes even faster and easier. It is easy for clients to use the Festo Online Shop (www.festo.co.za).

In conclusion, Festo makes the repair process simple by posting practical and user-friendly video tutorials on topics that are the subject of frequently asked questions in the areas of maintenance, commissioning and repair. It could not be more simple than with Festo, engineers of productivity.

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During my days as a process engineer, I worked on an amino acid fermentation plant where it was very important to keep the process sterile at all times otherwise entire batches could be lost to contamination. Dozens of automated diaphragm valves were used to control raw material feed into the fermenters, CIP (clean in place) and steam used to sterilise the equipment. The valve diaphragms were made of a special EPDM-PTFE compound which had a limited lifetime. Predicting when to replace the valve diaphragms was important to prevent pinhole leaks developing which could contaminate the system.

At first, the maintenance team replaced the diaphragms on a fixed schedule. But we knew that the useful life of the diaphragms was related to the number of valve cycles (open/close); and the total time that the diaphragm was exposed to high temperatures (steam). This data was readily available on the DCS system. It was not long before we analysed the historian data to try and predict the remaining life of the diaphragms. This promised to be a worthwhile exercise; the diaphragms were expensive, and we fully expected to reduce the number of changes without increasing the risk of contamination. The maintenance schedules were, as a result of this work, adjusted based on actual usage data. In a small way we were using the principles of predictive analytics to optimise planned maintenance schedules.

Breakdowns and equipment failures can be costly across all industries. In transportation, for example, the premature failure of a jet-engine can cause cancelled flights and delays, as well as being a safety concern. In process industries, a critical compressor failure can result in the shutdown of an entire plant. In power generation, the large high-speed turbines can take months or even years to replace, resulting in lost capacity and revenue.

Predictive analytics for planned maintenance is a technique that uses data to understand equipment degradation and predict failure. By better understanding the risk of failure, preventative maintenance can be scheduled at the best possible time to reduce disruption and therefore costs.

In the past few years the use of predictive analytics has grown. This trend has been

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underpinned by three main technology drivers:
1. Better field instrumentation that includes smart sensors connected to the Internet.
2. Cloud-based IoT platforms capable of streaming and analysing large volumes of data through the web.
3. Better connectivity and the ease by which the operating parameters of equipment can be remotely monitored by service providers.

Using predictive analytics to plan maintenance makes the most sense in asset-intensive operations such as transport, construction, chemicals, utilities, mining and so on. The techniques are equally applicable to continuous processes, as well as in discrete/batch manufacturing.

Predictive analytics has the most impact on the bottom line when used to predict failure of high value or critical components, where the impact of any downtime is significant. For example, the jet engines of a plane, the turbine generators in a power station, and key processing equipment like pumps or compressors in a chemical plant.

Predictive analytics can be applied at many levels, for example at the component level (e.g. turbine shaft vibration), at the equipment level (e.g. turbine output) or at the system level (generation plant efficiency). Deciding on where to apply the techniques requires an evaluation of the individual systems, equipment or components, together with an assessment of the available data sources. It is also important to assess the likelihood that a suitable artificial intelligence (AI) machine learning model will accurately be able to model the system and yield the desired results.

What is predictive analytics?
Predictive analytics is not magic. It uses established mathematical techniques to process data in a smarter way. In maintenance, it can manifest itself in a number of forms, one of which is called ‘condition monitoring’.

By understanding equipment condition and degradation patterns, it is possible to determine the risk of failure i.e. where it will fail, when it will fail and why it will fail. When there is sufficient confidence in the results of the analysis, maintenance can be rescheduled or deferred. Ultimately the goal is to make better maintenance decisions based on data.

The statistical techniques used include:
- Trend analysis and regression – projecting future performance based on past trends in the data.
- Pattern recognition – looking for patterns in the data that indicate abnormal operating conditions that could lead to imminent failure.
- Performance limits – triggering an alert when some parameter moves out of normal performance boundaries (anomaly detection).
- Prioritising – evaluating multiple options to prioritise maintenance work.
- Binary classification e.g. establishing whether or not something needs maintenance or not based on a complex set of input variables.
- Multiclass classification – predicting the probability of failures and failure classes over time.

Where predictive analytics makes the most sense
Predictive analytics is not necessarily a technique that should be applied to every item of equipment. The areas where the technique is most likely to yield good results include:
1. Moving machinery (where it is relatively easy to measure vibration, operating conditions etc.).
2. High capital cost items.
3. Critical equipment in a process where there is a high opportunity cost of breakdown.
4. Where the vendor already has built a good machine learning model and who can already provide a packaged solution.
5. Maintenance of specialised equipment under service contract (outsourced).
6. Failures where the root cause variables are well understood.

The benefits of predictive analytics in maintenance
There are very real business benefits to a predictive analytics system. These include:
1. Improved product quality and service levels.
2. Improved availability of equipment.
3. Early detection of expensive failure.
4. Better planning of the replenishment of assets.
5. Reduction of spare parts inventory.
6. Improved data to support warranty claims.
7. Increased life of assets and reduced use of consumables.
8. Reduced maintenance and downtime costs with better forecasting and budgeting.

How does predictive analytics actually work?
Predictive analytics is a technique used by data scientists to predict future events using statistical techniques. The common approach is to build a model based on a number of input data streams which are related to degradation/failure. After sufficient training, the model has ‘learned’ the system and can then theoretically be used to make predictions.

Training requires real-world data. For example, if you are going to predict breakdowns, then the model should be trained with data that includes some actual breakdown events: the more data that can be provided to train the model the better. In certain high-impact scenarios (e.g. aircraft engine manufacture) it is possible to do multiple experiments at sufficient scale that involve actual engine failures to train the model. In other scenarios (e.g. predicting the failure of a nuclear reactor) such experiments would for obvious reasons not be practical, and other training techniques will be better.

The modelling process will involve some processing of the input data, some clean-up/transformation, modelling and then interpretation/visualisation of the output in a form that makes sense to us humans. Rarely is this data capture process automated. Some human analysis is needed at the outset to decide on what input variables

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In many maintenance situations the only training data that might be available will be stored in legacy systems and probably not in the right format – for example it might be necessary to manually work through work order data from the maintenance system. This process can consume many hours before sufficient understanding of the system is developed, and enough data is collected for training of models.

Examples of historical data that might be useful input to develop a model:
- Failure history.
- Repair history.
- Condition of the machine.
- Operating conditions/context.
- Machine specifications.
- Operator parameters.

When building a system, it is very important at the outset to understand exactly what is going to be asked of the model. Each breakdown scenario needs to be defined exactly. This means that you have to have a very clear ('sharp') question in mind. For example: "At 90% confidence level, how many more hours can we run this motor before the bearings are no longer within specification?" Not, "Show me where things might go wrong."

The data being measured also needs to be reliable, accurate, complete and related to the specific failure. It is no good measuring vibration when a better leading indicator might be running temperature, for example. Your measurements should also be at the right level (i.e. at component level or at system level). It is unlikely (but not impossible) that you will get meaningful data at system level that will be able to accurately predict individual component failures.

When developing the model, you also need to know exactly how far in advance you need to do predictions. The further ahead, the more uncertain the prediction will be. It might make little sense to use analytics to predict failure a year in advance when routine inspections are done monthly.

Near real-time predictive analytics is only feasible when sensors are connected, manual data capture will delay the forecasting process and could introduce errors. Fortunately, with smart sensors and a good IoT enabled infrastructure, it is now more feasible to connect sensors to artificial intelligence models than ever before.

In many cases there is no need for online ‘real-time’ analytics. The processing costs need to be weighed up against the impact of only running the models daily (for example).

Cloud platforms that support predictive analytics models

Advanced analytics systems can be embedded in the equipment package, or can be run on local servers, or on cloud servers.

Cloud-based analytics processing is most suited for data sources that stream data from multiple locations to the web, such as the scenario where an equipment supplier remotely monitors their own specialised equipment under a maintenance contract. Cloud-based systems are also useful where the necessary processing power (servers) makes it uneconomical to build the infrastructure in-house and where economies of scale in large data centres can be leveraged.

An example of a cloud-based predictive analytics platform is Microsoft Azure, incorporating Azure data factory, Azure event hub, Azure machine learning, Azure stream analytics and Power BI. Solutions from the other enterprise software providers can also be considered, such as IBM’s Predictive Analytics, Oracle’s Asset Performance Management, Infor’s Enterprise Asset Management solution, SAP Predictive Maintenance and Service, and so on. Several providers of process control equipment also offer predictive analytics solutions that can run on premise or in the cloud.

Figure 1 shows an example of a cloud predictive maintenance architecture based on Microsoft Azure and Cortana Intelligence Solution. The on premise data is processed in real-time through the event hub and stream analytics. This is aggregated with batch data which is derived from on premise databases and stored in a cloud database for machine learning and further analysis. A single visualisation tool is used to aggregate and display the results of the analysis.

A few practical considerations

Predictive analytics is not going to be suitable for all situations. Your company needs to have mature processes that can use the output of the models in a way that fully takes advantage of the new information. There also needs to be sufficient skill within the business to develop, maintain and support the systems.

Models need to be trusted by those responsible for operations decision making. If the predictive analytics model does not make sense, managers may ignore the system and rely on tried and trusted techniques learned from their own experience. Unreliable models can worsen the situation and be very disruptive to production.

A predictive analytics project can be a data scientists dream; however, it is important at the outset to quantify the business benefits. Ultimately any such project needs to be business driven and not technology driven.

Conclusion

Predictive analytics in maintenance is becoming mainstream as a result of enabling technologies. There are many benefits to understanding exactly when something is likely to fail, leading to more effective maintenance, reduced costs and improved production/service levels. In order to get the business benefits of such a system it is important to understand the limitations of the technology and where it should be applied. Cloud-based analytics processing can be a game-changer in making predictive analytics more accessible to a business, but this needs to be supported by a good business case and mature processes that will make proper use of the output of the models.

Gear units and motors from SEW-EURODRIVE have always set the trend and established new standards in drive technology. For this reason, the quality label "made by SEW" has become a hallmark of quality in the drive industry. Market-orientated products developed and manufactured in-house, as well as uncompromising quality, are the cornerstones of our success.

