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Implementing a successful infrared programme at a plant involves planning and action. See this month’s cover story on page 4 to learn more about the benefits and steps that will help to grow thermographic imaging into a key component of any modern maintenance strategy.

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The modern trend in maintenance, repair and overhaul (MRO) tactics is to deploy a combination of continuous monitoring and cloud-based predictive analytic solutions. The underlying principle is early warning of impending equipment failure, which may not be detectable using more traditional inspection-based methods. But, since every plant is different, their MRO requirements could also be different. The SA Instrumentation and Control team has compiled this Industry Guide to provide you a reference point in the confusing landscape of approaches and technologies available for equipment monitoring, and the implementation of a reliability centred maintenance strategy.

The objective remains to keep the plant running at optimal efficiency, but now secure in the knowledge that a breakdown is not about to catch you unaware, suddenly and without warning. The answer lies in the knowledge that a breakdown is not about to catch you unaware, suddenly and without warning. The answer lies in the knowledge that a breakdown is not about to catch you unaware, suddenly and without warning.

The technologies of the IIoT put it all within reach

The profitability of asset-intensive manufacturing companies hinges to a large extent on maximum plant availability with minimal (zero) unplanned downtime. Even though the ideas of equipment condition monitoring have been around for many years, they were always limited by the need for plant-based specialists to analyse the data and detect the warning signs. Now, thanks to affordable smart sensors and cloud-based analytical software packages, seamlessly 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.

Whatever the unique requirements of your plant, we trust the extensive list of suppliers and service providers included at the back of this publication will help you to identify the right partner for an MRO strategy that moves your organisation closer to optimum performance and the benefits that accrue to those at the top of the pile.

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Implementing an infrared thermography maintenance programme

By John Snell, Snell Infrared – information supplied by Comtest.

Implementing a successful infrared programme at a plant involves planning and action. This article discusses the benefits and outlines the steps that will help to grow thermographic imaging into a key component of any modern maintenance strategy.

Getting started

Gain support from management: send management a summary of what you learned in thermography training and your ideas for what can happen next. Communicate what you would like in the way of support and find out how thermography performance results will be measured.

Integrate with other maintenance efforts: thermography is often part of a larger preventive or predictive maintenance programme. Data from several technologies, such as vibration, motor circuit analysis, airborne ultrasound, and lube analysis can all be used to study the condition of a machine asset. Ideally, these technologies will work from and with the same computerised maintenance management system (CMMS), to access equipment lists and histories, as well as to store reports and manage work orders.

Establish written inspection procedures: written inspection procedures drive the quality of the data collected and ensure the inspection is done safely. Key ingredients include safety, conditions required, and guidance for interpreting the data.

As a starting point for creating your specific inspection procedures, review the industry standards that currently exist. See if your company has procedures that can be used as a guide and then start with the major electrical and mechanical applications and refine as you develop the programme.

Avoid prioritising findings based on temperature alone. Temperature measurements identify problems extremely well and may help characterise problems, but they are not the best way to determine the cause of a failing component. Your inspection procedures should address the conditions required to locate problems, using thermography, as well as acknowledge the other technologies needed for further troubleshooting. Figure 1 shows how thermography fits into an overall maintenance programme.

Creating inspection routes

Begin by using existing lists of equipment from a CMMS or other inventory. Eliminate items that are not well suited for infrared measurement and focus on equipment that creates production bottlenecks. If possible, use history as a guide: where have failures occurred in the past? Use a database or spreadsheet to group the remaining equipment together, by or function, into roughly 2-3 hour inspection blocks.

If thermography is new in the plant, the first few inspection cycles may yield a large number of finds. Subsequent inspections should go more smoothly. After about three cycles, reorganise the routes so they are more efficient and add new routes and equipment into the inspection cycle as necessary. The optimum frequency of inspection will be determined by the needs of the assets. As they age, are heavily loaded, or are poorly maintained, inspections may become more frequent.

Frequency of inspection is based on a number of factors. The key drivers are safety, the criticality of the equipment, the expense of a failure, and the frequency with which problems impact production.

Conducting inspections

Working from a pre-inspection checklist is a good idea:

• Make sure the Fluke Thermal Imager is ready to go.
• Charge the batteries.
• Ensure that the system is within calibration by viewing a black body reference or conducting a simple ‘tear duct check’.
• Clear the memory of previously recorded data.
• If you will be following an inspection route that has been inspected previously, upload past results to the camera so they can be compared to new findings.
• If additional equipment is required, such as a digital clamp meter for load reading, or a voice recorder, etc., assemble all of it and make sure it is in good working order.

Unless you are conducting a first-time baseline inspection, only record thermal images when problems or ‘exceptions’ are located. Take time to look at the finding from several different angles and collect any other data that might be useful for analysis, including additional visual images of the component. Do not worry about actually measuring temperatures until after you have found a problem. At that point, if it is appropriate, the
correct emissivity and reflected temperature correction (RTC) can be used.

For electrical enclosures, such as an MCC panel, open only as many panels as is safe. If enclosure doors are left open for too long, any problem hot spots may cool off. Once you have completed inspecting an enclosure, close the cover to ensure the safety of anyone in the area. If necessary, post signs or barricades around an area during the inspection.

When the inspection is complete, meet briefly with the area manager(s) and review your findings. Prepare them for what you will say in your report, let them know when the report will be coming, and discuss when your next inspection cycle will occur. Download any data you have collected after each route as soon as possible to reduce the risk of accidental erasure. Delete any unnecessary images and process the rest individually, fine-tuning temperature measurements and making any adjustments to temperature level and span settings. Enter any supplemental data into the report page, along with the visual image of the equipment inspected.

**Reporting results**

The software that comes with the Fluke thermal imaging camera supports simple but useful comparisons of asset condition over time. An alarm temperature can be loaded onto an image before it is uploaded into the camera. During the current inspection, both that alarm setting and the previous image can be used to determine the extent of any changes that might have occurred. The new thermal image and data document the new condition. This can all be included in a report generated back in the office. Matching thermal and visual images is very useful, and a second thermal image, either a comparison over time or a follow-up image, can also be included.

Clearly identify the equipment inspected as well as the conditions found. Use the area measurement tool showing the maximum, minimum and average temperatures for the area, rather than the spot measurement tool whenever possible. This will ensure that the true maximum temperature is being identified. It is also important to report the conditions found during the inspection with regard to equipment loading and environmental variables. Note both the emissivity and the reflected background temperature corrections used.

Once the infrared data is correlated with data from other technologies, the actual operating condition of all assets will be known and can be reported in an integrated form. Those assets that are in an alarm stage (red) or an unknown stage (yellow) can then be scheduled for either repair or further monitoring, or managed in some other way, such as reducing load to minimise the risk of failure. Assets in good condition (green) are ready and available to make your plant profitable. Every machine asset may not be green, but at least you will know where the problem areas are and can anticipate their condition in the larger picture of plant operations. Reports organised using the green/yellow/red indicators quickly show whether overall plant asset health is improving, a powerful communication to managers.

Analysis of data over the long term is vital, so plan on accumulating it in forms that facilitate this process. The benefit is twofold. First, you will see trends that may not be obvious in a day-to-day analysis. For instance, you may discover that the motor shop is doing a poor job, or that a certain brand of fused disconnect consistently has problems.

The second benefit is that you will see what is working (or not!) about your programme. You’ll see where problems are continuing to occur, enabling you to justify dedicating resources in those areas or decreasing the frequency of inspection because few problems are being found. It can also help target maintenance investments and allocation of maintenance funds to get the best returns.

**I have my thermal imaging camera. Now what do I do?**

In summary, now that you have your thermal imaging camera and have been trained to use it, here is what to do next:

1. Communicate thermography plans with managers and operators.
2. Integrate thermography into existing preventive or predictive maintenance programmes.
3. Review safety standards and procedures.
4. Create an equipment list, schedule and inspection routes.
5. Capture baseline images of all critical equipment during first survey.
6. Download images after each survey and convert data for tracking.
7. Create a report template and distribute results after each survey.
8. Set up alarms for image comparison and key indicator tracking over time.
9. Modify inspection conditions, lists and routes over time as necessary.

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IoT-enabled field services improve industrial asset availability

By Ralph Rio, vice president, ARC Advisory Group.

Today, many equipment manufacturers are reclaiming the service relationship from the distribution channels with a modern field service management system and remote monitoring. Adding IoT to their products provides the infrastructure for predictive maintenance and proactive service. Rather than react to emergency calls and disgruntled customers, they know when the equipment’s health is deteriorating and can make the repair prior to failure. Service providers are also starting to provide a similar digital transformation by enhancing their service agreements with add-on components for remote monitoring and predictive maintenance.

IoT with predictive maintenance is beginning to transform field service from a reactive cost centre into a proactive business with higher revenue and margins. Unplanned downtime is particularly painful with lost revenues, missed customer shipments, quality issues, and safety or environmental incidents. By nearly eliminating unplanned downtime, customer satisfaction, net promoter score and repeat orders increase.

With modern field service management (FSM) and IoT-connected products, field services owner-operators can improve their asset availability and performance and technology suppliers can gain a competitive advantage with increased revenues for both products and services.

Unplanned downtime is ugly

Unfortunately, unplanned equipment downtime occurs while operating the equipment to produce goods or services. This is the point of greatest negative impact to the business. The ramifications include:

- Lost revenues with lower profitability since the equipment is not available when needed to make product.
- Missed shipments and lower customer satisfaction.
- Safety and environmental incidents.
- Scrap materials, quality issues and rework resulting in production delays.
- Lost hours waiting for a repair.

Costly attempts to mitigate the risk of downtime

Industrial organisations have layered a variety of activities and overhead costs to help negate the impact of unplanned downtime. These costs have been accepted as ‘normal’ business practices including:

- Extra equipment for back-up.
- Redundant systems.
- More internal, on-site maintenance staff.
- Increased reliability and maintenance engineering.
- Increased work in progress (WIP) inventory so downstream operations can continue during a failure and repair.
- Increased finished goods inventory to help avoid lost revenues and missed shipments.

