SCHAEFFLER

We pioneer motion

How can comprehensive condition monitoring optimize maintenance?

Maintenance Opportunities for the Process Industry

White Paper

Overview

Despite the threat of high costs resulting from unplanned downtime, production facilities – especially balance of plant assets and supply systems – are not subjected to comprehensive and regular monitoring using modern condition monitoring tools. In most cases, comprehensive condition monitoring is not considered at all. Sometimes projects even fail during the “proof of concept” phase.

This white paper shows how comprehensive condition monitoring can work economically using new technologies. In fact, this can be accomplished with such ease that the entire maintenance team can use this solution without possessing any special prior knowledge.

This white paper addresses a number of questions in detail, including:

- How are condition monitoring strategies used?
- What condition monitoring options are available for maintenance purposes?
- What do maintenance engineers expect from a condition monitoring solution, and what is deterring them from implementing such a solution?
- What forms of technology are available and how can they facilitate a breakthrough?
- What makes a good solution and how can maintenance engineers benefit from this?

This white paper also includes tips, comparisons, research results as well as examples from practical experience.

Legend

Information

Additional resources

Takeaways

Knowledge in a nutshell

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Schaeffler Technologies AG & Co. KG
Georg-Schäfer-Straße 30
97421 Schweinfurt
Germany
medias.schaeffler.de/en

Editorial Team

Schaeffler Technologies AG & Co. KG
Dr. Philipp Jussen, Sebastian Mergler, Sylvia Schmitz

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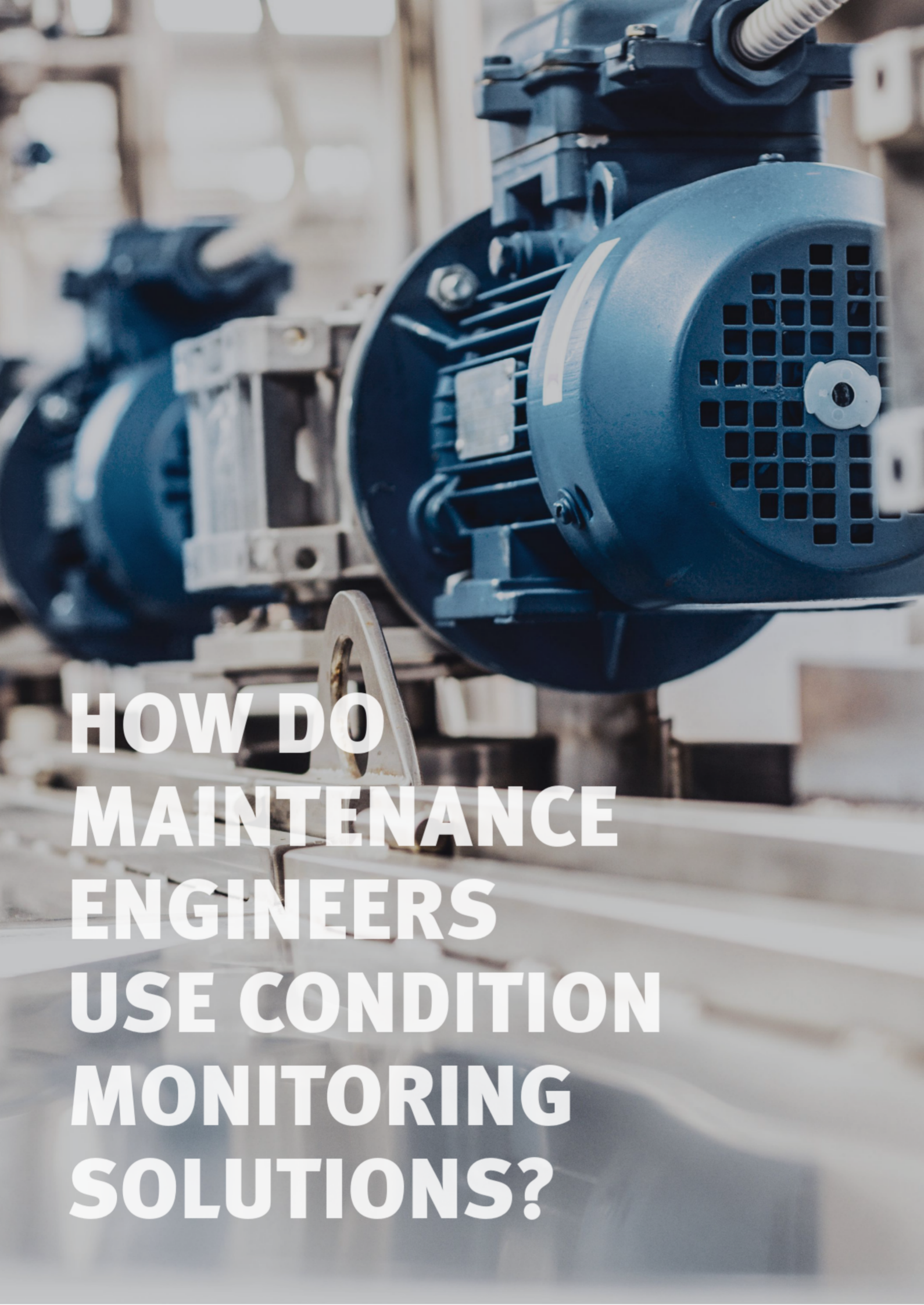