SEW-EURODRIVE - Driving the world
Leading industrial organisations improve asset management with IIoT


Most asset-intensive industrial organisations find it increasingly difficult to assure high asset reliability and low unplanned downtime. As the vast installed base of industrial assets continues to age, the need for maintenance increases, while at the same time, competitive pressures and commodity business models force executives to control costs. A compounding factor has to do with an ageing workforce where experienced staff is retiring and organisations are finding it difficult to hire replacements with the needed skills and capabilities. This conundrum drives adoption of the IIoT and analytics to move to higher-maturity strategies with predictive and prescriptive maintenance.

Higher maintenance maturity supports both production and C-suite objectives. Key performance indicators (KPIs) for asset management focus on uptime, asset longevity, cost control, safety, and quality to support production. These KPIs also directly affect C-suite metrics of revenue, cash conservation, profitability and risk management. The C-suite’s metrics involve the profit and loss (P&L) statement and balance sheet that are scrutinised by financial analysts and potential investors.

Preventive maintenance is the optimum approach for just a small portion of assets. Data on failure patterns from four different studies show that only 18 percent of assets have the age-related failure pattern appropriate for this approach. The other 82 percent of assets require predictive (single-variate) or prescriptive (multi-variate) maintenance, both of which are higher on the maintenance maturity curve.

ARC Advisory Group’s research, together with case studies, has identified a successful and sustainable approach for higher maturity predictive and prescriptive maintenance programs:
• Adopt a packaged/standard platform for IIoT and analytics.
• Create models that predict failures for key asset types.
• Apply the models across many similar assets.

Operations improve with increased asset management maturity

Operations need good asset management
Operations groups obviously depend on good asset management and maintenance to achieve production objectives for on-time delivery with in-spec quality at minimum cost. To meet these goals, production needs the equipment to be available (uptime) and performing as required (capable). High uptime with low unplanned downtime becomes the key metric for maintenance. Uptime has been shown to be the top metric in multiple ARC surveys among maintenance and operations personnel over the past decade. Fundamentally, higher uptime enables production operations to perform optimally.

Asset management supports C-suite metrics

Per the survey results, the asset management KPIs focus on uptime, asset longevity, cost control, safety, and quality. They directly affect C-suite metrics of revenue, cash conservation, profitability and risk management. The C-suite’s metrics involve the P&L statement and balance sheet that are scrutinised by financial analysts and potential investors.

Uptime: Unscheduled downtime causes losses in direct labour and, often, work-in-process (WIP) materials. These losses have a direct negative impact on profitability. With just-in-time (JIT) scheduling and minimal inventory, the production interruptions also cause missed shipment dates, customer satisfaction issues, and reduced revenue. The resulting lower revenue negatively impacts P&L.

Uptime also affects inventory and the balance sheet. Manufacturers typically have a queue of materials between operations to buffer interruptions, particularly equipment failures. Higher equipment uptime reduces uncertainty and allows for lower inventory. This conserves cash and improves the balance sheet.

Asset longevity: Good asset management extends the useful life of assets, delaying the need for costly capital projects to replace or refurbish those assets. Avoiding capital expenditures conserves cash. With more cash,
financial metrics improve, along with stock prices.

Cost control for maintenance: The demise of a relatively expensive component often cascades onto other system components (just as the loss of R60 of engine oil can cause a car’s engine to seize, leading to a R5 000+ repair). Without appropriate maintenance, repair costs can escalate dramatically.

Safety and risk management: Catastrophic equipment failure can put nearby people in danger. Also, failure of a major system can cascade into other systems, representing a significant business risk. Governance, including Sarbanes-Oxley compliance, necessitates good asset management.

Asset management maturity
Maintenance practices can generally be classified into four types: reactive, preventive, predictive and prescriptive.

Reactive maintenance
Reactive (run to failure) is the most common approach to equipment maintenance since the majority of assets have a very low probability of failure and are non-critical. This is appropriate in many cases and helps control maintenance costs. However, when a failure does occur, the impact of the broken component can cascade into other components and become a major expense. Clearly, this approach is appropriate only for non-critical assets.

Preventive maintenance
Manufacturers often employ a preventive maintenance approach. Here, maintenance is performed based either on time (analogous to replacing the batteries in your household smoke detectors once a year), or usage (changing your car’s oil every 5,000 miles). Preventive maintenance fits when wear with age, run-time, or number of cycles can be used to predict failure (i.e. assets with an age-related failure pattern). Periodic inspections and condition evaluation are often used for stationary plant equipment such as steam boilers, piping, and heat exchangers.

Predictive maintenance
Predictive maintenance (PdM) uses condition monitoring to predict when something bad is about to happen and provide a warning in advance of failure. This allows time for scheduling and performing the appropriate maintenance to prevent unplanned downtime. Typically, the monitoring involves a single asset attribute, such as vibration or temperature. Applications involve the more critical assets for which failure would significantly impact uptime, asset longevity, safety, product quality, or involve major repairs.

Prescriptive maintenance
Prescriptive maintenance combines ‘small data’ (from a particular device or system) with algorithms that model that type of equipment (virtual equipment or ‘digital twin’ to monitor condition and raise an alert when needed. The data from multiple sensors in a particular device, combined with algorithms engineered for that type of equipment, provide a means to assess condition and identify a problem. One benefit of a specific algorithm or model for a type of equipment is the ability to replicate it like a template across many similar devices – like doors on a passenger train or transformers in power transmission lines.

Predictive and prescriptive maintenance appropriate for 82 percent of assets
Prescriptive maintenance assumes the probability of equipment failure increases with use, and schedules maintenance based on calendar time, run time, or cycle count. However, data on failure patterns from four different studies show that — on average — 18 percent of assets have an age-related failure pattern. Thus, preventive maintenance provides a benefit for just 18 percent of assets.

Doing preventive maintenance on the other 82 percent may well cause failures by placing some assets at the beginning of the curve for early life failures. Predictive and prescriptive maintenance using IoT and analytics identify the randomly occurring faults that lead to failures. These more mature asset management approaches provide an appropriate maintenance strategy for the other 82 percent of assets.

Reduced maintenance costs
For appropriate assets, predictive and prescriptive maintenance allows the maintenance organisation to anticipate issues, schedule work orders prior to failure and prevent unplanned downtime. The asset health and condition monitoring allows maintenance to be scheduled when actually needed rather than when projected. A study by a major petroleum company showed that a predictive approach reduces maintenance costs by 50 percent compared to preventive maintenance.

The specific benefits reported include:

• Maintenance costs reduced by 50 percent.
• Unexpected failures reduced by 55 percent.
• Mean Time Between Failures (MTBF) increased by 30 percent.
• Machinery availability increased by 30 percent.

Aging workforce
Issues with the ageing workforce include the difficulty that industrial organisations are having hiring replacements with the needed skills and who are willing to work in an often less-than-glamorous industrial setting. Some have forecasted double-digit reductions in the available workforce for industrial companies in developed countries. With the combination of fewer people and continually ageing assets, more effective maintenance practices are required. Performing maintenance when conditions warrant (prescriptive or predictive) rather than periodically (preventive) requires less labour and can thus help mitigate issues associated with the ageing workforce.

Room for improvement
Results from an ARC survey on enterprise asset management (EAM) show that organisations on average have room for improvement. On the good side, preventive maintenance approaches exceed reactive. Thus, most organisations have avoided devolving into a run-to-failure maintenance practice that would result in mostly corrective or emergency work.

Asset Management Maturity Model

<table>
<thead>
<tr>
<th>Approach</th>
<th>Method</th>
<th>Application</th>
<th>Cost/Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescriptive</td>
<td>Multiple variables with engineered algorithms and/or machine learning</td>
<td>Longer range prediction of failure with high confidence</td>
<td>Unscheduled downtime approaches zero</td>
</tr>
<tr>
<td>Predictive</td>
<td>Monitor a single process data value for bad trends and alert prior to failure</td>
<td>Critical assets and those with a random or unpredictable failure pattern</td>
<td>1X maintenance costs</td>
</tr>
<tr>
<td>Preventive</td>
<td>Service in a fixed time or cycle interval</td>
<td>Probability of failure increases with asset use</td>
<td>2X maintenance costs</td>
</tr>
<tr>
<td>Reactive</td>
<td>Run to failure, and then repair</td>
<td>Failure is unlikely, easily fixed and/or non-critical</td>
<td>10X plus when failure occurs</td>
</tr>
</tbody>
</table>

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assignments. However, adoption of predictive maintenance – even though this is twice as effective as preventive maintenance for appropriate assets – has low adoption.

ARC’s research indicates that most predictive maintenance has been implemented as custom, point solutions. This is a brittle approach, since changes in related systems cause the software to break. The project members have often moved on to other activities and the predictive maintenance application falls into disuse. In contrast, IIoT platforms with services for analytics offer a common platform for a more sustainable approach.

Business process management
Unfortunately, with manual processes, even alerts triggered by predictive or preventive maintenance tend to get lost, leading to equipment failure and associated downtime. But, integrating the alerts into other applications with business process automation (BPA) helps assure that this does not happen. To avoid alerts being received and ignored, technicians need to be provided with information to help them understand and diagnose the problem.

Recommendations
Higher maintenance maturity supports both production and C-suite objectives. KPIs for asset management focus on uptime, asset longevity, cost control, safety, and quality to support production. These KPIs also directly affect C-suite metrics of revenue, cash conservation, profitability and risk management. The C-suite’s metrics involve the profit and loss (P&L) statement and balance sheet scrutinised by financial analysts and potential investors: meeting these needs for improved asset reliability while controlling costs requires a higher asset management maturity.

Preventive maintenance is suitable for a small portion of assets. Data on failure patterns from four different studies show that only 18 percent of assets have an age-related failure pattern appropriate for this approach. The other 82 percent require predictive (single-vari ate) or prescriptive (multi-vari ate) maintenance.

ARC’s research identified a successful and sustainable approach for predictive and prescriptive maintenance programs:

- Adopt a packaged/standard platform for IIoT and analytics.
- Create models that predict failures for key asset types.
- Apply the models across many similar assets.