Many of these costs have become thought of as necessary for a well-run business, or even considered a ‘best practice.’ However, in the context of lean manufacturing, they are non-value-added waste that should be eliminated.

More preventive maintenance is not the answer

For preventive maintenance, reliability engineers examine an asset’s failure history and schedule maintenance based on usage using either time duration or number of cycles. The strategy for preventive maintenance is to schedule work orders just before the frequency of failure starts to increase. The ‘bathtub curve’ at the top of the graphic for equipment failure patterns is a prime example often taught to new reliability engineers. But, reliability studies (starting with Reliability Centred Maintenance by Nowlan and Heap in 1978) have shown that only 18% of assets have an age-related failure pattern. Preventive maintenance is effective for only this small portion of assets. The other 82% of assets have a random failure pattern with no rise in failure rate. Another approach is needed for the other 82%.

Critical assets, both new and existing, often have a high degree of technical sophistication. This makes it increasingly difficult to isolate and identify problems. As equipment gains complexity, it becomes impractical for a general-purpose maintenance team at the end customer’s site to support and maintain (compared to the time when cars had carburettors and no computers, few people

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*Figures and tables related to equipment failure patterns and maintenance strategies are not included in this text representation.*
repair their cars – the author included). One response is to provide the technician with deep product training. Unfortunately, the training knowledge decays or leaves for another role before the next repair.

Equipment complexity has been increasing across two dimensions: automation and intellectual property:

- **Automation**: mechanical controls that could be observed have given way to electronics, mechatronics, software, and networking with interaction among the sub-systems. The technician’s eyes and ears alone are no longer sufficient to identify and resolve impending problems. Debugging and problem isolation requires specialised training and tools.

- **Intellectual property**: R&D involves science and computer-aided design (CAD) software to optimise equipment performance. Adjustments made by a general-purpose technician can be counterproductive (long gone are the days when you could tune your car by making carburettor adjustments until it sounded right).

  This trend of increasing asset complexity is driving the outsourcing of maintenance to the equipment supplier. Much like for your car, routine maintenance like oil, tyres, battery, muffler and brake replacement can be done by an independent repair shop (which would be analogous to the on-site, general-purpose maintenance staff). But, more involved diagnosis and repair of the engine, transmission and electrical systems requires the deep training and proprietary equipment in the dealer’s service centre (analogous to the equipment manufacturer or a specialised service provider).

**Digital transformation for assets**

Industrial IoT (IIoT)-enabled condition monitoring and predictive maintenance approaches allow manufacturers to consider outsourcing to the OEM or a specialty service provider. Now, with remote asset health monitoring using IIoT and analytics, service providers can obtain warning of an impending failure and provide repairs to reduce unplanned downtime to near-zero levels.

**Remote condition monitoring**

The OEM or specialty service provider has an intimate understanding of the operating performance of the equipment. This often enables it to develop algorithms for successful early detection of issues – sometimes up to six months prior to failures. With this advanced notice, the service provider can either alert the end user or schedule repair with its own field service technician. In the latter case, the technician’s deep understanding of equipment performance and repair knowledge typically translate into a higher first-time fix rate (FTFR) and longer mean time between failure (MTBF) compared to work by on-site, general-purpose technicians.

**Reactive field service and two-pass repair**

Without IIoT and remote asset health monitoring, it was previously often impractical for the OEM to maintain critical equipment. When the equipment failed, the OEM or its local dealer would be called with an urgent request for a technician. The first field service visit typically becomes an inspection to assess the problem and determine the needed parts, tools and skills. A second field service visit is needed for the repair. With two service calls, the unplanned downtime could easily extend for multiple weeks. For most equipment, this is unacceptable.

**One-pass planned repair with IIoT and PdM**

Using remote asset health monitoring services for predictive maintenance (PdM), the service provider can identify and repair the problem before unplanned downtime occurs. The proactive repair and high FTFR avoids lost revenues for the manufacturer. This improves customer satisfaction at the executive level with high likelihood of repeat sales. Elevator manufacturers have told ARC their FTFR rose from 65 percent to over 90 percent using IIoT and PdM.

**Digital business processes for field service management**

Field service involves widely distributed assets. Service providers use FSM solutions to deliver maintenance services to asset owners. FSM systems plan, optimise, execute, and track the needed service activities with the associated priorities, skills, materials, tools, and information. The field service business processes involve several functions within a company and many stakeholders.

“Rather than react to emergency calls from disgruntled customers, remote monitoring empowers OEMs to know when equipment health is deteriorating and schedule a repair prior to failure.”

**Automation and visibility**

By adopting modern IoT and cloud technologies, nearly every aspect of the business process for condition monitoring, triage and servicing equipment can be automated. Analytics can take the form of first principle engineering models, machine learning, or both to generate an alert that provides advanced warning of the failure. A modern FSM application supports technician scheduling and route optimisation. OEMs tell ARC that 30% or more of the repairs can be made via the web by modifying parameters remotely or through guided assistance of an on-site person.

**Lower cost with improved speed**

IIoT and the business process automation make both the cost and speed of maintenance by a service provider rather than an on-site technician more attractive. Consider the combination of remote monitoring, alerts prior to failure, schedule optimisation, one-pass repair, high FTFR, faster mean-time-to-repair (MTTR), and a significant portion of repairs occurring without a service call. Meanwhile, equipment continues to become more complex and a large portion of experienced technicians are retiring.

**Field service management business models**

The adoption of smartphones and related technologies for mobility have facilitated
high growth and broad adoption of field service management software. Different types of businesses have their unique needs, and competitive pressures drive software developers to create specific functions for the larger segments. At this stage of the market development, three business models have emerged for field service management software. In rank order by market size, these business models are:

- OEM (providing after-market services for asset health)
- Service provider (maintaining other companies’ assets)
- Self-service (maintaining widely distributed assets by the owner).

OEM’s aftermarket field service delivery
The IoT provides the means to monitor equipment health and its performance in the plant.

**Predictive maintenance**
Using IoT, analytics and predictive maintenance, OEMs deliver condition monitoring services that provide near-zero downtime. This provides customers with clear business benefits for revenue, quality and on-time shipments. Currently, the most common application of the IoT involves selling after-market services for asset health monitoring to reduce unplanned downtime, improve reliability, and extend asset longevity.

**Operating performance**
The IoT also offers the ability to deliver a more holistic view of the customer experience beyond failure prevention. More recently, OEMs have expanded this service to include guidance for improving the operating performance.

**Revenue growth**
OEMs that can provide predictive maintenance aftermarket services successfully gain a new high-margin revenue stream and improved customer satisfaction with a higher ‘net promoter score’ (a customer loyalty metric) that drives repeat orders. ARC expects high growth in maintenance outsourcing as these technologies continue to mature with broader adoption of remote equipment condition monitoring.

Involving multiple business entities
To execute on the promise of ‘near-zero unplanned down-time’, the business processes need to include the scheduling of a technician to do the repair. Most OEMs have a dealer network that sells and services the equipment. Since the technicians are part of the dealership, that business must be included in the programme. The dealership will need to be involved in processes to qualify skills, support ongoing training, execute service, track compliance, and update the business agreement.

**Intelligent service delivery optimises asset availability**
In the past, many equipment manufacturers ceded service and the customer experience to their dealers and distributors. Today, manufacturers are reclaiming that service relationship through a modern field service management system and remote monitoring. Adding IoT to their products provides the infrastructure for predictive maintenance and proactive service. Rather than react to emergency calls and disgruntled customers, they know when equipment health is deteriorating and perform the repair prior to failure. Service providers – particularly those focused on a type of equipment like HVAC – can provide a similar digital transformation by enhancing their service agreements with add-on components for remote monitoring and predictive maintenance of the equipment.

By combining machine data from IoT-connected products and artificial intelligence, manufacturers can power truly intelligent service experiences for customers. They can also personalise the service experience better and provide guidance for operators by understanding on a granular level how their customers use their products. Unplanned downtime is particularly painful with lost revenues, missed customer shipments, quality issues, and safety or environmental incidents. By nearly eliminating unplanned downtime, customer satisfaction, net promoter score, and repeat orders increase. This capability enables a market discontinuity (a change in market shares and ranking) among industrial equipment suppliers and service providers.

Obviously, industrial end users stand to gain significant benefits as well.

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Improving power plant performance with a modern calibration process

Calibration is an essential activity in power plants and there are various reasons to establish a proper calibration process. Improving power plant efficiency is one obvious reason in order to ensure profitability, while proper calibration is also vitally important for safety. Furthermore, properly calibrated emission monitoring equipment is essential in regulated areas. Various national and international regulations and standards require certain calibrations to be performed. Naturally, the reasons may vary in different types of power plants. This article takes a brief look into the most common reasons to implement a modern calibration process in power plants, explores the typical issues of an outdated calibration process, and concludes with a short discussion of a modern calibration process and how to implement it.

Common reasons for calibration

Power plant efficiency

Power plants have been proven to run more effectively and produce more energy and higher profits if the critical process measurements are more accurate. Regardless of how advanced the control system is, the system is only as good as the quality of the measurement data provided by the process control instrumentation. Inaccurate measurement data may cause the control system to make adjustments elsewhere in the process, causing additional strain on the assets and directly impacting their lifecycle and maintenance costs.

Source fuel is the largest operating cost for a power generation unit, and plants which have performance or heat rate improvement programmes perform better than those that do not. Many of the initiatives identified to achieve the largest improvements are also capital intensive, requiring considerable time and resources. Addressing instrument calibration can be a much lower cost initiative, but can still contribute to improved performance and heat rate. In order to keep the process measurements accurate, a proper calibration process needs to be established. Calibration should be performed with high quality equipment that ensures proper accuracy and uncertainty. Likewise, the plant should utilise calibration management software to provide the highest level of traceability. The calibration process itself, commonly referred to as standard operating procedures (SOP), must be well planned to help ensure that the work is performed effectively. Using calibration management software to analyse data and perform history trend analyses helps with instrument prioritisation and ensures the usually limited resources are used for the most important calibrations.