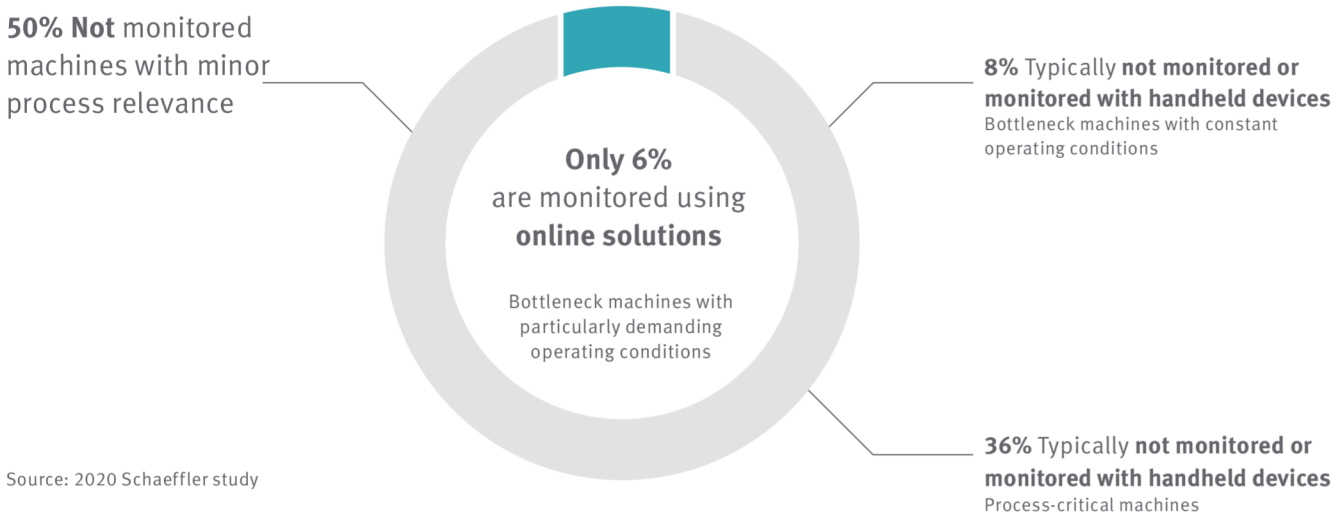
HOW DO MAINTENANCE ENGINEERS USE CONDITION MONITORING SOLUTIONS?

The current situation
How are machines currently monitored?

Example
Pulp and paper production

Hundreds or even thousands of electric motors, fans, pumps, and gearboxes play a key role in ensuring a smooth production process. For cost reasons, up to 94 percent of all balance of plant assets in a typical paper production facility are either not monitored at all or only intermittently monitored.

This is not an isolated example; many other industries face similar challenges.



Source: 2020 Schaeffler study

Vibration-based condition monitoring has the following advantages in machine monitoring: early detection of defects, minimized risk of unplanned downtime, and supporting the proactive maintenance of machinery or equipment.