Asset management case story
This study shows how newly emerging technologies – IIoT and analytics – allow specific types of critical assets to have near-zero unplanned downtime while improving asset longevity and maintenance costs.

Duke Energy avoids unplanned downtime and improves reliability with predictive maintenance
Duke Energy is the largest electric power holding company in the US with extensive fossil and hydropower operations in six states. It has four monitoring stations for reviewing the health of its power generation fleet. The ‘Duke Energy SmartGen Program’ introduces the application of IIoT technology for predictive maintenance.

Business driver
The primary reason for the new SmartGen program is to avoid catastrophic failures at power plants. In one case, Duke Energy had a transformer failure that cascaded into other transformers and two turbines, causing over $10 million in damages, plus significant loss of power generation capacity and associated revenue.

An assessment of the cause of this incident pointed to the many manual data collection and analysis processes established over the preceding decades, in which meter readings, vibration measurements and oil analyses were recorded on paper. In the case of the transformers, the readings and analysis were performed every six months. The paper documents were filed in cabinets spread across the five legacy companies that now make up Duke Energy. Unfortunately, an issue with an electrical bus accelerated a known minor transformer issue into catastrophic failure within that six-month inspection cycle.

Solution
The significant financial loss drew management attention which, in turn, drove the review of condition monitoring and prompted initiation of the SmartGen program to leverage technology to improve reliability and operations. To fill the time gap between inspections, engineering determined that online continuous monitoring was needed, which includes sensors, a data management infrastructure, and equipment health and performance monitoring. Duke Energy built an advanced monitoring, predictive analytics and diagnostics infrastructure, providing significant advancements in:

- Remote equipment monitoring.
- Smart diagnostics and prognostics.
- Data integration and visualisation.
- Enhanced reliability processes (consistency across the company).
- Zero event operations (safety and environmental).

The new SmartGen infrastructure also provided a ‘force multiplier’ to leverage the domain knowledge of a few specialists across the fleet of critical equipment. Their technical specialisation and analysis improves reliability and operational performance.

For each type of plant, a model was built that helped to identify the sensors needed. The assessment included updating the failure modes and effects analysis (FMEA) for 10 000 assets in 50 plants to identify the critical assets needing monitoring. Implementation occurred in three phases with many of the easier items coming first, and then moving to those requiring more resources. The monitoring and diagnostics system now has over 30 000 sensors, and uses the Schneider Electric Avantis PRiSM APR software for asset health monitoring and alert notification. PRiSM uses machine learning, which avoids the need to develop complex engineered algorithms, allowing Duke to build over 10 000 models. The system gives the company the visibility and decision support needed to focus on the 10 or 20 things that need attention now, out of tens of thousands of devices in the plants.

Benefits
An example of an issue that was identified early and avoided a $4.1 million expense
The monitoring and diagnostic centre picked up small changes in vibration after unit startup of a turbine rotor. The PRiSM software monitors patterns and notifies when small changes occur – well before people in operations are aware of the issue. In this case, PRiSM recognised a change in overall vibration information. Further investigation suggested that this rotor had a history of blade-to-shroud connection issues. A borescope inspection verified that several pieces of shrouding were missing. Since this was found during extremely cold weather, vibration levels were watched even closer for another change. The unit was taken offline for repairs six weeks later.

New sensors, added data and smarter analytics provide alerts that prevent the occurrence of costly equipment damage. A total of 384 finds during three years has conservatively avoided $31.5 million in repair costs. Duke Energy expects the rate of cost avoidance to increase further as it continues to train the machine learning models in PRiSM and adds newer sensor technologies.

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How smart sensors aid predictive maintenance as part of Industrie 4.0

By Franck Roussillon, European product manager for actuators, Parker Hannifin.

Industrie 4.0 is far more than a term that is simply 'trending' in the manufacturing industry, it’s a tool made up of many component parts which are able to offer genuine benefits and competitive gain to plants prepared to think progressively about the digital future. Take smart sensors, for example. When optimally selected and applied, the latest smart sensor technologies for fluid-power applications can have a positive impact on strategies such as predictive maintenance. Real-time data collection (via smart sensors), as part of Industrie 4.0, can influence decisions about scheduling downtime to carry out maintenance operations. These decisions can prove advantageous in terms of maximising productivity and meeting ever-shortening customer delivery schedules.

Predictive versus preventative maintenance

Maintenance operations vary from plant to plant, but are traditionally based on reactive or preventative strategies. With the former, lost production and unforeseen costs are the typical outcome, while the latter often sees systems or parts repaired, not because they need it, but simply because they are listed on the general maintenance procedures, again incurring unnecessary expense.

With these facts in mind, attention has been gradually shifting to predictive maintenance as a potential industry game-changer, spurred on to a large degree by the emergence of Industrie 4.0. For many years, it has been postulated as a potential industry game-changer, spurred on to a large degree by the emergence of Industrie 4.0. For example, some of the diagnostic data generated from control valves could be invaluable in troubleshooting power issues. Among the common concerns in fluid-power systems are voltage sags that can occur downstream on long runs, which sometimes lead to misfiring valves. Normally, without an oscilloscope, there is no means of diagnosing the root cause of the problem. In contrast, if each valve manifold node included voltage sensing, a ‘sweeper’ program could be written to record voltage levels across the machine during certain periods of the cycle.

Smart sensor technology also has the ability to help predict hydraulic hose or connector leakage. With vibration sensors embedded at the right locations on a hose or connector, and the tools to communicate that data back to a monitoring system, a simple program can be written to conduct and record a straightforward trend analysis with the ability to predict if a hydraulic leak is likely to occur.

A similar strategy could be employed for detecting leaking piston seals in a hydraulic actuator. Using a correctly specified embedded temperature sensor, a cylinder would be able to alert maintenance personnel to any unexpected temperature differentials, which might indicate bypassing of the piston seal.

Unified communications standards

Of course, selecting an Industrie 4.0-enabled sensor is one thing, but ensuring that it can communicate with other such devices is quite another. For this reason, it is imperative to select a sensor vendor that operates a centralised strategy to ensure that its smart devices and subsystems share open communications standards and best practices. IO-Link is the first I/O technology for communicating with sensors and actuators to be adopted as an
international standard (IEC 61131-9). This open protocol is bringing the world of Industrie 4.0 to component level, and already proving essential in ensuring interoperability across multiple technologies and manufacturers.

Consider a pneumatic device, for example, which is being used to grip workpiece blanks and load them into position on a machine tool. Here, the voltage of the coils across the solenoid valves can be monitored for signs of impending failure. In such a scenario, IO-Link can offer budget-friendly communication with low-level devices, connecting them to motion controllers that subsequently connect to a factory network and, if required, to the cloud.

Smart sensors and other Industrie 4.0-enabled devices must work in co-operation with products from other manufacturers. In fact, the value of any connected digital solution is directly proportional to its interoperability. There is no place for proprietary solutions; an open, exchange-based architecture that enables interoperability with third-party products, applications and platforms is essential.

The security issue
Talk about Industrie 4.0 and one recurring area of concern arises: security. Indeed, this issue has been central in discouraging many plants from taking the decision to connect machines and devices to the cloud, and gaining the insight required to predict failures and optimise performance at component level.

For any company concerned about this issue and seeking guidance on how to move forward this is the point where choosing the right vendor becomes crucial. It is essential to choose suppliers who can share technical knowledge and hands-on experience gained from working across a wide range of advanced applications. With specific focus on fluid-power installations, the selected vendor should be able to offer advice on where sensors need to be integrated to obtain optimal insight, the type of data to collect, and how to present the results to MRO (maintenance, repair and operations) personnel in the way that is most useful.

Progressive, forward-thinking vendors are striving to bake in best-practice data encryption in motion and storage to create secure end-to-end Industrie 4.0-enabled systems.

The big picture
Using the latest sensor intelligence is now about far more than simply monitoring factors such as position and speed. It’s about using data, collected in real time, to provide vital information concerning service life that can help facilitate the implementation of predictive maintenance. This data can be used to identify when a machine or system is not functioning correctly, or at its optimum efficiency. Early sensor notification of issues allows system operators to investigate, consider, plan and schedule the required corrective maintenance for a time when production throughput is either low or can be stopped. This could be overnight, during a larger planned plant maintenance shutdown, or whenever there is least impact to those all-important customer delivery schedules.

A recent study by Accenture and GE found that predictive maintenance can generate a 30% reduction in maintenance costs and an up to 70% cut in production downtime caused by equipment breakdowns. Clearly, the value that the latest smart sensors can add to the implementation of predictive maintenance strategies as part of an Industrie 4.0 environment should not be underestimated.

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High-speed cameras for risk management

Risk management within a production factory context is a complicated topic where the range of potential problem areas is wide and varied, and many of the threats facing a factory are out of direct control, being dependent on third-party suppliers or contractors. Yet with the rapid increases in technology, coupled with some careful planning and strategy, risk to mechanical and electrical equipment can be reduced. In past years most factories depended on ‘that old guy’ for maintenance. He could very often simply step out of the office door, listen carefully and know something in his machines was starting to go wrong. His years of knowledge and experience gave him an almost intuitive feeling and understanding. There are not that many old guys left, so how does a factory manager replace this intuition so that repairs can begin before catastrophic breakdowns occur?

The goal is to detect problems before they become serious problems, and definitely before breakdowns. A very useful dataset is the ‘baseline status’. This shows what the components in the machines are doing, moving and sounding like with respect to temperature, vibration, speed, etc. when the machine is running at 100% health. How many factories have a baseline dataset like this – something which can be invaluable for the early identification of possible problems? Of course this will not provide information on every possible problem, but when mechanical and electrical components come under stress, these can be quickly compared to a baseline and a quick decision made.

While there are many different types of sensors, this example primarily uses optical systems. However, other sensors can add to this data and provide even more information and insight – for example vibration sensors. People are visual, and look at a problem area as the first response. However, today machines and production lines often move so quickly that it is impossible to see what is happening. Slowing the line down often makes the problem go away, but is not always an option. The cost of a good camera with features such as machine vision, high speed, thermal high speed and gas identification has not decreased, but what you get in terms of performance compared to ten years ago for the same cost makes today’s cameras look quite cheap.