So efficacy in this context means being able to run the power plant in a more effective manner in order to produce more energy and earn higher profits. But efficacy also means that the calibration SOPs create the best outcome from normally limited available resources.

Plant safety

Plant safety is an essential matter for power plants for many obvious reasons. Apart from regulatory requirements, safety is a very high, if not the most important, priority for any plant. The power plant environment is a collection of systems to carry fuel, combustion air, and boiler water. In addition to the high-pressure steam hazards there are a variety of other conventional and chemical/physical hazards that must be controlled. Operating a high pressure boiler-turbine combination involves a rigorous set of controls to ensure safe operation to prevent the boiler from exceeding pressure limits. Safely managing these risks requires critically accurate pressure and temperature measurement.

Depending on the plant type, there are a number of critical safety measurement points, which most often have redundant measurement circuits. As such, the number of critical safety measurement circuits to calibrate can be very high. Since the calibration of these critical safety circuits is controlled by regulations, it is best to ensure that these are calibrated at suitable intervals with proper uncertainty and also ensure that the calibrations are documented and reported in an appropriate way. Failing to do these regulated safety calibrations may in the worst case entail the plant to be fined or even shut down by authorities, or cause a harmful accident.

One of the major sources of injury for electric power generation is caused by falls from ladders, scaffolds or other elevated platforms. Job safety involves the interrelationship between people and work; materials, equipment and machinery; and the environment. At the same time, for economic reasons, the highest possible level of productivity must be achieved. An accident prevention strategy with regard to calibration...
work must focus on reducing the tools required to perform the work and minimise the number of steps involved.

Regulations, emissions and invoicing-related measurements
There are regulations for continuous emissions monitoring systems in power plants. Depending on the plant type there may be a series of gas analysers which monitor the flue gas for example for: sulphur dioxide, nitrogen oxides, carbon monoxide, carbon dioxide, hydrogen chloride, airborne particles and organic compounds, just to mention a few.

In addition to the continuous measurement of these emissions, the measurements must also be calibrated properly. If the power plant fails to perform these measurements or calibrations it may be shut down and/or heavily fined.

Although the actual fiscal metering and custody transfer is most often related to the oil and gas industries, power plants also have measurements that are used as the basis for invoicing or money transfers. It is obvious that a large amount of invoicing is based on certain measurements, the accuracy of is of utmost importance. Any error directly affects the invoiced amount. Hence significant effort must be made to ensure that these measurements are as accurate as possible.

Non-critical calibrations
The previous sections discuss some of the most critical calibrations in a power plant, but of course there are many plant measurements which require calibration. These may not need to be calibrated so often and the uncertainty requirements are not so critical. Even the documentation requirements of these calibrations may not be so stringent. However, they could have a significant effect on power plant performance and safety over time.

Typical challenges in power plants
Lack of dedicated metrology resources
In an ideal world, power plants would have enough dedicated skilled metrology experts who could concentrate solely on performing calibration work. However, the reality is that most of us are not living in this ideal world.

One common challenge that can be seen in many power plants today, as well as in many other process plants, is the lack of experts who have deep subject matter expertise in calibration-related metrology. Also, typically there are only limited resources that can be deployed for calibration work during an outage as there is a long list of other tasks that the same workforce is required to perform.

“The most important reason to implement a modern calibration process is to improve efficiency.”

Calibration is just a small part of their overall responsibilities. As such, it is important to use a modern automated calibration solution that helps make calibration work more effective in order to perform the calibrations faster and with fewer resources. Furthermore, the automated calibration solution should guide the workforce, through the calibration work in the correct way. This can include intelligent calibration equipment that executes fully automatic calibrations according to specified procedures with guidance on how to complete the calibration including how to connect to the instruments, the points to calibrate and the Pass/Fail calculations.

Legacy calibration process
Even in modern power plants, the calibration process may be outdated and based on manual or home-grown management tools. After upgrading a plant to modern, high-accuracy process instrumentation, legacy calibration equipment could be outdated because it fails to provide acceptable Test Uncertainty Ratios (TUR). Additionally, all documentation may rely on manually recording results using paper-based records. In these environments the entire calibration system may feel like a burden and inhibit real performance improvement.

High-accuracy calibrators increase annual production at Central Nuclear de Almaraz (CNA), Spain.
In the case of this nuclear power generation facility, an enhanced calibration system with high accuracy calibration equipment made it possible to perform calibration operations with better uncertainty levels, thus enabling improved production results.

This was achieved by using Beamex MC6 multifunction calibrators in the plant. By improving the parameter measurement from 2% to 0.4% (parameters associated with reactor efficiency), enabled power in each unit to be increased by 1.6%. This resulted in a significant increase in annual production.

Calibration programmes based on heavily manual processes normally utilise paper-based forms for the procedures that guide the technician through the calibration. The calibration is often performed with non-documenting calibrators, so the calibration documentation is hand-written on paper, causing more work and the potential for typing errors. Also, error calculation for each test point is a manual process when determining Pass/Fail status. Results may be typed into an electronic database, if one exists, and the confirmation that the work has been performed is also manually entered into a computerised maintenance management system (CMMS).

So in short, an outdated legacy calibration process can be labour intensive, may result in poor calibration accuracy, generates unnecessary paperwork and may be prone to errors related to manual data entry.

Outsourcing support
Due to the lack of calibration resources, calibration is outsourced just as often as it is in-sourced. When service providers perform the calibrations, the process needs to be very well planned and specified, so that the plant can be sure the service provider calibrates exactly as required. The calibrations need to be compliant and well aligned with the company’s internal SOPs. The process needs to follow regulations and be optimised, so that no time is wasted during shut downs and schedules are met. Plants should always strive to reduce and shorten the shutdown period with an effective calibration process.

When calibration is out-sourced to a service provider there is always a risk. If calibrations are done on paper, manual data entry involves a significant risk of errors. Having calibration software in place where the data is automatically stored makes the data easily accessible and the oversight remains within the plant and not with the service provider. Documenting the calibrations makes the data not only dependable but also traceable for inspections and/or audits.

Modern calibration processes
What is a modern calibration process like?
If we look at the most modern calibration processes available today, we can find the following key components: the management, monitoring and scheduling of all calibrations is automated with the help of dedicated calibration management software. The calibration management software can be linked to the CMMS for a fully automated and paperless flow of work orders. The calibration management software also communicates with

portable documenting process calibrators, meaning that the work orders can be downloaded directly into the calibrators with all the required instructions for the technicians to go into the field. During calibration, an intelligent calibrator performs an automatic Pass/Fail calculation, complicated calculations do not have to be performed. Also, the results will be stored in the calibrator’s memory, and can be directly uploaded to the calibration management software. Finally, the calibration management software can automatically send an update to the maintenance management software that the work has been completed. As such, the whole process is fully paperless and more can be done with fewer resources as the process is highly automated, thus reducing costs and improving the quality of calibration data. A modern calibration process is also far more efficient, allowing more calibrations to be performed in the limited time during an outage.

**Why and how to implement a new calibration process?**

The most important reasons to implement a modern calibration process are to improve calibration efficiency, save costs, obtain higher quality calibrations and be compliant with related regulations. But how can a new calibration process be implemented?

Briefly, here are a few words on implementing a new calibration process: it is vital to remember that implementing a new calibration process is a process itself, with many interrelated tasks that need to be performed in the appropriate sequence.

A proven project supply implementation model is recommended, managed by a dedicated project manager and supported by experts in the subject matter. Without a proven implementation model, typical risks of implementing a new process are usually encountered, such as unclear expectations, budget and schedule overruns, scope creep, and a lack of expected benefits.

Although implementing a new calibration process is far smaller in scope than implementing, for example, a new ERP system, there are still many similarities.

The implementation should start with establishing the project framework in order to have a common understanding of the project targets, specify the roles of the parties in the project team and steering group, establish management rules, determine testing and acceptance criteria. During specification, you will need to document all the relevant requirements and make sure all parties have a common understanding. If all previous steps have been performed correctly, the next phase is the actual execution according to plans. Finally, the new process is put to use with secure support when in production use.

Using a supplier that has a proven implementation model for the required actions is recommended.

**Summary**

A modern state-of-the-art calibration process can help a power plant to:

- Improve the plant performance and efficiency.
- Ensure safety.
- Ensure emissions control.
- Improve the accuracy of invoicing and related measurements.
- Make the calibration work more effective, automated and paperless.
- Save calibration related efforts and costs.
- Improve the quality of calibration and help regulatory compliance.

For more information contact QTEK Instrumentation & Calibration Solutions, +27 11 391 4598, jacques@qtekics.co.za, www.qtekics.co.za
Understanding how predictive analytics tools benefit power utility management

By Mike Reed, manager Analytical Services, AVEVA. (IS3 is the authorised distributor for AVEVA in sub-Saharan Africa.)

The impact of utility industry restructuring is being felt on several levels. The upside of distributed generation growth and the diversification of power sources are also resulting in the downside of loading issues, less switching flexibility and the potential for reverse power flow. New predictive asset analytics tools allow utility personnel to address these issues before they become problems. This paper reviews how these tools can be applied to both utility operations and maintenance.

Introduction
Utilities today are looking for new ways to address an evolving energy marketplace. The pressures of government regulation, increased competition and rising consumer demands are driving the need for improved reliability, efficiency, and safety. The upside of distributed generation growth and the diversification of power sources have unfortunately augmented the downside of loading issues, less switching flexibility and the potential for reverse power flow. In addition, an ageing infrastructure and workforce is driving the need for asset renewal and knowledge capture.

The amount of ‘big data’ available today is providing utilities with an opportunity to overcome some of these disruptive obstacles. Forward-looking utilities are beginning to invest in monitoring and predictive analytics tools that help to leverage this data. Navigant Research estimates that utilities will spend almost $50 billion on asset management and grid monitoring technologies by 2023. Using predictive asset analytics software, utilities can improve equipment reliability and performance while avoiding potential failures. These tools also leverage power network data to prioritise maintenance and reduce operational and maintenance expenditures.