KNOWLEDGE IN A NUTSHELL

Advantages and disadvantages of offline solutions

While manual diagnostics (offline) can be cost effective, they are often extremely time consuming and require a significant amount of preparation and run time – which often leaves little time for specialists to analyze the data and assess the necessary maintenance measures. In most cases, expert knowledge is required. A key disadvantage of these solutions is the low log frequency. Manual measurements are only performed weekly – or, in some cases, even monthly – which increases the risk of defects going undetected or being detected too late.

Advantages and disadvantages of online solutions

Online solutions can be expensive, particularly if they are used across the board (although this does not necessarily have to be the case: see chapters “The Practical Application” and “The Practical Application (part 2)”). Online condition monitoring can help to ensure that specialized personnel spend the maximum-possible amount of time on key tasks, since good online solutions are largely automated and ideally require no expert knowledge. Theoretically, an online measurement can be performed every minute, or even every second, thus reducing the probability of impending damage going undetected.

Bottleneck machines

Bottleneck machines are work systems in which experience has shown that there is a capacity shortage for a single capacity when there is a high level of activity.

Any deviation from the planned and specified production process leads to a capacity overload. Bottleneck machines therefore have a critical impact on both the production capacity and the production process. This can potentially incur high additional costs, for example, with respect to throughput times, delays, overtime for bottleneck elimination, or in relation to rescheduling.

WHAT TYPES OF APPLICATIONS DO MAINTENANCE ENGINEERS ENCOUNTER?

The current situation
Applications

If you opt for comprehensive monitoring of your machinery, you will encounter machines that operate in a wide variety of applications. This means they are subject to varying requirements for a suitable monitoring system. Process relevance, operating conditions, and ambient conditions constitute the key distinguishing features between these applications.

PROCESS RELEVANCE

High criticality
Continuous monitoring is strongly recommended for machines with high process relevance. Even simple online systems can help to provide continuous feedback on a machine's condition. Given the possibility of significant subsequent damage, consideration can also be given to systems that offer extensive functions. Route-based manual monitoring is not suitable, as this only provides selective insights into the condition of the machine.

Medium to low criticality

Simple and inexpensive solutions are particularly suitable for less critical machines.

In order to cost-effectively monitor the large quantities associated with this machine group, it is particularly important that the solution can be installed, commissioned, and used with considerable ease and speed.

OPERATING PARAMETERS/LOADS

Continuous speed and loads
This machine group often has a lower process relevance. Once again, due to the large number of machines, rapid installation, configuration and use of the solution is a key feature here. In these applications, the solution should perform most tasks automatically.

Alternating speed and loads
With this application, the condition monitoring system must make allowances for flexibility. Numerous interfaces are required for the purpose of exchanging speed or other relevant information with the machine's control system. The measurement tasks can take into account the different operating conditions and, as a result, provide more precise analytical results. Accordingly, the analytical tool should be easy to install, configure and use. Ideally, condition monitoring solutions of varying complexity should be visible in a single overview.

AMBIENT CONDITIONS

Choosing the right condition monitoring solution requires taking into consideration different ambient conditions. Temperature, IP protection class, and even explosion-proof areas can play a significant role here.

Machines used in cement production, for example, are exposed to extremely high loads. In addition to the significant vibrations that are generated when crushing and grinding the heavy stone, the furnace area's extreme temperatures also place high demands on the machines and associated technology.

Challenging ambient conditions in the form of dust, fibers and high humidity or moisture, for example, are a common feature in various areas of the pulp and paper industry.

Machines used in mining must also overcome difficult ambient conditions, such as dust, heat, cold, humidity as well as long supply channels.

For the varying and, in some cases, harsh ambient conditions involved in such applications, online condition monitoring solutions can be a viable option. Once again, the solution should perform most tasks automatically in these applications.

The options
Digression: classic maintenance strategies

Machine maintenance can be categorized according to different strategies. The criticality of the machine in the production process is just one of the determining factors involved in choosing the right maintenance strategy. The availability of information on the condition of the machine also plays a crucial role; more information facilitates a more proactive maintenance approach. The more that is known about the machine's condition, the more proactively maintenance can be planned. All the more astonishing is the fact that most machines today are still not subjected to condition monitoring (see page 5).

Maintenance strategies are predominantly being used on a reactive and failure-oriented basis. Condition-oriented or predictive maintenance is often not used – due to a lack of cost-effective machine monitoring technology.