Machine vision is typically used to look at products on a production line, but can also be used to detect problems; but machine vision cameras tend to be fixed point, with a great deal of programming and conditioning in the background to achieve a particular function. More versatile are non-fixed point cameras that are not tied into the PLC. Today, high speed cameras can be small – with an entire setup including a light fitting into a tool bag. Within ten minutes, camera and lights can be set up and areas of a well running machine can be filmed. Just one to two seconds of recording on a quick moving part is required. Similarly, using a thermal camera the temperatures of moving parts and pressure points can be registered. Sometimes a high-speed thermal imager may be required, typically if the process is very fast and hot – for example in flaming or very fast heat sealing. Vibration sensors can be added for even more detail. This gives a recorded baseline dataset for this area. When it is suspected that there is a problem developing in an area, a technician can go out with the cameras, and within ten minutes be viewing current footage, comparing to the baseline dataset and seeing if anything has changed.

For example, has a foot been moved, which is placing pressure on a roller so the bearing is heating up, causing vibration as well as a skip every 15th turn, which in turn causes the bottle of jam to turn over? Furthermore, the extra strain on the conveyor belt can make the motor work harder, which overheats the drive, leading to a component failure in the drive.

The key principle here is that today there is a wide range of optical and other sensors, which are increasingly cost-effective, and which can help engineers rapidly find, isolate and remedy problems in factories and production lines. It therefore becomes less sensible to have large ‘break down budgets’. Most production managers will have in place an acceptable percentage of rejects, as well as an acceptable percentage reduction in overall output of the line (no rejects, but slower running line) and even the less palatable, but still occurring ‘acceptable’ total line downtime.

A well planned and carefully executed strategy can help any factory build up the necessary data and capacity to enable it to quickly reduce maintenance issues, shorten down time, and increase production and profit using now commonly available tools.

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Yokogawa has announced the introduction of Device Lifecycle Management, a new IIoT cloud-based service for the management of information on plant assets. This is an information management support service for the digitised asset data of the IIoT era. The Device Lifecycle Management service allows customers to digitalise the management of all device information and helps customers to improve the efficiency of plant maintenance and the quality of data management.

Digitisation of asset information is an important key to the automation and realisation of efficiency in asset management. Many of Yokogawa’s customers have already introduced solutions such as computerised maintenance management systems (CMMS) to optimise efficiency, but not all have met their initial targets for improvements in the efficiency of their maintenance operations because they have encountered challenges in making full use of all their asset data. This solution was developed to meet this need.

Features

Centralised device list
Information on all purchased devices including documentation is linked to the device tags and serial numbers. By accessing the Device Lifecycle Management portal, users enjoy prompt access to the right information on both online and offline devices. Dashboards on the portal provide a comprehensive summary that details the number of spare devices, installed devices, and disposed devices.

Collaboration with existing CMMS
Device information registered using the Device Lifecycle Management portal can be easily exported to a CMMS, which saves time and improves accuracy by eliminating a process (the re-input of data) that can result in data entry errors.

Compatibility search
When an instrument fails and there is no spare device in inventory, this function helps to determine whether other devices in the spare parts inventory are compatible with the failed device.

Mobile application
A mobile application for the Device Lifecycle Management service has been developed. With this application, maintenance staff in the field can easily access device specifications and other types of documentation, confirm operating procedures, and check the compatibility between devices.

Value creation with Device Lifecycle Management
The newly developed service helps to minimise the amount of manual work that must be performed and improves the management of devices information. This service makes it easy to register, view, and manage information on instruments that is useful for maintenance work, and helps customers to improve the efficiency of plant maintenance and the quality of data management.

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Field Service Department grows with the addition of new value-added services

This will broaden the scope of SEW’s after-market support significantly, Eben Pretorius comments. Heading up the Field Service Department, Pretorius himself has six years’ experience in the industry. “Normally we carry out a visual inspection to determine the condition of a gearbox or power pack. Now we can pinpoint a specific bearing or gear component within the unit that is starting to fail and, in addition, identify whether or not the oil is in a usable condition.”

The advantage for customers is that they are made aware of potential problems or imminent failures, and can plan corrective actions around their normal shutdown periods. This approach is less disruptive to their businesses, and more cost-effective than unscheduled or unplanned downtime. “SEW is able to work with customers to carry out preventative maintenance or supply replacement units on short notice to maximise plant uptime,” Pretorius stresses. The value-added services are applicable to SEW’s extensive gearedmotor and industrial gear product ranges.

While SEW-Eurodrive South Africa has already been offering such value-added services to some of its larger customers, the plan is to roll it out to all customers. In addition, SEW is in the process of incorporating these value-added services into formal service contracts for customers to ensure their maintenance and condition monitoring is performed by skilled technicians with specialist knowledge in the transmission industry.

Pretorius highlights that the Field Service Department has grown significantly in the past year. “On the electronics side, we have just completed a major project for an automotive manufacturer that has extended its plant for the assembly of its latest model. We are currently busy at another automotive manufacturer, upgrading its entire plant with innovative, safe, and energy-efficient concepts and products from our comprehensive modular system of drive elements.

“We focus on energy efficiency and safety technology in particular, with products designed specifically for this purpose, making us an ideal partner. Our Field Service Department has highly-trained technicians, and we are able to draw from our skills and knowledge globally as and when required, meaning our scope of service and benefit to the customer is unparalleled in the industry,” Pretorius highlights.

The success of the Field Service Department to date indicates a clear need for skilled and knowledgeable technicians who are able to service and repair products in the field. “We are able to assist customers with field service on non-SEW geared units and the replacement of non-SEW control systems, providing customers with the advantages of our service and solutions offering, irrespective of the current products installed.”

SEW-Eurodrive South Africa’s Field Service Department is available 24/7, and provides support in 23 African countries. “Our large local stockholding is a key factor in our Field Service Department being able to respond quickly to breakdowns and critical situations,” Pretorius points out. “In terms of future developments, we plan to continue to strengthen our market-leading position by keeping pace with the leading technology and solutions we continue to develop.”

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Automation projects are under cost pressure now more than ever. Time available from the final investment decision until start up is getting shorter because companies need to start generating revenue as early as possible. Contractors and project leads typically follow KPIs based on time savings and cost reduction within a project, while comparing them to previous similar project experiences. Last minute changes in projects are common, e.g. adding new devices or changing configurations after the final order is placed, so it is important to be flexible and take an agile approach to managing these situations wherever possible.

Smart commissioning is an efficient time-saving approach to commissioning intelligent devices via a fieldbus. By using smart DCS/PLC functions such as Device Templates, Pre-Configuration, and Remote and Bulk Configuration, engineers can commission faster and safer when compared to conventional onsite processes. The result is drastically reduced commissioning time, risk and effort.

**Expertise is the key to fast, smooth and solid plant start-up**

Commissioning is on the critical path for start-up, and since delays can cost millions, customers are constantly searching for new ways to be more efficient during this phase.

Assuming an average time of 1.5 hours per device, with conventional (device display, handheld or a service tool) commissioning, at a price of R1000/h in a medium size project with 2000 devices, this task will take 3000 hours and cost R3 million. Taking the same project, but using Device Templates combined with a streamlined commissioning processes, this task can be done in less than 500 hours and cost only R500 000.

Typically, the time saving results in a 50-80% cost saving, mainly related to labour costs in larger projects with more than 200 devices and a good portion of intelligent devices. In addition, most work can be completed more efficiently due to early planning, reducing the likelihood of any impact on the project’s critical path. Moreover, this approach also avoids the risk of working on construction sites, as most of the work is done offline in safe office and workshop environments. All configuration and integration tasks are discussed and tested before the final commissioning of the devices, hence compatibility risks are eliminated.

With conventional commissioning, device diagnostics like NAMUR NE107 and Heartbeat Technology are sometimes not considered and therefore not configured, which often leads to false alarms in the DCS or Asset Management Systems. This often forces the customer to ‘switch off’ this functionality in the host system, which makes it impossible to utilise Heartbeat Technology and to adopt a preventive maintenance concept using sensor data as a source of information. To enable best practices, the optimum configuration of each device is mandatory.

The ‘smart’ factor is in the commissioning process

The essence of smart commissioning is to get involved as early as possible in the project discussions and make the best decisions at an early stage related to:

- Planning and preparing commissioning tasks in the engineering office.
- Efficiently performing commissioning in the field.

Figure 1 gives an overview of the two main phases as well as their associated deliverables.

**Conclusion**

Smart commissioning enables a faster and safer commissioning process and drastically reduces commissioning time, risk and effort. This value-added service is an integral part of Endress+Hauser’s extended service offering as it works to provide project consulting and execution services.

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Remote monitoring without the risks

Secure remote access to scada networks via Phoenix Contact’s mGuard cloud technology.

High availability of machines and systems is the demand of every operator. Regarding its remote maintenance concept, Hermes Systeme therefore relies on the Phoenix Contact cloud as a flexible and cost-effective solution for secure access to customer applications.

The employees of Hermes Systeme in Germany develop innovative solutions using automation technology. In addition to system modernisation, the range of services comprises maintenance and repair of existing technology as well as supply and installation of new systems. Hermes focuses on industry and building automation as well as water technology, swimming pool technology, wastewater treatment plant technology, cooling technology, information technology, and central control engineering. As a system integrator, the company has supported industrial and municipal users for more than 30 years, also with regard to implementing scada systems. Here, an I/O station designed by the company for remote maintenance services uses security appliances from Phoenix Contact to provide access for service engineers to the corresponding scada network.

"Nowadays, systems without remote maintenance technology are no longer competitive because every operator requires high availability, which means that any interference must be removed as quickly as possible," reports executive vice president, Ingo Hermes. His company has already been involved in many control projects, from simple pump control to large-scale projects. Among others, Hermes Systeme has specialised in the development of proprietary scada solutions that control and monitor the processes. In water management, this can be small pumping stations, but also complex distribution systems.