Equipment failure
Predictive asset analytics solutions provide early warning of equipment failure and abnormal operating conditions that may go unnoticed within the realm of traditional maintenance practices.

For example, consider a 110 MW steam model turbine with seven bearings (including generator bearings). According to the asset maintenance records, over one year this turbine demonstrated sporadic isolated issues, followed by an escalating condition that eventually resulted in the shutdown of the unit. The maintenance personnel identified turbine bearing vibrations and took corrective action. Upon completion of the maintenance, a similar cycle of sporadic issues began again, in addition to the introduction of new problems.

This unit’s raw historical data was then analysed with an up-to-date predictive analytics tool (in this case, Schneider Electric’s Avantis PRiSM tool). The results were significant. Had a predictive asset analytics solution been in place, plant personnel would have received early warning that turbine thermal expansion issues were developing and becoming chronic over the year. Through a modelling exercise, the tool was able to detect the fault patterns with early warnings six months prior to failure. The model showed that the bearing vibrations were a symptom while thermal expansion issues were the primary cause of the problem. Proactive remedial maintenance would have corrected the thermal expansion problem before it led to bearing vibration issues and the shutdown of the unit. The result would have been significant savings in maintenance costs as well as additional generation sales due to increased unit availability. Estimated savings in this case are in the millions of dollars – a result of 35 days avoided downtime offline and associated repair costs.

Additional benefits
Predictive asset analytics software allows for operations and maintenance personnel to be more proactive in their work. Instead of shutting down a section of the power plant immediately, a problematic situation can be assessed for more controlled outcomes. Loads can be shifted to reduce asset strain or the necessary maintenance can be scheduled during a planned outage. The software tools allow for better planning which in turn reduces maintenance costs. Parts can be ordered and shipped without the need for stressful rush and equipment can continue running while the problem is being addressed. Maintenance windows can be lengthened as determined by equipment condition and performance. Other benefits include increased asset utilisation and the ability to identify underperforming assets.

Other savings can be realised when avoided costs such as loss of power, replacement equipment, lost productivity, and additional man hours are considered. The power of predictive analytics tools is that they transform raw data into easy-to-understand and actionable insights that result in improved availability, reliability and decision making.

Predictive analytics tools allow personnel to visualise actual and expected performance of an asset including detailed information on ambient conditions, unit loading and operating modes. Operations personnel become knowledgeable regarding where inefficiencies exist and what
“Predictive asset analytics allow power utilities to monitor critical assets for the purpose of identifying, diagnosing and prioritising impending equipment problems.”

Reliability-centred maintenance
All of the aforementioned maintenance approaches create the foundation for reliability-centred maintenance (RCM). RCM is a comprehensive prognostic strategy focused on outcomes and is the process utilised for determining what should be done to ensure that an asset operates the way the user intended. RCM is the capstone of a fully integrated maintenance programme and cannot be efficiently deployed without a repeatable process for the foundational maintenance practices, which includes using a predictive analytics solution in support of predictive maintenance.

Conclusion
Predictive asset analytics solutions help grid operators, systems engineers, controllers and many other plant personnel take advantage of the massive amounts of data available today and use it to make real-time decisions that have a significantly positive impact on reliability and performance. Advanced pattern recognition software helps personnel work more effectively by providing early warning notification and allowing more lead time to plan necessary maintenance, ultimately avoiding potential equipment failure and improving performance.

Power generation and delivery utilities can transform their maintenance strategies by leveraging data and predictive asset analytics solutions to spend less time looking for potential issues and more time taking actions to gain the greatest return on every single asset. New predictive asset analytics software tools can allow power utilities to monitor critical assets for the purpose of identifying, diagnosing and prioritising impending equipment problems – continuously and in real time.

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When a local vehicle manufacturer experienced air leaks in the pneumatically operated components and systems of the specialised vehicles they construct, the company turned to SKF for assistance. SKF offered a turnkey solution in the form of the versatile TKSU 10 ultrasonic leak detector.

**Wasted air costs money**
Compressed air production is integral for the daily operation of manufacturing plants but is one of the largest energy consumers. Air leaks increase load on the compressor which can lead to higher electricity usage and a loss of total compressed air production capacity.

The TKSU 10 is a premium quality instrument that detects air leaks and is ideally suited for use in all industries utilising compressed air. This ingenious device is able to identify leaks in pneumatic brake systems, vacuum systems, pressurised gas storage, and steam traps.

“THE INSTRUMENT CAN BE USED TO VERIFY THE AIR TIGHTNESS OF TRUCKS, BUSES, PASSENGER AND RECREATIONAL VEHICLES MAKING IT THE PERFECT FIT FOR OUR CUSTOMER’S APPLICATION,” SAYS SKF PRODUCT MANAGER, EDDIE MARTENS.

Following initial discussions with the customer, SKF visited the vehicle manufacturer’s site to demonstrate the notable abilities of the new leak detector.

**Pinpoint leaks accurately**
“The hand-held instrument enabled us to pinpoint leaks with accuracy,” notes Martens. “The customer, impressed by the functionality, immediately placed an order for two units. One instrument has been allocated to their final quality control process, while the other will be used by the field service teams.”

The user-friendly instrument’s ultrasound measurement sensor enables operators to identify leaks from a distance – even in noisy industrial environments – with no training required. The TKSU 10 works like a microphone, but is only sensitive to high frequency ultrasound which is not audible to the human ear. This is translated into an audible sound or frequency through a passive industrial noise reduction headset worn by the operator. The headset also features an adjustable volume setting and a neck-band design that enables it to be worn with a protective helmet.

Suitable for use in a variety of harsh environments from −10 to +50°C, the instrument is equipped with a flexible probe that helps to find leaks in hard to reach areas.

SKF was responsible for delivery of the two units, which were supplied to the local vehicle manufacturer two weeks after the order was received. “Although the TKSU 10 is straightforward to operate, we provided our customer with the necessary product training to prevent machine abuse and deliver optimum functionality,” concludes Martens. “SKF is proud to have supplied this world-class instrument to our customer who we are confident will enjoy its numerous benefits including minimised energy costs, reduced inspection time and increased leak detection accuracy.”

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The difference between verification and calibration

Maintenance personnel often come across the metrological terms calibration and verification. For some, these two concepts are known and easy to differentiate, for others, they can cause confusion.

**Verification made easy**
According to the International Vocabulary of Metrology (VIM), the term verification is defined as: “Provision of objective evidence that a given item fulfils specified requirements.”

An interpretation of verification consists of checking calibration results as 'objective evidence' to comply with a 'specified requirement', such as the Maximum Permissible Error (MPE), defined either by a manufacturer, a legal metrology organisation or an end-user (i.e. process application). This situation is illustrated in Figure 1, where the device's relative measurement errors obtained by the calibration rig turn out to be smaller than the MPE, meaning that the flowmeter (item) fulfils the specified requirement.

**Endress+Hauser's onsite verification offerings**
- **Heartbeat verification**
  - Heartbeat Technology verifies the correct function of the measuring device according to the specifications and generates a protocol without process interruption.
  - The automatic generated protocol supports the documentation requested by internal and external formalities, laws and standards.

- **Inline ultrasonic clamp-on verification**
  - The inline verification is a comparison of the results obtained from the unit under test (UUT) against the inline ultrasonic clamp-on flowmeter.
  - A verification certificate which indicates the measured error between both the measurements is generated.

**Calibration made easy**
According to the VIM, calibration is a procedure to establish a relation between a quantity value given by a UUT and a reference quantity value (ref) obtained by a calibration rig, within its associated measurement uncertainty. The main objective is to check the accuracy of measurements by comparing the device in question with that of a known traceable reference. One fundamental requirement for carrying out a calibration is that the reference system must have traceability to the fundamental units of measurement needed to reproduce the unit flow. Calibration of devices assists:
  - The requirements of industry regulators and standards like FDA, IFS, ISO 9000 etc.
  - To prevent influence of inaccurate measurements on the quality of the final product.
  - To prevent energy or material losses due to improper control.
  - To prevent safety issues caused by poor monitoring.

**Endress+Hauser's calibration offerings**
- **Onsite: portable rigs and buffer solutions**
  - On-site calibration is performed by highly trained engineers. It is convenient and cost effective, and removes the need to send instruments offsite, keeping downtime to an absolute minimum. It also offers the highest flexibility as calibration can be scheduled according to process demands.

- **Laboratory**
  - Laboratory calibration services are one-time or repeat contract-based calibrations of customer instrumentation carried out in a facility owned by Endress+Hauser. Calibration services performed in a laboratory have the advantages of the best calibration uncertainty and wide calibration ranges.

- **Calibration management service**
  - Calibration management service is an optimisation service where Endress+Hauser take day-to-day management responsibility of a customer’s calibration function. Goals of this outsourcing are improving a customer’s plant operations, and securing calibration process compliance to internal and external regulations while reducing its costs.

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SA Gauge, a local manufacturer of temperature and pressure gauges, recently received the South African National Accreditation System (SANAS) accreditation conforming to the ISO/IEC 17025 standard for temperature calibration. “Customers that are already used to the quick pressure calibration turnaround times by SA Gauge’s accredited pressure laboratory, will now be able to get the same quick service on temperature calibrations,” says managing director, Chris du Plessis.

Having several heat sources permanently stabilised at dedicated, commonly requested set-points enables the laboratory to ensure quick turnaround times on thermocouples, PRTs and digital thermometers. Dial thermometers, infrared thermometers and liquid in glass thermometers can also be calibrated.

Trained and qualified metrologists working under controlled environmental conditions with highly accurate and stable equipment and standards, ensure all work is performed competently and on time, usually within two to three days.

What does SANAS ISO/IEC 17025 accreditation mean?
To achieve ISO/IEC 17025 accreditation, the laboratory’s quality management system and technical competence is regularly evaluated thoroughly by a third-party assessment body. Audits are conducted on a regular basis to maintain accreditation and to prove compliance. ISO/IEC 17025 accreditation can only be granted by an authorised accreditation body, such as SANAS, which is authorised by the Department of Trade and Industry in South Africa. Accreditation means that the laboratory has met the management and technical requirements of ISO/IEC 17025, and is deemed technically competent to produce valid calibration results.