KNOWLEDGE IN A NUTSHELL – Which strategy for which application?

Failure-based maintenance
knowingly allows potential failures and then responds with a suitable repair measure. This form of maintenance is suitable for machines or components that are not critical to production, are easy to replace, and do not cause expensive damage.

Condition-based maintenance
undertakes maintenance and repair work according to the actual condition of the machine. This form of maintenance is principally suitable for process-critical systems involving heavily interlinked processes. The costs associated with the monitoring systems already pay off the very first time consequential damage is prevented.

Preventive maintenance
includes the planning and implementation of maintenance measures before the onset of damage to the machine or equipment. Preventive maintenance is usually prescribed by the warranty provisions, as defined in the maintenance schedule. When the warranty expires, a suitable monitoring strategy can be considered. In many cases, the switch is made to condition-oriented or predictive maintenance.

Predictive maintenance
uses empirical values about the actual condition of the machine. In order to prevent them, problems are identified from existing data, statistics, or machine-based learning. Predictive maintenance is suitable for production-critical systems, which incorporate sensitive processes. It builds on the findings obtained from condition-oriented maintenance, but focuses on long-term and cost-conscious advance planning.

The benefits of online condition monitoring are clearly demonstrated in the following practical example

A Spanish paper manufacturer was experiencing approximately four unplanned downtimes per year in its wet end press. These downtimes were specifically attributable to bearing failures. The paper maker ultimately selected an online-based monitoring solution which determined that the gearbox had been absorbing the axial forces arising from the machine. This, in turn, had damaged the gearbox bearings.
Annual savings with preventive maintenance:

› 90,000 €

more

More information on maintenance strategies, methods, composition as well as other practical examples and much more can be found in the white paper *Practical Knowledge – Condition Monitoring & Services*.

› Link

WHAT DO MAINTENANCE ENGINEERS EXPECT FROM COMPREHENSIVE MAINTENANCE?

The expectations

What do maintenance professionals look for in a comprehensive condition monitoring system?
The results of an authoritative survey conducted by Schaeffler are summarized here:

1

No additional qualifications

Using vibration-based diagnostics should not require additional qualifications. Alarms should be predefined, with no manual adjustments required to measurement configurations. Data analysis and interpretation should be automated.

2

Easy installation

Monitoring technology should be easy and straightforward to commission. Wireless sensors should connect and evaluate data automatically.

3

Low costs

Acquisition costs for sen- sors, diagnostic electro- nics as well as running costs – such as those incurred by external data analyses – should not exceed the maintenance budget.

4

Increased safety

The solution should increase the safety of the maintenance team and reduce the risk of accidents. Wire- less sensors, for example. contribute to increased safety.

Specific examples – Expectations

Finnsementti

Cement manufacturer Finnsementti expects a condition monitoring (CM) solution to increase its employees' safety. Since ancillary devices are typically difficult to access, accidents are inevitable. Finnsementti had not installed CM solutions to monitor ancillary equipment in the past, as these were too expensive and, for the most part, did not work wirelessly.

Schaeffler

The maintenance manager of one of Schaeffler's plants in Germany expects a reliable, cost-effective, and comprehensive solution to monitor ancillary devices in its supply systems and hardening facility. Unplanned downtime in production machines caused by, for example, broken motors, pumps or fans are always associated with high costs.

Albeco

The plant maintenance management team of Polish company Albeco expects a CM solution to monitor the many machines that are involved in complex production processes. Accordingly, the solution should require minimal installation work. In addition, the CM solution should be intuitive and, ideally, require no expert knowledge.

WHAT HAS PREVENTED THE IMPLEMENTATION OF COMPREHENSIVE MACHINE MONITORING?

The obstacles

Even though the expectations of maintenance engineers have been clearly communicated (page 8), there are a number of reasons why many companies have never, or hardly ever, used vibration-based (let alone comprehensive online-based) condition monitoring. Apparently the market is not yet offering solutions that meet the expectations of maintenance engineers.*
The top three reasons cited as preventing the introduction of comprehensive machine monitoring are: additional knowledge requirements, high maintenance outlay, and steep costs.