Using the cloud solution is free

In the field of remote maintenance, Hermes Systeme relies on proven technology from Phoenix Contact. The primary focus is on fast removal of errors but also on a transparent security standard that is requested by the system operator in order to accept remote maintenance. Using the Phoenix Contact cloud, therefore, is an optimum solution for the relevant applications as it saves resources. This because using the cloud is free and Phoenix Contact is responsible for cloud security. This offers the following advantages:

- No hardware costs for a remote maintenance centre.
- Easy-to-use cloud services via web browser.
- Stationary and mobile access is possible.
- Many service engineers can have access at the same time.
- Phoenix Contact is responsible for cloud security.
- Reduced capital commitment and labour costs.
- High availability.
- Phoenix Contact is responsible for scaling and adapting the performance.

In the event of maintenance, the service engineer can immediately and remotely obtain information on the system's operating state. The engineer simply presses a button to evaluate a large amount of log files and other historical data that give information about the cause of an error. "We can remedy about 80 percent of all the problems completely by means of remote access," explains Christian Nölker, electrical engineer and programmer at Hermes Systeme. "To do so, our service engineers view the operator’s screen of the system on their computer and then work on error removal together with the employee on site."

Easy management of systems and service personnel

"It is not enough to look at the technical parameters and prices in order to make the right choice of remote maintenance technology," emphasises Nölker. With an increasing number of systems, management of the online accesses and configuration of the remote router stations can become time-consuming. Issues like secure authentication, managing customised access and configuration data as well as different software environments of a plant that has grown continuously make the decision even more complicated. "We were looking for a supplier offering a solution for easy management of
the systems as well as of the service personnel,” adds Hermes. “It was also important that this was a renowned manufacturer in order for our customers to accept the remote maintenance concept.”

The decision-makers were convinced by the complete solution from Phoenix Contact because it comprises system and service personnel management in addition to a high IT security standard. The required configuration of the terminal devices is automatically generated in the cloud and downloaded to the devices. Any processes, such as VPN configuration, routing settings, and certification management, are implemented using the cloud. “The Phoenix Contact cloud as a portal manages the increasing variety of different maintenance environments of the systems and automatically provides the right environment to the service engineer,” says Nölker. “Every service access starts a temporary virtual machine, which is deleted again afterwards, which allows for parallel operation of different software generations. For Hermes, this type of remote maintenance platform has proven to be an efficient solution that ensures increased system availability for our customers.”

**Robust solution for harsh industrial environments**

“We were looking for a solution that uses the Internet to dial into the scada network of the system, while at the same time, we wanted to protect the network against unauthorised access,” continues Nölker. “However, the majority of security applications on the market have been developed for the office environment. This is why we opted for the FL mGuard product range, and thus for security appliances that meet all the requirements of the industrial environment. This series comprises security components with integrated firewall, routing and VPN functions for industrial networks. The devices combine IT requirements and robust hardware in a metal housing for harsh industrial applications.

“The version we use can be mounted on a DIN rail and features a 24 VDC power supply. Based on the situation, we either opt for the RJ45 or the mobile network unit to connect the system to the cloud. The FL mGuard RS2000 acts as a secure gateway that protects the scada network against unauthorised access, therefore, the scada network can be connected directly to the Internet and thus to the cloud. The service engineers use a VPN software client to establish a connection and the VPN function ensures that only authorised persons can initiate communication using the corresponding access data. When the VPN connection has been set up, it works like a direct connection to the local network. In this way, the programming software of the controller recognises the security devices and can simply connect them.”

**Conclusion**

Modern plants are often comprised of complex machines and systems that are characterised by a high level of automation. As digitisation in the industrial environment increases, a rising trend in remote monitoring can be expected. These applications must be provided with IT security that is based on user and system requirements, which provides suitable protection against typical attack vectors – the Internet, for example. Secure access is a constant requirement that can only be provided by new security architectures that can be controlled by the user – the Phoenix Contact cloud, for example.

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German-based Maturo is a global specialist in electromechanical positioning systems for EMC, automotive, radio and radar measurements. The only reliable way to test the EMC properties of heavy trucks and buses weighing tons is using a facility with interference-free control based on fibre optic communication, which supports precise positioning of rotary tables up to 14 m diameter. Flexible PC-based control and drive technology are key factors for Maturo's ability to cover a wide range of applications and diverse customer requirements.

Maturo offers a wide range of rotary positioning tables for application in EMC cabins and in field installations. The table diameters can range from 0.3 up to 14 m, with payloads between 10 kg and 100 tons. Manual, semi or fully automatic antenna masts and tripods for different measuring heights or loads and movements are used for positioning the required radiation antenna. The overall facility is operated with three controllers developed in-house, including the new NCD, which can control up to eight multi-axis devices. These can be comprised of any combination of antenna masts, rotary tables, rotary units, sliding tracks or other positioning devices.

Markus Saller, technical director of Maturo, explains the configuration for a classic EMC application: “An EMC-shielded space generally contains a rotary table and an antenna mast with a radiation antenna. A controller, such as the newly developed NCD based on Beckhoff technology, is connected to the outside via a fibre optic cable to protect against interference. The NCD is used to control different measuring distances between the test device and the antenna as well as the rotary table and antenna positions. In addition, high-precision applications with a rotary table positioning accuracy of up to 0.01° are becoming increasingly important. This is implemented for antenna calibration or to minimise the necessary measuring distances and reduce the required size of the EMC space, among other applications.”

**PC-based control offers a wide, scalable product range**

Regardless of the basic configuration of an EMC application, the solutions offered by Maturo must be flexibly adaptable to a wide range of individual customer requirements. According to Stefan Lehner, manager of the software department at Maturo, the high flexibility of PC-based control and drive technology from Beckhoff were major factors in the decision process: “The Beckhoff product range is expansive and has the additional benefits of high modularity and scalability. In this way, both standard and special functions can be quite easily implemented according to the customer’s requirements – for example, through integration of different interfaces or special safety functions. Additional benefits are offered through the openness of the system, which facilitates the incorporation of third-party components. Here, we are optimally supported by the EtherCAT communication standard, which was originally developed by Beckhoff and is now established worldwide. EtherCAT is tried and tested as an extremely powerful and easy-to-handle bus system.”

The flexibility of the automation technology from Beckhoff also benefits Maturo in other ways. One aspect is the use of optical fibre as transmission medium. Lehner explains: “Without fibre optic technology, our solutions would not be possible. A key factor is that this type of cabling can be seamlessly integrated with the control technology we use. In contrast to many other systems, PC-based control offers the capability of holistic system integration, without the need for an intermediate LAN to fibre converter.” This is implemented in the new NCD controller, which includes four EK1521 controllers.
EtherCAT fibre optic junction terminals, through which all other devices are addressed. A customised CP6907 control panel ensures optimal usability, while a CX1020 embedded PC provides the required computing power. TwinCAT NC PTP software is used to control the numerous axes in the application. A TwinCAT XML Data Server handles the data management, while a TwinCAT TCP/IP Server supports communication with the higher-level control system.

Flexible and compact control technology with high precision
According to Lehner, the modularity of PC-based control results in another benefit: “In many cases, our projects are very challenging in terms of limited available space. Therefore, we never use conventional control cabinets since we have to be able to install the automation components in different positions, including horizontal or suspended, not to mention the need for modular, distributed components. The modularity of PC-based control helps us address these challenges, especially since the control technology can be flexibly scaled to individual needs. For example, the I/Os can be used precisely as required for each channel or added later on, which avoids the need to specify large, oversized I/O modules. Another advantage: In conjunction with the EL7041 stepper motor terminals and the EL7211 servomotor terminals, we use the new ZB8610 fan cartridge, which facilitates more compact configurations in installation. In the past, we used an external fan, which required significantly more space and installation effort.”

For high precision, Maturo also uses the options offered by eXtreme Fast Control (XFC). Lehner elaborates: “Via the EL2262 EtherCAT Terminal, we can specify the positions with an oversampling factor of 100 and reach a far higher resolution than would be possible with the underlying control cycle. This is the only way to transfer the required commands to the drive technology at relatively high speeds and with 0.01° resolution. The XFC technology based on the distributed clocks feature provided by EtherCAT is a prerequisite for the hot-connect functionality, which ideally supports the highly flexible bus configuration with EtherCAT.”

Compact drive technology for numerous axes
The high complexity of EMC test facilities is illustrated by the large number of motion axes required in many cases. It is not uncommon that up to 50 axes have to be programmed. In addition to the rotary table axis, these include axes for several antenna masts, which can each have up to seven axes. For the rotary tables this is realised via servo axes. For the antenna masts, which require a higher torque, stepper motors are used. Saller concludes: “With our wide range of requirements, we benefit greatly from the diverse Beckhoff drive portfolio. Added benefits come from the simplified installation and commissioning with the One Cable Technology (OCT), including electronic type plates. In particular, we benefit from the compact drive technology, specifically the servo and stepper motor terminals, which we prefer to use whenever possible. Because the drivetrain can easily be assembled in a highly compact configuration according to individual needs, maximum flexibility is assured for customer implementations.”

For more information contact Michelle Murphy, Beckhoff Automation, +27 (0)11 795 2898, michellem@beckhoff.com, www.beckhoff.co.za.
Emerson simplifies asset health monitoring and maintenance

New apps deliver actionable asset alerts to improve reliability, safety and production.

With the demand to implement the IIoT, the challenge is knowing where to start. Plants generate more data than ever before without meaningful analytics to guide expert decisions and actions. Plantweb enables customers a scalable, easy path into IIoT benefits that will transform data into truly actionable information – information that plant personnel can use to improve the safety, reliability and efficiency of assets, people and processes.

Deployable via traditional workstation, tablet or smartphone, Emerson’s Plantweb Insight apps provide specific asset alerts that enable companies to see a quick return on investment in months by avoiding slowdowns and shutdowns. Instead of having to rely on an asset expert, these affordable apps can be quickly deployed and easily accessed anytime, anywhere by maintenance staff to improve asset operations. A user can begin with one or more assets, such as pumps or heat exchangers, and then expand as they achieve measurable benefits.

The built-in domain expertise of the analytics helps resolve asset issues that were formerly solved by periodic, time-consuming manual rounds or unexpected failures. Pre-built analytics require minimal configuration, and its flexible software is operating system-independent, easily installing and integrating with existing infrastructures.