Manufacturing strength
SA Gauge customers have the right to receive a reliable, accurate product – the company’s professional pride will have it no other way. In-house production and SANAS ISO/IEC 17025 calibration laboratories allow it to set high standards for quality control. Coupled with a ‘customer satisfaction at all costs’ sales team, a ‘results driven’ engineering team and a ‘first time right’ production team, customers are ensured of accurate, quality instruments made to their specifications at short notice. The in-house SANAS ISO/IEC 17025 accredited laboratories then ensure that customers are left with the same level of confidence in their equipment after recalibration, as when it was new.

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Predictive maintenance should be considered essential in any digitalisation strategy aimed at Industry 4.0 migration towards the smart factory ideal. The ability to track machine performance and anticipate failures before they occur helps manufacturers to improve overall equipment effectiveness and reduce wasted time and costs. A leading solution for predictive maintenance is condition monitoring; however, collecting machine performance metrics is only the beginning. The ability to interpret and communicate this data is essential for system reliability, and this is where machine learning comes into play. A condition monitoring solution with machine learning removes human error from the equation and makes predictive maintenance solutions smarter and more effective.

This article explains what predictive maintenance is, how condition monitoring with machine learning works, and five capabilities to look for in a condition monitoring solution.

**What is predictive maintenance?**
Predictive maintenance is the process of tracking the performance of crucial machine components, such as motors, to minimise downtime needed for repairs. Predictive maintenance enables users to anticipate when machine maintenance will be needed based on real-time data from the machines themselves. Because of this, predictive maintenance can help reduce machine downtime, increase mean time between failures (MTBF) and reduce the cost of unnecessary machine maintenance and spare parts inventory.

Traditionally, plant managers relied on preventative maintenance schedules provided by a machine’s manufacturer, including regularly replacing machine components based on a suggested timeline. However, these timelines are only estimates of when the machine will require service, and the actual use of the machine can greatly affect the reliability of these estimates.

On one hand, this means that you could be paying for unnecessary maintenance and replacement parts that are not needed. On the other hand, many things can go wrong between scheduled maintenance visits. For example, if bearings wear prematurely or a motor overheats, a machine may require service sooner than anticipated. Furthermore, if a problem goes undetected for too long, the issue could escalate further damage to the machine and lead to costly unplanned downtime. Predictive maintenance helps avoid these problems, saving time and money.

**Condition monitoring with machine learning**
Condition monitoring plays a key role in predictive maintenance by allowing users to identify critical changes in machine performance. One important condition to monitor is vibration. Machine vibration is often caused by imbalanced, misaligned, loose or worn parts. As vibration increases, so can damage to the machine. By monitoring motors, pumps, compressors, fans, blowers, and gearboxes for increases in vibration, problems can be detected before they become severe and result in unplanned downtime.

Vibration sensors typically measure RMS velocity, which provides the most uniform measurement of vibration over a wide range.
of machine frequencies and is indicative of overall machine health. Another key data point is temperature change (i.e. overheating). Machine learning takes this information and automatically defines a machine's baseline levels and sets thresholds for acute and chronic conditions, so you know in advance – and with confidence – when a machine will require maintenance.

**Five key capabilities of a smart predictive maintenance solution**

Machine learning is just one important element that creates a smart condition monitoring solution. The following are the top five capabilities to look for in a predictive maintenance solution:

1. **Continuous monitoring**
   The most effective predictive maintenance solutions will continuously monitor machines for critical changes, including changes in RMS velocity, high frequency RMS acceleration, and temperature. Changes in these conditions are leading indicators of future failure. A continuous monitoring solution will pick up on these in real-time and allow for timely remedial action.

2. **Machine learning**
   After mounting the vibration sensor, most sensors require you to collect enough data to establish a baseline. Machine learning removes the chances of human error by automating the data analysis. A condition monitoring solution with machine learning will recognise the machine's unique baseline of vibration and temperature levels and automatically set warning and alert thresholds at the appropriate points. This makes the condition monitoring system more reliable and less dependent on error-prone manual calculations.

3. **Wireless communication**
   A wireless condition monitoring solution is easy to deploy quickly and it can be adapted as needs change without requiring extensive downtime for cable runs. In addition, the ability to monitor machines in inconvenient locations allows for more comprehensive monitoring and increased reliability throughout the facility.

4. **Local and remote indication**
   When a vibration or temperature threshold has been exceeded, a smart condition monitoring system should provide both local and remote indication, such as sending a signal to a tower light in a central location or sending an email or text alert. This will ensure that warnings are addressed quickly regardless of whether the machine is within the sightline of an operator.

5. **Data logging**
   A condition monitoring solution that logs the collected data over time enables even more optimisation. With a wireless system, vibration and temperature data can be sent to a wireless controller or PLC for in-depth, long-term trend analysis.

**Conclusion**

Monitoring vibration and temperature using machine learning improves reliability, reduces unplanned downtime, and saves maintenance costs. It is also an easy way to start making better, data-driven decisions about machines and transforming a plant facility into a smart factory.

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A new release of Emerson’s AMS Device Manager helps improve plant reliability with better organised data, for more informed and proactive management of field devices. New embedded tools allow project and operations teams to customise plant device hierarchies, project tracking, and device alerts, delivering improved decision support – a key competency of digital transformation. With AMS Device Manager, Emerson is helping teams effectively use device data to deliver more reliable operations and shorten project engineering timelines.

Many plants struggle to manage thousands of devices in complex and often out-of-date plant device structures (hierarchies) – often using long, disorganised lists that make it hard to find and identify critical devices. Without having devices organised by zone, asset, unit, or other category, teams have access to health data, but little insight into where a faulty device is located or how it is impacting production data. However, creating or rearranging this hierarchy used to be a time-consuming, manual process, for which few organisations had the spare time or resources.

AMS Device Manager’s enhanced bulk transfer functionality changes this paradigm, providing the tools to configure whole systems automatically – including setup of device alert monitoring and plant hierarchies. Users can simply export a tag list and open it in a spreadsheet application to enter a location and alert group for each device. Then, using bulk transfer, users can instantly set up the system with an accurately populated hierarchy and alert monitor. With a correctly defined plant hierarchy, maintenance teams can visualise device data in targeted views, allowing them to evaluate and manage the reliability of specific areas of the plant. This is particularly useful during shutdowns and turnarounds when selected plant areas are down for maintenance.

“An accurate data backbone all the way down to the device level helps build the foundation for digital transformation with a more accurate picture of asset health,” said Mani Janardhanan, vice president, Plantweb product management. “With the new AMS Device Manager, users can prepare their plant’s data infrastructure for technologies such as Plantweb Optics that will digitally enhance maintenance practices with data they can trust for decision making.”

Maintenance teams commonly have difficulty separating critical alerts from irrelevant ones. With the updated AMS Device View – the browser-based interface for AMS Device Manager – maintenance can assign devices to specific projects and track them on separate project dashboards, avoiding the distraction of alerts flooding the operations dashboard. This organised alert delivery allows more efficient response during periods with significant changes like shutdowns, turnarounds and outages.

The newest version of AMS Device Manager also increases safety and security with system-wide automated locking of devices. Organisations can protect against unauthorised changes to devices without relying on physically adding or removing jumpers. Customisable software-based locks can be enabled for select personnel for specific amounts of time, after which the system will automatically relock the devices to ensure that device configurations are protected.

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Festo Automation Suite
Software for quick and reliable commissioning.

Three functions, one software: the PC-based Festo Automation Suite software combines the parameterisation, programming and maintenance of components in one program. It enables the entire drive package, from the mechanical system to the controller, to be commissioned in just a few intuitive steps.

The free Festo Automation Suite is the main software of the constantly expanding Festo Automation Platform, entering the automation market with numerous new products and solutions from mechanical systems to the cloud. With this software, the parameterisation of servo drives and integration into the control program take no time at all.

**Complete connectivity**
The software is an important part of the Festo philosophy of complete connectivity i.e. the ability to connect a workpiece completely to the cloud, from its mechanical connections and electrical interfaces to commissioning and controller programming. This simplifies the work of every machine builder and automation engineer when it comes to integrating the mechanical and electric technology, including the control levels and interfaces, with other hardware and software.

The basic functionalities of all Festo components are included in advance. To customise the software, plug-ins or add-ons can be installed directly via the program. Just enter the equipment type or part number and the software will find and install the relevant modules.

Device description data, manuals and application descriptions can be downloaded conveniently from the software without having to open a web browser every time. The overall control concept permits the problem-free commissioning of various devices. These are added to the product and connected to each other via drag and drop functionality.

**Only five steps to a ready-to-use drive system**
The plug-in of the servo drive CMMT-AS makes configuration and parameterisation child’s play, as the integrated commissioning assistant reliably and conveniently leads to a completely functional drive system in just five steps. Together with the automation system CPX-E, integration into the control system is quick and easy. Where 100 mouse clicks and keyboard operations were once required, only two now suffice. The software automatically integrates all required driver modules into the user program and calculates all important parameters in the background. Optionally, the Codesys add-on enables the further programming of motion control and robotics functions.

**Breakthrough in digitalisation**
Festo is driving digitalisation forward and helping its customers to enter the age of Industry 4.0. The company is combining its extensive knowledge of industrial applications with the latest developments in information technology to realise online applications for industrial automation practice. Festo is also using digital communication to support its customers throughout the Digital Customer Journey. This guides customers reliably and comprehensively through the Festo portfolio, from information procurement and configuration through ordering and delivery to commissioning and maintenance, and even to the technical training offerings of Festo Didactic.

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Multidisciplinary maintenance and repair approach

**Skyriders cements**
A multidisciplinary maintenance and repair solution from Skyriders Access Specialists has assisted a leading supplier of superior quality construction materials and technical solutions such as cement, aggregate and readymix concrete make the most of a recent shutdown period.

A five-person rope-access team was deployed for the four-day project, which was completed successfully during September 2018. Skyriders’ scope of work comprised routine inspection of induced draft (ID) ducting associated with a cooling tower at the supplier’s Kiln 3 operation.