1

Required additional knowledge
The use of vibration diagnosis usually requires specialist know-how. For example, the correct limit values must be determined for the alarms, specific adjustments must be made to the measurement configuration, and data must be analyzed and interpreted. During the vibration diagnosis, the measurement data may, for example, be viewed in their chronological context and examined for fluctuations. This is time consuming and requires specialized knowledge. Many providers are unable to supply this service to their customers at attractive terms.

2

High maintenance effort
Setup and commissioning of monitoring technology is a complex process. This prevents maintenance engineers from using vibration sensors to monitor machines on a large scale, as vibration analysis requires sophisticated planning. Cabling, installation, and initial configuration of the electronics are also complex. Alternatives, such as route-based monitoring of machines with a handheld device, are also associated with drawbacks – such as inadequate recording of the machine's condition, or accidents that occur when attempting to reach hard-to-access measuring points.

3

Steep costs
Acquisition costs for sensors, electronic diagnostic systems as well as running costs, such as those associated with the use of external data analyses, are another hurdle. For example, monitoring a measuring point with a conventional condition monitoring system can cost between 500 and 1,000 euros – that's just the acquisition cost! This means that 500 measuring points can cost between 250,000 and 500,000 euros. Such sums often exceed the company's maintenance budget, thereby making the ROI for comprehensive monitoring unattractive.

*The facts initially speak for themselves, but there are also arguments in favor of comprehensive vibration-based condition monitoring. These are examined, using new technologies, in greater detail in the chapters "Breakthrough" and "The success factors."

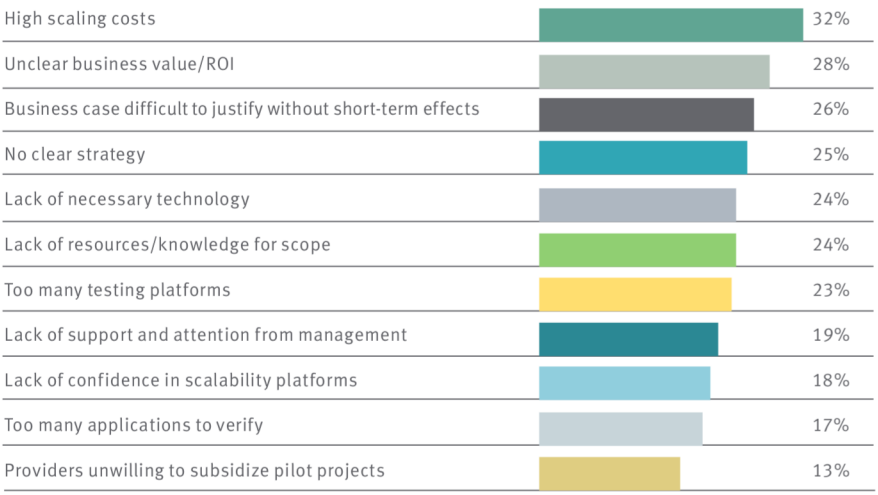
Research studies

Can IIoT-based components and solutions help?

Current research studies confirm that the CM solutions that have been available up to now do not meet these requirements. There is indeed a willingness to adopt new types of solutions and approaches across all industry sectors, and money is also being invested in these options. But this only applies in the early stages, after which projects usually come to a standstill. The reasons for this are evident from Microsoft research results and a Cisco study, which show that IIoT projects fail as early as during the concept phase.

Reasons why IIoT projects fail

Microsoft research results



Source: www.dynamiccio.com

Failure to launch
According to studies by Microsoft, IoT users believe that around a third of their IoT projects fail during the "proof of concept" (POC) phase due to expensive implementation or unclear benefits. Complexity, technical challenges, lack of resources, and insufficient know-how are also cited as disruptive factors.

Cisco study

According to this study, almost 70% of IoT – and implicitly IIoT – initiatives fail during the "proof of concept" phase. The five main reasons cited by Cisco experts for such a high failure rate in the early stages of a project are shown at right:

- Lack of clarity regarding business implications
- No scaling roadmap submitted
- Lack of know-how for implementation
- Lack of cooperation between teams
- Changing priorities and lack of management commitment

Long-term planning with clearly defined goals is the key to success. This enables companies to win business in a rapidly growing and evolving market. Primary success factors in such an undertaking include: enthusiasm, teamwork and a clear understanding of what is to be achieved.