Using Plantweb Insight, users can improve asset reliability and energy usage by identifying abnormal situations and inefficiencies, recognising optimum maintenance times, and tracking asset health to identify and prevent failures before they occur. They also can avoid potential safety incidents and ensure regulatory compliance, reducing fines and environmental impact though the real-time identification of leaks and other hazards.

Plantweb Insight is currently available with applications for steam trap monitoring, pump monitoring and pressure gauge monitoring. The newest app in the suite:
- Heat Exchanger Insight – this Plantweb app provides an overview of heat exchanger status and diagnostics from all the instruments on the network. Based on an algorithm, it provides directions to maintenance on where to focus action for issues, and provides a detail of the issue to guide them in efficient resolution, thereby avoiding slowdowns and shutdowns.

Future Plantweb Insight applications launching in the next year include:
- Air-Cooled Heat Exchanger.
- Pressure Relief Device Insight.
- Network Management Insight.
- Corrosion Insight.

For more information contact Rob Smith, Emerson Automation Solutions, +27 (0)11 451 3700, rob.smith@emerson.com, www.emerson.com
In a world where safety systems are of paramount importance, the integrity of these systems becomes a focal point. Fire protection systems are a case in point.

Alien Systems & Technologies (AST) takes great care to ensure that its fire protection systems are designed and manufactured to the highest quality standards. In addition, its personnel are highly trained and equipped with the latest maintenance technology for the peace of mind of customers. AST goes a step further by certifying its system integrators, which must undergo installation, commissioning and maintenance training. This is to ensure that all customer equipment is installed and maintained to the highest standards using only approved suppliers and genuine parts.

In South Africa, for example, all Pyroshield systems requiring hydrostatic pressure testing and/or refilling must be returned to AST for this service. No other facility has been approved to provide this service. This is to ensure that customers know that their cylinders are filled with the proper mixture of fire extinguishing gas, that the parts used are genuine, and that the personnel performing this work are competent and using the right tools. This is vital to ensure that Pyroshield fire extinguishing systems will perform reliably when called upon to do so.

Beware of uncertified imitators

AST has evidence of companies that, while attempting to refill Pyroshield cylinders, have damaged valves. In addition, it is uncertain whether the gas mixture used was correct. Furthermore, the persons doing the work had not undergone training from AST and were therefore not certified as competent. All of this poses a serious risk to customers who may think that their Pyroshield system is in perfect working order, when in fact it probably is not.

“So what can you do?” Anyone who has doubts about the integrity of their Pyroshield cylinders can contact AST and ask to speak to the sales department who will be able to verify whether the cylinders were returned for servicing. Should the cylinders not have been filled by AST, this poses a risk to customers and insurance companies alike, as the system is no longer a Pyroshield and falls outside of the control of AST, the manufacturer.

A major benefit when using AST to refill is a free hydrostatic pressure test is included. AST also offers a free refill on all Pyroshield cylinders that have discharged after a fire. Furthermore, the company offers a collection and delivery service and has a full scale 400 bar production capacity filling plant, meaning that cylinders can be refilled timely and with precision.

Second-hand cylinders

“What if you have second-hand Pyroshield cylinders and want to use them?” Sure, but first contact AST so that these cylinders can be checked and verified for reuse. This will ensure that they carry the product manufacturer’s guarantee when using them on another system.

AST encourages anyone to notify them should they think that your Pyroshield cylinders are being refilled by someone not certified. In addition, customers can also verify whether their fire system installer/maintainer carries authentic training certification.

For some, taking shortcuts is a way of life. However, it has been shown time and again that this exploitative practice can put lives at risk. Nobody wants this kind of practice giving a false sense of security to customers when it comes to their fire protection systems. To this end, AST is standing by to assist anyone who wishes to verify that their Pyroshield systems are only being maintained by people who are competent to do so.

For more information contact Grant Wilkinson, Alien Systems & Technologies, +27 (0)11 949 1157, sales@astafrica.com, www.astafrica.com
Condition monitoring can have a positive impact on OEE

Condition monitoring is the science and practice of monitoring key information to alarm, predict and prevent problems. Familiar examples include the monitoring of the tyre pressure on a car, or monitoring the vibration of large motors in industrial facilities.

Alerts and alarms provide some specific diagnostics that lead to a corrective action (i.e., for a car, pump the tyres with air), which leads to improved results and operation (i.e., fuel efficiency, reduced tyre wear and safer driving in wet weather).

The potential for improvement is great. Most industrial facilities are only leveraging a small fraction of the available process and equipment data, while many problems lie hidden in plain view. Large, expensive equipment can receive a lot of attention, while smaller, less expensive equipment is not monitored as closely. However, it should be, as up to 30% of control valves, for example, can improve process performance with minor repairs or upgrades.

Sensing drives more condition monitoring capability

Sensors are everywhere. For example, a new car today can be equipped with small cameras to detect passengers in seats, and pinch sensors on the door jamb. Sensors can detect pedestrians or cars moving into the car’s path, and a multitude of other events. This level of sensing was not possible 10 years ago. In many downstream plants, the levels of sensing technology used has also skyrocketed. Far from the old 4-20 mA world, smart instruments and valve positioners have added sensors for temperature, air pressure, vibration, etc. to all corners of the plant.

When used properly, the monitoring of these added sensing points can identify the true root cause of problems faster and more accurately than a team of engineers. Therein lies the potential for a great step forward in Overall Equipment Effectiveness (OEE). But first, we need to find a low cost, simple way to gather the right information, filter it, and suggest the proper corrective action to the right person.

Low cost condition monitoring for existing plant facilities

Fortunately, most hydrocarbon processing facilities are already connected to this vast array of sensor information via fieldbus and other smart networks. The data comes into the control system, and is sometimes passed along to an Asset Management System (AMS). But often, it is not.

A low cost approach will extract the data via Open Platform Communication (OPC) Object Linking and Embedding (OLE) for process control, and feed it into software systems that have been designed for diagnostics and alerts. Almost every modern control systems offers an OPC server, or can feed data into an OPC-capable process historian. Diagnostic solutions, such as Metso’s PlantTriage system, can perform the diagnostics and alerting for a fraction of the cost of an unplanned shutdown or quality incident.

Even traditional ‘dumb’ 4-20 mA instruments can give enough data to provide important diagnostic clues to condition monitoring systems. For example, the noise levels emitted by a flow meter can change over the equipment’s lifetime. Certain patterns in the noise level can be indicators of imminent sensor failure. As a result of monitoring the noise level for these patterns, this can give an advance warning as to when to conduct a scheduled repair and replacement of the meter, and so contribute towards avoiding a catastrophic failure during production.

All this newly available data can be overwhelming. One of the most important aspects of condition monitoring is the concept of filtering through the data for targeted action. In a refinery, for example, there are typically 2000 or more control loops. Each control loop has an instrument, a controller, and a valve or variable-speed pump and, after installing smart instrumentation, there will be tens of thousands of data points. The condition monitoring system must be able to analyse and filter the information, providing targeted advice to specific personnel.

Examples of condition monitoring improving OEE

Paying attention to valves

In this first example, condition monitoring has
identified a significant new valve problem. Through technical and economic filtering, this issue was highlighted as the most important issue throughout the plant. A technician received notification of the issue and performed a field inspection of the valve. On inspection, the technician discovered that the valve actuator bolts had worked loose from the valve and in fact, the actuator was barely attached to the valve.

If the problem had not been addressed then, the actuator would have fallen to the floor, meaning the valve would have failed and the plant would have suffered an unplanned shutdown, directly affecting OEE. Instead, the issue was resolved immediately by tightening four bolts and applying some sealant/surface adhesive. Low cost resolutions such as this are typical and simple to execute especially if plant personnel are paying attention to the right conditions.

Process conditions detected indirectly
In this example, a plant was experiencing unplanned shutdowns as a result of material build-up in process equipment. When detected, the build-up could be easily resolved by temporarily bypassing the equipment and flushing the lines. However, direct detection of the plugging was not possible. This issue was resolved by observing the variability of flow measurement. Once plugging had started to occur, a downstream flow meter began to show erratic measurement.

In this case, a customer alert was established in order to monitor the variability of the downstream flow measurement. As a result, operators now receive an alert before plugging reaches a critical state. Line flushes are then carried out, again avoiding another costly and unplanned shutdown.

A simple fix brings stability and quality
After many years of experience working in hundreds of plants worldwide, Metso found that process stability is affected by many small factors. Process instability can have wide-ranging impacts on energy costs, the environment and quality. In this example, a high degree of variability was traced to a control valve issue. Condition monitoring ruled out tuning and upstream process issues, so efforts were concentrated on the valve. Once the issue had been identified, the solution was to replace the valve trim during the shutdown, resulting in smoother operation, tighter control, less valve damage and improved process quality.

Condition monitoring and the Internet of Things
For some, the distinction between 'condition monitoring' and 'the Internet of Things' (IoT) can be confusing, but in fact, the IoT may provide a platform for future condition monitoring applications. Yet despite this, many processing plants continue to have significant concerns regarding cybersecurity when connecting live process data to the Internet. However, until those concerns can be properly addressed, the use of 'on premises' systems with secure web interfaces for reporting will continue to help bridge the gap.

Conclusion
Condition monitoring can be an effective and low cost solution to making improvements in OEE. Modern control system platforms can allow a plant and its operators access to deep and rich information from its instruments, valves, turbomachinery and other process components. Capturing these OEE improvements, however, not only requires gathering the raw data, but filtering out what is useful, providing diagnoses, and delivering accurate and targeted information to the appropriate personnel to ensure that a corrective action is taken. In this way, low cost and targeted actions can help to increase production, prevent unplanned shutdowns, and improve product quality.

For more information contact Metso South Africa, +27 (0)31 502 9350, steve.clark@metso.com, www.metso.com

Vision and mission
We are a successful family company. In laboratory and process automation, customers around the world trust our products, solutions and services to improve their processes, and thus their products, sustainably.

We support our customers in improving their products and in manufacturing them even more efficiently.