An ID tower is essentially convection cooled, as opposed to a forced draft (FD) cooling tower. The former is 50% more energy-efficient, based on a draw-through arrangement whereby a fan mounted on top pulls air through to create a cooling effect around the furnace area.

The Skyriders team gained access via the top hatches, and from there abseiled down in order to carry out the internal inspection. “We picked up a few issues that required repair,” explains the company’s marketing manager, Mike Zinn. “However, the fact that the team we deployed had welding experience as well facilitated this aspect of the project.”

Close collaboration with the client in terms of providing the correct dimensions and thicknesses for the repairs meant that the replacement sections could be cut and bent according to specification, and then rigged and welded in place by the Skyriders team.

“The fact that we used rope access meant that no scaffolding was required for the repair portion of the project,” concludes Zinn. “This was critical in terms of the timeframe, as such a shutdown has fixed start and end dates, which cannot be moved around.”

The concrete supplier is a long-standing client of Skyriders, which is looking to introduce its Elios collision-resistant drone technology for future confined space and remote inspection work at the plant.

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**TECHNOLOGY & APPLICATIONS**

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A tamper-proof vibration indicator paste that can improve safety and reduce inspection time across a number of industries is now available locally from Bearings International (BI). Applications for DYKEM Cross-Check Torque Seal range from haul trucks to head gaskets in vehicles, gearboxes, and even conveyor belts, BI product manager Richard Lundgren explains that when a piece of equipment vibrates, whether it be a car, aeroplane, crane, or water supply pump, there is always the chance that nuts and bolts may loosen. It is essential to be on the lookout for this when servicing equipment or carrying out routine maintenance, in order to prioritise safety and reduce downtime.

To use the product, the artisan simply draws a line of the paste from the bolt head and along the threads of the screw, once ideal torque has been achieved. At the next inspection, the artisan checks to see if the brightly-coloured mark is still in alignment. If not, action can be taken there and then on that specific bolt, instead of having to retighten all of the bolts, thereby speeding up the process and reducing the possibility of any loose bolts being missed. With its excellent adhesion to all types of materials, including steel, the indicator paste comes in a range of eight colours for high visibility, and is also fluorescent under UV lighting. Lundgren stresses that the safety aspect of this product cannot be overstated, especially when one considers the potential danger of a bolt coming off a long conveyor belt in a factory where people are working in close proximity. Preventing potential dangers like this by using the vibration-warning indicator paste means safety checks can be carried out more easily, as they now take just a few minutes.

The indicator paste is supplied in a tube, and comprises a gel-like substance. This is dry to the touch in one to two hours, and fully cured in 24 hours. It also has a two-year shelf life, meaning clients can be sure of the quality of their stock. The product is GHS compliant and meets the Globally Harmonised System for classification and labelling of chemicals, the guideline for ensuring the safe production, transport, handling, use and disposal of hazardous materials. Typical applications are found in the manufacturing, agricultural, mining and power generation sectors.

For more information contact Bearings International, +27 11 899 0000, info@bearings.co.za, www.bearings.co.za
Seamless acquisition and analysis of plant data

TwinCAT Analytics supports the ability to investigate machine optimisation and facilitate predictive maintenance.

PC-based control and TwinCAT automation software together provide the technological foundation for the advanced Industry 4.0 and Internet of Things architectures that enable highly intelligent machines. TwinCAT Analytics, as a basis for comprehensive analysis functions, provides an important component of such architectures. It supports, for example, the ability to investigate the potential for machine optimisations, to facilitate both predictive maintenance and subsequent behavioural analyses and to manage a long-term data archive. TwinCAT Analytics also helps innovative machine builders create entirely new business models.

Even an intelligent machine may sometimes experience malfunctions. At such times, true intelligence can be recognised in the methods provided by the machine for analysing the problem. Naturally, malfunctions will always be costly and time-consuming. However, they are all the more annoying if vital machine data and production parameters are no longer available that could otherwise be used to analyse and avoid these problems in the future. The end result is often that problematic behaviour cannot be analysed, and additional data logging mechanisms must be implemented. Even then, analysis cannot proceed until the problem occurs again. Specifically positioned to solve this lack of information, TwinCAT Analytics collects all process-related data for every machine cycle. This produces a complete log of all machine procedures. Depending on requirements, the data can be collected and analysed locally on the machine’s computer, or within a cloud-based solution in a private network, or over the Internet. Cloud-based solutions are particularly suitable for developing new business models, because they not only enable users to analyse behaviours after the event, but they can also analyse the data itself in order to take preventive action on the appropriate machine. Here, the key idea is ‘predictive maintenance’, something that machine manufacturers can offer as a revenue-generating service to their end customers.

No data? No analysis.

The basis of effective analysis is seamless data acquisition; users can enable this functionality by running the TwinCAT Analytics Logger on the control computer. It can also be easily configured in the engineering environment of TwinCAT 3: in the configuration interface, users simply activate the checkboxes for the data to be cyclically collected from the process image or application. The user can also specify whether the data should be stored locally or transmitted using a communication protocol. For either case, one can set up a ring buffer, useful to help ensure that local storage does
not exceed the maximum possible storage capacity. If the data is communicated directly, a ring buffer can also bridge a temporary loss of connection.

**IoT communication and cloud technology promote highly flexible analysis architectures**

Direct transfer of data with the TwinCAT Analytics Logger is particularly suitable for developing new business models. It relies on so-called ‘IoT communication protocols’, which offer outstanding features for using cloud services. IoT protocols always set up an outgoing connection to a message broker. This decouples the communication so that the network nodes – unlike those using conventional client/server communication protocols – do not need to know one another. The communication participants all operate as the client. In this case, the TwinCAT Analytics Logger that runs on a control computer is an IoT client, ‘publishing’ data to a message broker and storing it in what is called a ‘topic’. Note that topics can be hierarchical.

The message broker maintains a list of interested parties for corresponding topics, and other IoT clients can subscribe to these topics and their data. For example, an analysis server may be interested in the logger’s data or even a mobile application on a smartphone. Both of them are IoT clients, both subscribe to an appropriate topic and each receives a copy of the data. The beauty of IoT protocols is in their outgoing connections, because firewalls usually only block incoming connections. An elaborate opening of ports is no longer necessary. A further advantage of IoT technology is evidenced by the complete flexibility that can be achieved: users can leverage the identical mechanisms within a local network architecture and for communicating with Internet-based services. Cloud providers such as Amazon Web Services and Microsoft Azure have their own IoT message brokers that can be used for communication. The best-known protocols here are currently MQTT (MQ Telemetry Transport) and AMQP (Advanced Message Queuing Protocol), which are both supported by TwinCAT.

**The TwinCAT Analytics infrastructure**

As previously stated, the IoT interface gives machine manufacturers and end users great freedom when setting up TwinCAT Analytics. Naturally, the TwinCAT Analytics PLC library can be used to analyse the recorded data locally on any machine. If a machine controller should not be powerful enough to carry out the analysis locally, IoT connectivity enables the analysis of data in a local cloud by the end user. This means that machine operators can analyse their machines in their own network environment. In this case, TwinCAT Analytics can run on a server and analyse a number of machines at this one production site.

You can alternately install TwinCAT Analytics on a virtual machine. The obvious way of doing this is to use a public cloud. Here, you can flexibly use and use processor power, storage space and IT infrastructure from vendors such as Microsoft Azure. This greatly simplifies the global connection of machines to the analytics system. Another variant is for machine manufacturers to operate as service providers for their machines and either analyse the generated data in the cloud, or use the cloud only as a ‘transmission medium’ and perform the analysis on a server within their own IT infrastructure. If end users – who are of course interested in high machine availability, high productivity and high product quality – prefer to hire external analysts, they can provide them with the necessary access data for the message broker, the topic architecture and the data description. In this way, a third-party analyst can access the necessary data and offer its customers appropriate services.

**Big data brings big benefits**

TwinCAT Analytics not only provides data using the IoT protocol, it also answers the question of how to use the data. Simply generating enormous amounts of data is not enough, these data volumes also have to be managed. The core element, the TwinCAT Analytics Workbench, makes exactly that possible, providing the ability to analyse data directly online or offline. Online means that the Analytics Workbench uses the IoT communication protocol to subscribe, on the message broker, to the topic corresponding to the machine that is to be analysed. Offline is an option if the machine has previously stored its data using Beckhoff Cloud Storage. The Cloud Storage facility integrates itself seamlessly into all the variants of the previously described Analytics infrastructure, both in the cloud and in a local IT network environment. The Workbench can then access this historical data and analyse it.

**The TwinCAT Analytics Workbench**

TwinCAT Analytics Workbench is based on a TwinCAT runtime system that can be configured and programmed using the TwinCAT Engineering Environment. The big advantage is that machine manufacturers do not need to make any changes when switching between the programming environment for the controller and the environment of the analysis software. They can directly apply their years of programming expertise when using the Workbench. This makes it very easy to implement their own analysis algorithms, reuse algorithms previously used for different machines, or alternatively, to use algorithms from the TwinCAT Analytics PLC library. This incorporates modules for counting flanks, analysing maximum and minimum values, evaluating the timing of machine cycles, and calculating the energy consumption per unit time of a selected component.

Particularly when evaluating the timing of machine cycles, it is useful to identify the shortest, longest and average runtimes. This enables you to recognize potential optimisations or to derive indicators for predictive maintenance. For example, a status analysis can easily determine whether a rotating milling head is frequently stationary, running with speed a, b or c, or is in an error state. Such results can be clearly displayed in a histogram, which is why the familiar TwinCAT Charting Tool, ‘TwinCAT Scope’ is such a crucial feature of Analytics Workbench. This particularly applies to interactions with the Analytics Configurator that is also embedded in the TwinCAT engineering environment. It means that you can compile a post-scope configuration for previously recorded data in order to get a fresh graphical display of the data curves.