The breakthrough

New technologies and options – explained in brief

Notwithstanding the aforementioned obstacles, new technologies can be used to create IoT solutions for the various industries that enable cost-effective, wireless, and comprehensive vibration-based condition monitoring on an automated basis. The key is to use a combination of the right technologies – note the use of the plural form here. For example, a combination of technologies comprising micro-electromechanical systems (MEMS), low-energy wireless networks as well as mesh and cloud computing may provide an appropriate solution. Before this is explained in greater detail using a practical example, the special features of these technologies are explained below.

Microelectromechanical Systems (MEMS)
MEMS are tiny components that combine logic elements and micromechanical structures in a single chip. A typical application of MEMS is the measurement of acceleration. As a result of current advances in the field of MEMS sensor technology, condition monitoring systems can now be configured with an effectively usable frequency band width of up to 10 kHz and a signal quality comparable to piezo sensors. The advantages: MEMS sensors are currently inexpensive and require little power, which enables them to be battery powered. They are very small and can be easily integrated using A/D converters located, in part, directly on the chip. Vibration sensors based on MEMS technology are suitable for integration into cloud-based data networks.

Low-energy wireless networks
Just like MEMS technology, today's low-energy wireless networks consume little power, which makes battery operation possible.
As a result, they are also suitable for more complex applications such as vibration technology. An example of this form of wireless technology is Bluetooth Low Energy. Due to the high data rates and low power consumption, this technology also works in device networks such as Mesh. This enables the configuration of control, monitoring and automation systems that have hundreds of devices communicating with each other.
Near-field communication (NFC) is another form of wireless technology that consumes little power.
NFC enables the exchange of data between two devices over a short distance – measured in centimeters – which means that unintentional connections can be virtually ruled out.

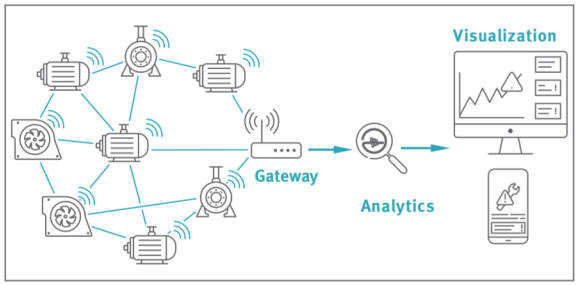
There is no single technology for comprehensive condition monitoring. It often comes down to a healthy mix of several technologies and options.

Mesh technology

In contrast to conventional network topologies, which are based on the hierarchical connection between a small subset of nodes, mesh technology constitutes a network of nodes in which messages are sent via the network to the recipient. The term “mesh” refers to a multiple connection between devices or nodes: The nodes/devices connect directly to as many other nodes as possible and cooperate with each other in order to forward data efficiently. This means that the device is always connected to the network node that offers the strongest signal. This Bluetooth-based technology solves the remaining challenges inherent in a Bluetooth network.

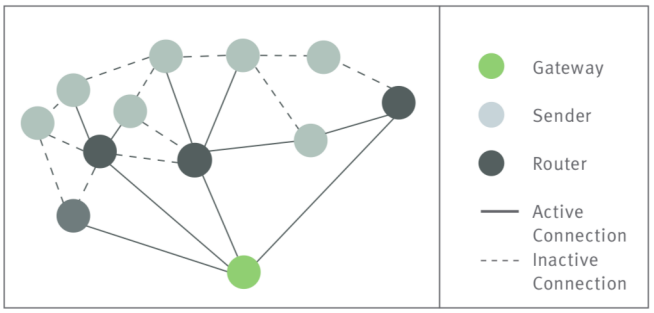
The main advantages of mesh technology are:

- automatic network configuration
- self-restoration of the network
- automatic network adjustment to optimize energy consumption
- flexible network design that adapts to potential structural obstacles

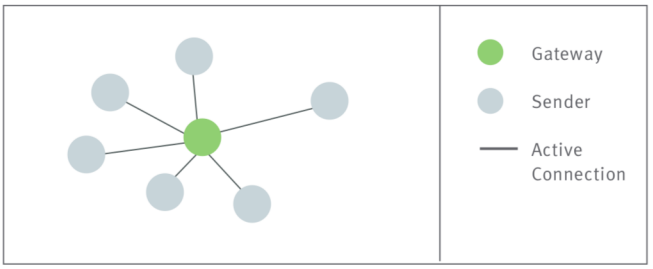


Mesh communication model

A comprehensive solution must be able to set up a stable network quickly and automatically, while providing a high degree of flexibility due to the varying structural conditions involved. System maintenance and connection problems must be solved automatically by the network itself. Mesh technology enables all of these features, as each sensor becomes both an intelligent transmitter and receiver. Mesh is superior to a point-to-point network in all of these aspects. Setup is quick and secure, while the user does not need any specialized knowledge. Maintenance expenditures are therefore eliminated.