Meet the ‘People for Process Automation’
We are a leading supplier of products, solutions and services for industrial process measurement and automation. We offer comprehensive process solutions for flow, level, pressure, analysis, temperature, recording and digital communications across a wide range of industries, optimising processes with regards to economic efficiency, safety and environmental protection.
While “an ounce of prevention is worth a pound of cure,” we might say today, “a dollar of prevention is worth many thousands of dollars of downtime, shortened asset life, repair and maintenance costs and decreased productivity.” When it comes to hydraulic systems, there are many factors that can compromise both the operation of machines and the cleanliness, or purity, of the fluids.

Contamination

One of those factors is contamination. Contaminant particles can be solids or liquids ranging from visible to too small to see with the naked eye. Contaminates can cause degradation of fluids and sluggish system function as well as decrease the range of motion of equipment parts. Overall, they reduce system or equipment efficiency, leading to higher operating costs, lower productivity, more frequent servicing and – worst of all – system failure.

That is why ParkerStore offers two distinct services that can save money and avoid problems in the long run, and even in the short term. These use the latest technologies to monitor and test systems to ensure they operate with maximum reliability and efficiency.

Fluid analysis

Implementing fluid analysis can help identify problems that cannot be detected by human senses and, in the end, can help prevent major hydraulic or lubricating oil system failures. The most obvious benefit is identifying any water or dirt in the fluid.

Whether talking about petroleum-based or water-based systems, it is important to realise ParkerStore fluid analysis equipment can help recognise potential problems that simply cannot be detected by the human eye. Using fluid particle detection, particles can be measured down to four microns in diameter.

ParkerStores will test for water in oil, which can cause corrosion, cavitation or even machinery failure. Making sure the Total Base Number is high enough in engine oils helps to avoid corrosion of components. Pinpointing the Total Acid Number: the weak organic and strong inorganic acids present within an oil helps to maintain and protect equipment. The service also tests for insoluble particles like soot, and monitors combustion-related debris and oxidation products in engine oils, while testing for viscosity can determine a change in the oil chemistry.

Condition monitoring

Condition monitoring can accurately pinpoint issues in equipment, taking guesswork out of the picture. Employing a condition monitoring system, which measures and tracks variables such as system pressure, temperature and humidity, is an effective predictive maintenance strategy, because it covers three critical bases:

- Provides real-time and historical data trends of assets and processes.
- Allows operators to detect and diagnose problems before they snowball into failures.
- Delivers analytics and alerts to operators.

Condition monitoring for predictive maintenance gives operators the power to predict and improve processes, so that they can optimise systems and assets based on what is happening in real-time, rather than simply reacting to unexpected events – or fixing problems that may not even exist.

In addition, there is no longer a need to stock a full inventory of spare parts because, with condition monitoring in place, maintenance personnel have plenty of time to plan and order the specific parts required.

For more information contact Lisa de Beer, Parker Hannifin SA, +27 (0)11 961 0700, lisa.debeer@parker.com, www.parker.com/za
Exposure to harmful levels of radiation can easily be prevented with a new generation of ultra-small, wearable dosimeters. Less expensive, simpler to use, and portable, these devices boast the same levels of accuracy as their larger counterparts. In fact, miniaturisation is set to become one of the most important trends in the radiation detection market, estimated to become a $1.6 billion industry by 2020. This growth is caused by falling costs in detection equipment, as well as factors like higher cancer rates, growing popularity of radiation therapy, and fears of nuclear terrorism. Global industry experts include the Middle East and Africa as one of the world’s top three fastest-growing regions. “Recent innovations in lightweight, wearable devices have dramatically reduced the cost of radiation detection, bringing devices within reach of new users,” notes Raymond Naidu, CEO of OEN Enterprises.

These newer ranges of dosimeters capitalise on the power of Big Data. With their data recording and archiving features, users can closely track exposure, measured over periods of time, ensuring that exposure is within certain dose thresholds. South Africa’s National Nuclear Regulator pegs the safe radiation threshold at 20 millisieverts per year, averaged over the past five consecutive years.

“Above all,” notes Naidu, “radiation detection equipment must be 100% reliable. As with anything relating to personal safety, we advocate higher quality and longer lasting dosimeters, to give users the peace of mind that they are fully protected.”

For more information contact Mauritz van Niekerk, OEN Enterprises, +27 (0)11 675 4447, sales@oen.co.za, www.oen.co.za

Festo’s energy efficiency module MSE6-E2M

Saving energy is easier than ever before thanks to the MSE6-E2M. It helps end users to achieve their energy efficiency and sustainability targets and improves the efficiency of machinery for OEMs. The intelligent service module rigorously monitors and regulates the compressed air supply in new and existing systems – fully automatically.

Standby: compressed air off
If the E2M detects a standby status on the basis of predefined data, the compressed air supply is shut down automatically – similar to energy-saving start-stop systems in cars. The compressed air consumption drops to zero during these pauses, even if the system has leaks. The compressed air supply can be easily restarted at the machine’s control panel.

Leakage measurement
When the compressed air supply is shut down, the E2M checks the system for leaks. Rapidly dropping pressure indicates excessive leakage and a notification is then sent to the system operator. For the first time, the air preparation system is monitoring, diagnosing and notifying maintenance teams based on actual requirements.

Condition and system monitoring
The E2M enables simple energy monitoring by continuously providing process data. Connected to the machine’s control system via Profibus, the E2M cyclically exchanges important data such as flow rate, pressure and consumption, which can be seen and operated via the control panel. Other features include:
• Zero compressed air consumption in standby mode.
• Monitors the system for leaks.
• Ensures maintenance in the event of leaks.
• Enables effective monitoring of relevant process data.

For more information contact Kershia Beharie, Festo, 086 003 3786, kershia.beharie@festo.com, www.festo.co.za

How a new generation of miniaturised devices is changing the radiation detection industry

For more information contact Mauritz van Niekerk, OEN Enterprises, +27 (0)11 675 4447, sales@oen.co.za, www.oen.co.za

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For more information contact Kershia Beharie, Festo, 086 003 3786, kershia.beharie@festo.com, www.festo.co.za

InterCal extends solar panel testing capability

InterCal director Paul Haarhoff and sales manager Mike Devenish recently received training from Netherlands-based Chroma ATE on several of the Chroma systems.

Chroma ATE is a leading supplier of precision test and measurement instrumentation, automated test systems, manufacturing execution systems and turnkey test and automation solutions marketed globally under the brand name Chroma. From military and aerospace to automotive, renewable energy and medical device testing, Chroma products are trusted by many of the world’s leading R&D laboratories to provide consistent, fast and accurate measurements. With offices and manufacturing facilities located worldwide, Chroma is renowned for its commitment to excellence in products, services and innovation.

In South Africa, Chroma is represented by InterCal and this training session was for Haarhoff and Devenish to become familiar with the 17020 battery test system and the PV inverter ATS 8000, soon to be installed at a local university for alternative energy research and solar panel testing.

Chroma ATE is accredited to ISO 9001 for quality systems, ISO 16949 for electric vehicle power systems and ISO 17025 for calibration. Along with InterCal’s own SANAS ISO 17025 accredited laboratories and southern African footprint, the Chroma/InterCal partnership is a strong contender in the southern African market.

For more information contact Guy Snelling, InterCal, +27 (0)11 315 4321, guy@intercal.co.za, www.intercal.co.za

Save with simple and cost effective hydraulic filtration solutions

Maintenance personnel have to facilitate optimum hydraulic system performance in their programme, hence the incorporation of oil cleanliness checks, or oil contamination monitoring should not be neglected. System efficiency can be achieved with proper contamination control, but the consequences of system or component failure can be ghastly. Hydrasales can help with low cost and effective filtration solutions.

The MP Filtri range of hydraulic filtration and contamination monitoring products are designed to keep systems operating well.

Custom manufacturing of filtration ranges for hydraulic systems are designed for equipment, including mobile. These ranges cover wide operating pressures, flow rates oil viscosities and meet the requirements of various international standard specifications.

Tested at MP Filtri’s excellent research and development under extreme conditions, the company’s products are at the forefront of development and technology for the future. MP Filtri believes in acting as a partner for its customers and this facility is designed to assure reliability through planning, analysis and testing of the final product. This guarantees quality and reliability for existing filtration ranges and allows for new project planning and development tailored to customer needs.

For over thirty-nine years, Hydrasales excellent relationship with MP Filtri has given it access to proven expertise and solutions in the field of hydraulic filtration.

For more information contact Hydrasales, +27 (0)11 392 3736, harpo@hydrasale.co.za, www.hydrasale.co.za
Flexible manufacturing through innovation in automation

Omron’s i-Automation ‘Innovation in Manufacturing’ drive is focused on intelligent, integrated, and interactive automation to increase overall plant proficiency. The company functions as a partner to customers help innovate global manufacturing. Through its expertise in sensing and control technology, it enables manufacturers to operate with greater productivity and streamlined efficiency.

Omron has over 200 000 products to deliver ‘Inputs’, ‘Logic’ and ‘Outputs’ – everything the user needs for machine automation. The range includes:

- Automation systems – IPCs, machine automation controllers, PLCs, remote I/O and HMI.
- Motion and drives – motion controllers, CNC, servo systems and frequency inverters.
- Robotics – industrial robots, linear axis control and mobile robots.
- Quality control and inspection – inspection and indent systems.
- Sensing – photoelectric sensors, mark and colour sensors, light curtains and area sensors, fibre optic sensors and amplifiers, inductive sensors, mechanical sensors/limit switches and rotary encoders.
- Safety – emergency stop and control devices, safety limit switches, safety door switches, safety mats, safety sensors, safety logic control systems and safety outputs.
- Control components – temperature controllers and sensors, power supplies, UPSs, timers, counters, programmable relays, digital panel indicators and energy monitoring devices.
- Switching components – electromechanical relays, solid state relays, low voltage switchgear, monitoring products, pushbutton switches and thermal blocks.
- Software – CX-One, Sysmac Studio, CX-One Configurator FDT, CX – Drive, CX-Thermo, Trajexia Studio, CX-Supervisor, CX-Server OPC, CX-Compool/Sysmac Gateway, NS Runtime PC and Kepware OPC Server.

Omron is at the forefront of seamless input/logic/output technology, delivering connectivity that is reliable, fast and completely transparent. High performance, effortless integration, total safety and rapid time from concept to market ensure overall plant efficiency.