**The Analytics Configurator**

For viewing data, the Analytics Configurator already uses the same algorithms that are used in the analytics library. The data streams from the selected periods are analysed in the Configurator and displayed directly. Significant values obtained in this way can easily be dragged-and-dropped into the charting interface of TwinCAT Scope. Scope then automatically navigates to the corresponding locations in order to illustrate their relation to other signals. This makes it much easier to locate the needle in the ‘big data haystack’. It also markedly simplifies engineering using the Analytics Configurator. Since all algorithms come from the same source, you can take the configuration that was set up in the Configurator, together with all the selected variables and their corresponding limit values,
and feed it into the PLC. This enables switching from offline analysis to online analysis using data streamed from the cloud.

**The TwinCAT Analytics Workbench Base**

The functionality described here refers to the TwinCAT Analytics Workbench Base. This incorporates a TwinCAT PLC runtime system, the Analytics PLC library, an IoT connection for streaming data, the Analytics Configurator and ScopeView Professional. The Workbench can also be extended by installing packages for Condition Monitoring, C++ and MATLAB/Simulink. In particular, integrating MATLAB/Simulink into the TwinCAT runtime system offers comprehensive access to useful toolboxes that answer tough analytical questions. For example, one such toolbox deals with machine learning and optimisation.

In addition to the dedicated extensions of TwinCAT Analytics, other TwinCAT standard tools can also be used. The TwinCAT Database Server can store online and offline data in a variety of databases. An analytics system can also be supplied with data using the widely used automation protocol, OPC UA. In addition, Beckhoff provides converters from OPC UA to IoT protocols in order to give, for example, third-party controllers access to analysis functions. Another very important solution is TwinCAT 3 HMI, which enables you to design intuitive dashboards based on HTML5 for the Analytics Workbench. This creates an Analysis Cockpit that can then be used to display all the results for a given machine or a number of machines. A hierarchical structure makes it possible to display much deeper levels of detail.

**Forward-looking automation with TwinCAT Analytics**

Industry 4.0 and IoT technologies, and particularly the use of clouds, are increasingly dissolving the hierarchies of conventional communication architectures. All network nodes, from real-time field devices to ERP systems, can now communicate with each other. TwinCAT Analytics suits this trend extremely well, by incorporating not just a single product, but a complete solution. The IoT communication protocols used handle the data transport and give the infrastructure maximum flexibility. The Analytics Workbench itself takes over machine-related evaluations, visualisations and pre-processing of data, as well as long-term database storage. Extended data analysis and machine learning for the purpose of machine optimisation can be implemented in TwinCAT through the seamless integration of MATLAB/Simulink or other cloud services accessible via IoT protocols. Analytics Workbench makes all of these functions available and is itself directly integrated into the familiar TwinCAT environment in Microsoft Visual Studio. This robust analysis of machine data serves as a key factor for numerous new business models, as well as for future-proof and efficiency-optimised automation.

For more information contact Michelle Murphy, Beckhoff Automation, +27 11 795 2898, michelle@beckhoff.com, www.beckhoff.co.za

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**Pump monitoring in hazardous areas**

Safety has top priority wherever flammable media are used in industry. This applies in particular to the chemical industry, where flammable liquids are produced, processed and transported by pumps in hazardous areas. If the pumps start to run dry, hazardous conditions may arise inside and outside the pumps, such as air-gas mixtures, sparking and high temperatures caused by friction. The power consumption of electrically driven centrifugal pumps falls in the event of dry running, so Simocode pro switches the pumps off when consumption falls below a minimum value. This eliminates the installation of conventional monitoring devices, such as level sensors. The Simocode pro motor management system offers comprehensive protection, monitoring and control functions for the safe disconnection of motors, integration in process control systems such as Simatic PCS 7, and a large number of interfaces for system-wide communication. Simocode pro makes detailed operating, service and diagnostic data as well as process and measured values available to higher-level systems and cloud solutions.

**Extended to hazardous areas**

A new type of detection technology was recently introduced by Siemens to protect centrifugal pumps in hazardous areas from dry running. For this purpose, the company developed special current/voltage detection modules for its Simocode pro motor management system. The principles and practical applicability of this technology have been investigated within the scope of a research cooperation project with the Physikalisch-Technische Bundesanstalt (National Metrology Institute of Germany) in order for it to be certified as an ignition source monitoring device corresponding to a type b1 ignition protection system according to ATEX and IEC Ex.

Simocode pro uses measuring modules to monitor the active electric power consumption of the pump motor to detect a diminishing flow rate and shut off the pump in good time at defined limit values to prevent impending dry running. Additional sensor technology otherwise required to monitor the pump for dry running can be eliminated. A menu-guided teach-in procedure in the engineering software helps the user to set the limit values. The advantages of the new type of active power-based dry running protection from Siemens are not only less hardware, early detection of faults and the avoidance of damage to the pump but also safe, reliable explosion protection, savings in time and money spent on maintenance, as well as higher system availability and economic efficiency.

For more information contact David Moela, Siemens Digital Factory and Process Industries and Drives, +27 11 652 2000, david.moela@siemens.com, www.siemens.co.za
Online condition monitoring with fieldbus interface

The VSE150 from ifm electronic is a 6-channel diagnostic system designed to evaluate four dynamic signals (e.g. rotational acceleration) and two analog inputs. The new VSE15x family provides different fieldbus interfaces to exchange data with a PLC. This makes it possible to display the measuring values directly on the control system and optimally adapt the monitoring functions to the operating states and processes of the machine. In addition to the fieldbus, two fast digital switching outputs are provided for time-critical alarms.

Reduced network complexity saves time and money

The direct PLC connection via fieldbus allows auxiliary parameters (e.g. rotational speed and triggers for operating states), as well as non-critical alarms from condition monitoring to be exchanged over the bus. This not only reduces wiring complexity but also saves the cost of providing the corresponding inputs/outputs on the PLC.

Machines with varying processes, such as machine tools, have high demands on condition monitoring systems. To recognise deterioration in quality at an early stage and avoid scrap, or even damage, a process-dependent detection of even the smallest change is necessary. This can only be achieved by interlinking the operating parameters (e.g. rotational speed, power consumption, feed rate, tool etc.) and the vibration data – ideally in the PLC. This combination of control and condition monitoring data enables process-dependent monitoring, leading to a considerable increase in quality and process reliability. The same applies to diagnosis (rolling-element bearing condition, ball screw, unbalance), where, in many cases, a high degree of diagnostic validity can only be achieved by combining the vibration monitoring data with the machine/process parameters of the PLC.

Influencing process factors must be minimised and the measured data evaluated systematically. Here, too, integrating condition monitoring with the PLC is an enormous advantage and a direct fieldbus connection provides the optimal solution.

Rapid response protects machinery

If machine protection is part of the monitoring concept, a fast response is critical to minimise potential damage. For time critical alarms, the diagnostic electronics provides two additional digital outputs with a response time of 1 ms, which can be used to initiate an immediate machine stop to minimise, or even completely avoid, consequential damage.

Online condition monitoring with fieldbus interface

VUVS-LT Poppet Valve

Frequently used in different locations and exposed places, the VUVS-LT Poppet Valve can take a lot – all without losing its good looks. Simple on the outside, sturdy on the inside, it is the ideal combination to meet a multitude of requirements, even for challenging environmental conditions. The plug type poppet seal variant is particularly suitable for these types of applications.

Reliability

The valve stands out thanks to its robust, sturdy poppet design, constant switching time and great sealing. It combines features required for operation in harsh environments such as impact resistance, mounting options and ease of handling. An extensive range of mounting accessories provides various options for integrating the poppet valves into any machine concept.

This cost-effective design pulls out all the stops by allowing a 2x 3/2-way valve setup in one body. This allows for space and cost saving on an individually wired valve. Also, inside the 5/2 way bi-stable valve there is a locking circlip that holds the poppet in position, even after a power failure or loss of air pressure. This increases process safety as it ensures the valve maintains its position during unexpected failures. Other features include:

- Available on a manifold and with fittings assembled.
- Best tightness (very low leakage).
- Constant switching time.
- Quick switching time due to poppet design.

Fulfils safety requirements.
- Fits to standard spool type accessories.

For more information contact Kershia Beharie, Festo, 086 003 3786, kershia.beharie@festo.com, www.festo.co.za
Setting standards for monitoring and safety in the radiation detection industry

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, Thermo Scientific’s EPDs (electronic personal dosimeters) set a standard for trusted performance in electronic personal dosimetry. The recently introduced Thermo Scientific EPD Trudose delivers performance and reliability with all the modern features expected from a portable radiation detection monitoring instrument.

The Trudose delivers real-time readings that improve safety by providing ultra-precise dosage information. This EPD offers new benefits that allow the user to measure ‘Pulse Field Radiation’ as well. The innovative multi detector technology allows measurement of Alpha, Beta, Gamma and Neutron radiation, and the improved dose-rate range accuracy, which measure as low as 0.05 micro-sieverts per hour, provides assurance in the accuracy of measurement to anyone at risk of exposure to a radiation source. Via the newly added warning thresholds, personnel are empowered to respond to alarms, or even react before they occur, due to the enlarged easy to read graphical display. The instrument also enables real-time monitoring of multiple personnel through its networking functionality.

“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, the exclusive licence partner for Thermo Scientific field and safety instruments in southern Africa. “Due to the EPD Trudose’s small dimensions, and with a weight of only 100 grams, this futuristic dosimeter easily attaches to the belt through a new improved clip design.” In the fight against radiation exposure and contamination, smaller devices are perhaps the industry’s biggest advancement in recent years, with their capability to sound different types of alarms depending on the threat level, and keeping an accurate account of detected radiation.

Naidu explains that it is essential to select the right device for a specific requirement. For example, while the lightweight Thermo Scientific Trudose may be useful for many industry applications, the RadEye PRD would be required for a customs officer looking for hidden sources of radiation. At 160 grams, the more specialised RadEye PRD is up to 100 000 times more sensitive than typical electronic dosimeters.

In addition, these new dosimeters capitalise on the power of big data. With their recording and archiving features, exposure can be closely tracked over periods of time ensuring that exposure remains within safe thresholds, pegged by South Africa’s National Nuclear Regulator at 20 millisieverts per year, averaged over the past five consecutive years.