For more information contact
Omron Electronics, +27 (0)11 579 2600, info.sa@eu.omron.com, www.industrial.omron.co.za

Affordable machine health monitoring with SKF Multilog IMx-8

The compact Multilog IMx-8 from SKF offers sophisticated condition monitoring for a multitude of industrial applications. This latest 8-channel unit forms part of SKF’s popular IMx-16 and 32 channel machine health monitoring platforms.

Initially targeted at the offshore wind and marine sectors, the versatile IMx-8 brings affordable machine health monitoring to a much wider industrial user base. The system is ideally suited for mechanical and fluid power train applications, while the inclusion of an ‘Event Capture’ feature will appeal to machine tool users who require a cost-effective crash detection capability.

Taking up less cabinet space compared to the 16 and 32 channel variants, the compact DIN-rail mount IMx-8 is easily installed into instrument cabinet enclosures, often alongside existing instruments. Suitably housed, it also serves space-restricted applications such as small-size marine thruster pods or direct-drive wind turbines where instruments often need to be located as close as possible to the monitored machinery.

Ethernet power and communications and the app-based configuration interface make installation of the IMx-8 extremely easy, most users can set up the system with little or no previous experience.

The greatly enhanced internal memory (4 GB as opposed to the 8 MB of previous models) enables stand-alone monitoring and logging of large amounts of data, which is particularly beneficial for remote applications where routine site maintenance visits are infrequent. Moreover, following a critical event, data can easily be accessed for analysis.

The IMx-8 offers a compact, versatile means of monitoring rotating machinery and this cost effective, reduced channel online system fills a large gap in the market, offering features, functionality and flexibility not available anywhere else.

For more information contact Samantha Joubert, SKF South Africa, +27 (0)11 821 3500, samantha.joubert@skf.com, www.skf.com
**PRODUCT SHOWCASE**

### The RS Pro RSHS800 series handheld digital oscilloscope

The RS Pro RSHS800 series handheld digital oscilloscope has dual-input features such as an oscilloscope, multimeter and recorder with trends and waveform functions all in one instrument. There are four different models to choose from with bandwidths of 60, 100, 150 and 200 MHz. These instruments offer high performance and have the flexibility to be used in workbench and field applications.

This device weighs 1.5 kg with dimensions of 260 x 163 x 53 mm and has a rechargeable battery pack which is compact and a portable fit for outdoor operation. It features a voltage through BNC up to CAT II 300V and CAT III 150V with a standard probe 10X CAT II 400 V. The oscilloscope and multimeter safety grade is up to CAT II 600 V and CAT II 300 V and has a 5.7 inch TFT colour LCD display. The 1GSa/s real-time sampling rate single channel, has up to 50 GSa/s equivalent sampling rate and a 2 Mpts memory depth and offers a Scope TrendPlot, Meter TrendPlot and a Scope Recorder.

This handheld digital oscilloscope can be used for various applications such as outdoor measurement, automotive electron testing and for education and science research. It is supplied with a USB cable, quick start guide, product qualification certificate, multimeter pen (1000 V), 1:1 / 10:1 probe (1 per channel), CD (containing EasyScope PC software), and power adaptor.


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### Bringing innovation and world-class ignition technology to the combustion environment

Firing up large industrial combustion plants with many burners is a complex process requiring various equipment such as ignitors that require gas or oil to initiate the combustion process. OEN Enterprises just made this process easier and more efficient through the introduction of the new Hegwein Microwave Plasma Ignition System, which forms an electric arc – a bright white plasma – at a temperature in excess of 3500 degrees Celsius. Once introduced into the boiler, it directly ignites liquid fuels as well as pulverised solids like coal and biomass. It can also be used to ignite gaseous and liquid fuels in other combustion applications across industries.

The high ignition temperature of this new ignitor enables high ignition potential, and ignition in oxygen-free environments, with no additional fuels such as gas or oil are required. The new ignitor caters for applications requiring instantaneous and reliable direct ignition of hard coal burners, whilst eliminating the time-consuming conditioning of traditional gas and oil start-up burners. It allows for 1 and/or 2 mill operation with higher boiler system availability and improved flexibility of the load control, resulting in a more efficient energy mix usage.

An alternative ignition product that OEN offers is the Durag D-HG series, a high energy spark ignition system (HESI). It has an integrated temperature control and an under and over voltage protection functionality, as well as a discharge control, short circuit test, LED indication for ignition feedback, ready for operation signal and fault finding capability. It produces an energy of 5.6J at a maximum ignition frequency of 20 sparks per second and is also fully programmable to suit specific plant requirements. Various ignition lance lengths to suit plant specifications, and a retraction unit are also available.

To evaluate the characteristics of the flame produced, the Durag D-LX 201 range of flame monitors provide fail safe and self-monitoring functionalities. As the D-LX 201 is burner and flame specific, it measures the electromagnetic radiation in the ultraviolet, visible and infrared region of the flame spectrum, and analyses specific portions such as intensity, frequency, flame flicker and stability of the flame in more detail. This enables the flame monitor to indicate that there is a flame, as well as provide a flame on signal and a ‘valid’ ma output. There is also a RS-485 output available that can be used for diagnostics or as a permanent output to the appropriate Durag software.

For more information contact Chesney Brady, OEN Enterprises, +27 (0)11 675 4447, sales@oen.co.za, www.oen.co.za

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For more information contact RS Components SA, +27 (0)11 691 9300, sales.za@rs-components.com, www.rsonline.com
See the unseen
The Seek thermal cameras supplied by Horne Technologies can help detect problems ranging from air leaks to electrical shorts to missing insulation. Made for iPhone and Android top models, the Seek Compact transforms smartphones into a professional thermal imaging tool. By utilising the smartphone, thermal photos and videos are easily taken, findings shared and documentation recorded. All that is needed is to connect and open the app. Engineered to run on low power from smartphones, the cameras do not require batteries or charging.

With a powerful and rugged design, the standalone Seek Reveal combines high resolution thermal imaging, a long-lasting rechargeable battery, and a large colour display in one durable device with rubberised casing and intuitive controls. Reveal’s powerful 300 lumen LED light is available at the touch of a button.

The health of buildings can easily be assessed using non-destructive thermal imaging technology, HVAC systems can yield the single largest potential saving on utility costs. The health of heating, ventilation and air conditioning systems is often difficult to track and monitor with traditional tools. A previously cost-prohibitive technology, infrared thermal imaging, is a tool that is now becoming widely adopted by HVAC technicians. It can find refrigerant leaks, spot loose connections, diagnose bad valves, detect energy losses, see corroded fuses, overloaded circuits and overheating pumps or motors, and locate unbalanced loads. All this adds to security at work and home.

For more information contact David Horne, Horne Technologies, +27 (0)76 563 2084, david@hornet.cc, www.hornet.cc

Process indicator for advanced monitoring applications
The LT1200 panel mount process indicator is a precision digital indicator for interfacing to and measuring most process variables. The LT1200 is capable of measuring and processing variables such as mA, volts, potentiometers, frequency and counting, and also has built-in functions such as an event timer, real-time clock (RTC option required) and a manual analog output station (Analog out option required). The LT1200 also includes a multiple output excitation voltage selection for sensor excitation of two or three wire transmitters, encoders, potentiometers and more.

Calibration of the analog process variables is simply done by either entering in the display range selection or by direct sensor injection calibration. The high bright 6-digit 14-segment LED displays make for easy setup and readability. A simple menu system with built-in help hints allows for easy configuration of display and sensor settings.

A universal mains switch mode power supply (85-264 VAC) is provided as standard but an optional low voltage (10-30 VDC) isolated power supply or a high voltage (25-70 VDC) isolated power supply can be installed. RS-232 communications is supplied as standard with the Modbus RTU and Modbus ASCII protocol. A simple ASCII out protocol is also provided for serial printing and communicating to large displays. A second communication RS-485 interface can be added if required.

The LT1200 also has an analog out, or an isolated analog out, option to generate a precision 0/4-20 mA and 0-10 V analog output signal. Other advanced features include user input linearisation, max/min recording, programmable front push buttons, programmable digital inputs, security menu lockout and advanced digital filtering to provide a truly universal process indicator.

For more information contact Glen Webster, Loadtech Load Cells, +27 (0)12 661 0830, glen@loadtech.co.za, www.loadtech.co.za

## Directory of Vendors

### Maintenance, Reliability & Asset Optimisation Directory

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sales@process-auto.com  
www.process-auto.com

QTEK Instrumentation & Calibration Solutions  
38 Braambos Street, Glen Marais, Kempton Park  
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Fax: 088 011 391 4598  
Cell: 083 629 0706  
jacques@qtekics.co.za  
www.qtekics.co.za

Process Dynamics  
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kobusvanniekerk@process-dynamics.co.za  
www.process-dynamics.co.za

Pulse Control Systems  
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Fax: 086 519 1733  
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16 Field Street, Wilbart, Germiston  
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Fax: (011) 394 2606  
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REP Automation Controls  
RET Automation House, 130 Boeing Road East, Bedfordview  
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Fax: (011) 453 2406  
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sales@retautomation.com  
www.retautomation.com

Rockwell Automation  
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Fax: (011) 654 9702  
mjunius@ra.rockwell.com  
www.rockwellautomation.co.za

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Fax: (011) 608 4679  
office@roninstruments.co.za  
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www.siemens.co.za

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www.simation.co.za

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www.tilt-tech.co.za

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www.tlc.co.za

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www.westplex.co.za

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Fax: (011) 621 0060/59
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www.wika.co.za

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Cresta, Johannesburg
Tel: (011) 831 6300
Fax: (011) 86 411 8144
info@za.yokogawa.com
www.yokogawa.com/za
## Hardware: Calibration, configuration & adjustment

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<th>Network capable HART device calibration/configuration</th>
<th>Network capable Profibus device calibration/configuration</th>
<th>Network capable proprietry device calibration/configuration</th>
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<th>Wireless HART device calibration/configuration</th>
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# Hardware: Monitoring, analysis & in situ testing

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### TECHNEWS INDUSTRY GUIDE

#### Maintenance, Reliability & Asset Optimisation 2018

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<td>gavin@<a href="mailto:gavin@halse.com">gavin@halse.com</a></td>
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