“Above all,” concludes Naidu, “radiation detection equipment must be 100% reliable. As with any equipment relating to personal safety, we advocate high quality instruments that give users the peace of mind that they are fully protected.”

For more information contact Herman Welman, OEN Enterprises, +27 11 675 4447, radiation@oen.co.za, www.oen.co.za

Procentec launches new Profibus and Industrial Ethernet diagnostics solution

Procentec Mercury
With the increased complexity of industrial networks comes the need for devices that provide an easy-to-understand overview of the status and health of the infrastructure. The Procentec Mercury is a robust mobile tablet for delivery of a new cross platform software package. This device is perfect for troubleshooting, maintenance and monitoring of industrial Ethernet and Profibus networks.

The Mercury combines the power of the ProfiTrace and the Procentec Atlas. It is based on Osiris, the same software as Atlas uses for industrial Ethernet diagnostics and therefore offers the same easy to use interface. When combining Mercury with ProfiTrace, it offers a new software package for troubleshooting Profibus networks.

Overall this device offers the ability to mobile monitor all Profibus and industrial Ethernet networks in a facility. Since the software is pre-installed, the device is ready to use immediately.

For more information contact Industrial Data Xchange, +27 11 548 9970, info@idx.co.za, www.idx.co.za
When diagnosing problems, capturing and displaying small temperature variances makes all the difference. Comtest now offers Fluke’s Ti480 and Ti450 PRO series infrared cameras, recently fine-tuned to make it easier for technicians, engineers, and electricians to get to a problem’s root cause faster by identifying hot spots, cold spots, and apparent surface temperature differentials, with a higher degree of confidence. These IR cameras have increased thermal sensitivity to capture minute differences and the latest Fluke technology for on-screen clarity, making it easy to visualise field issues. With the enhanced measurement accuracy and the wider dynamic temperature range of the Ti450 PRO – up to 1500°C with NETD as low as 25 mK – technicians can collect precise information for making informed decisions that boost the company’s return on investment.

The Fluke PRO series cameras introduce a leading-edge visual infrared experience with intuitive user interface. The units feature increased thermal sensitivity that captures the smallest measurement differences, the latest technology for on-screen clarity, and lens compatibility to capture targets from small to large. Now, with the Ti450 PRO, worrying about focus is obsolete. MultiSharp focus captures images that are focused throughout the field of view, even if users start from a completely blurry target. The camera takes multiple images and combines them to give a clear, accurate focus on targets, near and far. The advanced focusing system enables users to capture an automated, focused image of multiple targets at once, delivering the image clarity needed by professional thermographers and maintenance managers to produce top-quality results and avoid costly rework.

**PRO series cameras with leading-edge technology**

For more information contact Comtest, +27 10 595 1821, sales@comtest.co.za, www.comtest.co.za

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**Innovative ignition technology and analysis for the combustion environment**

Ignition systems

Firing up large industrial combustion plants with many burners is a complex process requiring equipment such as igniters that require gas or oil to establish the combustion process. OEN Enterprises just made things easier with the introduction of the new Hegwein Microwave Plasma Ignition System. This ignitor generates a bright white plasma at a temperature in excess of 3500 degrees Celsius. Once introduced into the boiler, it directly ignites fuels and pulverised solids like coal-sand biomass. It is also able to ignite gaseous and liquid fuels in combustion applications across industries. No additional ignition fuels are required, allowing instantaneous and reliable direct ignition of hard coal burners. This enables higher boiler system availability and improved flexibility of load control, resulting in more efficient energy 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, under and over voltage protection, discharge control, short circuit test, LED indication for ignition feedback, ready for operation signal and a built-in fault finding capability. The system produces an energy of 5.6 J at a maximum ignition frequency of 20 sparks per second and is fully programmable to suit specific plant requirements. It has varying ignition lance lengths to suit plant specifications, and a retraction unit is also available.

Flame monitors and analysers

To evaluate the characteristics of the flame produced, the Durag D-LX 201 range of flame monitors provide fail-safe functionality. 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 parameters such as intensity, frequency, flicker and the stability of the flame. These measurement criteria need to be fulfilled in order for the D-LX 201 flame monitor to indicate that there is a flame, as well as provide a valid ‘Flame On’ signal. There is also a RS-485 output available that can be used for diagnostics, or as an output to the appropriate Durag software.

OEN also supplies the WDG-VC Oxygen and combustibles analyser, which can be used by all companies that need to monitor boiler efficiency as well as control their stack emissions. The principle of operation is based on a Zirconium oxide cell for net oxygen measurement, and dual hot-wire catalytic detectors for both combustibles and methane.

**For more information contact Chesney Brady, OEN Enterprises, +27 11 675 4447, ches@oen.co.za, www.oen.co.za**

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For more information contact Comtest, +27 10 595 1821, sales@comtest.co.za, www.comtest.co.za
The LT1200 panel mount process indicator is a precision digital indicator for interfacing to and measuring most process variables. The instrument 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.

Maintenance personnel have to facilitate optimum hydraulic system performance through their programmes, 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 40 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 11 392 3736, harpo@hydrasale.co.za, www.hydrasale.co.za
**Handheld digital oscilloscope with multimeter and recorder**

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 300 V and CAT III 150 V with a standard probe 10X CAT II 400 V. The oscilloscope and multimeter safety grade is up to CAT II 600 V and CAT III 300 V and has a 5.7 inch TFT colour LCD display. The 1 GSa/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.


For more information contact RS Components SA, +27 11 691 9300, sales.za@rs-components.com, www.rsonline.co.za

**FLIR launches addition to high-performance T-series thermal camera family**

FLIR Systems has launched the FLIR T840, a new thermal camera in the high-performance T-series family. The high-resolution T840 offers a brighter display and an integrated viewfinder to help electrical utility, plant managers, and other thermography professionals find and diagnose failing components in any lighting conditions to help avoid costly power outages and plant shutdowns.

Featuring the award-winning design of the FLIR T-series camera platform, the T840 features an ergonomic body, a vibrant LCD touchscreen, and a viewfinder that enables ease of use in any lighting conditions. The 464x348-resolution camera incorporates FLIR advanced Vision Processing, including the patented MSX image enhancement technology, UltraMax, and proprietary adaptive filtering algorithms to provide customers with enhanced measurement accuracy and image clarity with half the image noise of previous models.

The T840 also offers an optional 6-degree lens that allows professionals to capture accurate temperature measurements on small targets at far distances, such as connectors on overhead distribution lines. Also, advanced, on-camera measurement tools unique to newer FLIR T-series models, such as one-touch Level/Span and precise, laser-assisted autofocus, the FLIR T840 enables users to find problems and make critical decisions easily.

With a 180-degree rotating lens platform, the T840’s ergonomic design helps users reduce the strain of full-day inspections and diagnose hard-to-reach components at substations and on distribution lines. The new camera offers rapid reporting features that help users stay organised in the field. Wi-Fi streaming to the FLIR Tools app makes it simple to survey issues in real-time, while in-camera GPS automatically tags image files with geolocation data to simplify identification for precise documentation.

For more information contact Reynhard Heymans, FLIR Systems South Africa, +27 11 300 5622, reynhard.heymans@flir.com, www.flir.com
## DIRECTORY OF VENDORS

### Maintenance, Reliability & Asset Optimisation Directory

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Beckhoff implements open automation systems based on PC control technology. The product range covers industrial PCs, I/O and Fieldbus components, drive technology and automation software. The Beckhoff ‘New Automation Technology’ philosophy represents universal and open control and automation solutions that are used worldwide in a wide variety of different applications.

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### Hardware: Conditioning systems

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## Hardware: Monitoring, analysis & in situ testing

| PRODUCT & SERVICES | In-stream/in situ | Angular alignment | Calibratiation alignment | Corrosion | General purpose data logger | Hydraulic fluid | Insulation/Insulation oil | Lubricant | Other | Pneumatic air | Thermographic Imaging | Thermographic Infrared Imaging | Valve shutoff testing | Valve stem testing | Vibration Analysis | Sampling valve | pH | Special Analysis of Process Fluids |
|-------------------|-------------------|------------------|------------------------|-----------|-----------------------------|----------------|--------------------------|-----------|------|-------------|------------------------|------------------------|----------------------|----------------------|----------------|-----|-----------------------------|
| Adroit Technologies |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Afriiek Automation |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Allpronix          |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Alpine Instruments |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| ASSO               |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Associated Technology |             |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Atlanta Instruments |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Automation & Control Solutions |   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Bearing Man Group (a/BMG) |   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Beling Supply Service BEP Bestobeil | |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| BEMET Measurement and Control |   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| C.A.G.E. Solutions |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Contest            |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| CraigCor Distribution Co. |             |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Ernest Lowe (Div. of Hudson Trading) | |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| ESTEQ Test & Measurement |   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Evanet             |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Festo              |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| FLIR Systems       |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Horne Technologies |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Hydramatics Control Equipment | |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Hyradsales         |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Hytec South Africa  |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| IAC – Industrial Automation & Control | |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Impact Instruments  |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| INDECON Instrumentation |             |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Instrotech         |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Instruments 4 You   |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Mecosa             |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Microsep           |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| MOOG SA            |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Moore Process Controls |             |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Newelec Pretoria   |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Oakleaf Investment Holdings 52 (OIH) | |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| OEN Enterprises    |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Omniflex Remote Monitoring Specialists | |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Parker Hannifin Sales Company South | |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Pinnacle Instruments SA |             |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| PREI Instrumentation |             |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| R&C Instrumentation |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Rockwell Automation |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| RS Components SA   |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Siemens Digital Factory & Process Indust. & Drives | |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| SKF South Africa   |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| TeleEye (South Africa) |             |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Tilt-Tech          |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Turck Banner       |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Vepac Electronics  |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Westplex           |                   |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Yellow Technical Services |             |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |
| Yokogawa South Africa |             |                  |                        |           |                             |                |                          |           |      |             |                        |                        |                      |                      |                |     |                             |

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# Products & Services

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