Mesh network



Star network (point-to-point connection)

Cloud Computing

Cloud computing refers to the provision of an infrastructure (e. g., computing power and memory space), platforms, and software on the internet. This infrastructure can then be easily used there via defined technical interfaces.
For example, large data quantities, software and information can be made available to different users without the need for local installation or storage. With this technology, the global storage capacity is leased from a cloud provider and can be customized to the user’s specific requirements.
Cloud computing thus enables the flexible storage of data.

The simple transfer of data and other elements facilitates many applications. As a result, the user is able, for example, to easily access information on the status of a machine or the progression of specific values via a mobile application on a smartphone or on a web-based dashboard. The only limitation: An internet connection is required.

Computing power as well as storage capacity can be customized to the user’s requirements. The large quantity of standardized and available data combined with the high computing power provides the basis for new, scalable analytical approaches, which allow new insights into the machine’s condition.

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The practical application

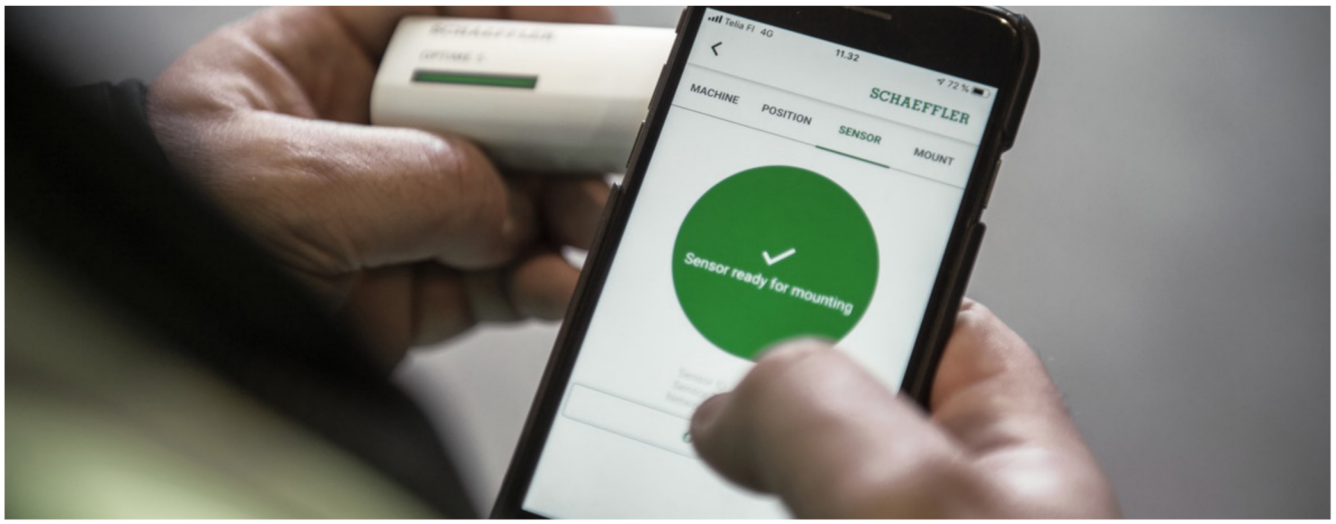
Example featuring OPTIME

In a pulp and paper mill, hundreds of sensors were quickly installed on numerous balance of plant assets such as motors, pumps or fans. After several months of normal operation, the sensors detected a defect affecting one of the pumps at startup.
Within two days, the machine status had changed from warning level 1 “Normal” to warning level 3 “Warning”. The customer’s maintenance team confirmed the failure and immediately replaced the pump.

Warning levels: *(1) Normal **(2) Suspect (3) Warning (4) Severe

Applying the different technologies described above, the result in practice looks like the one on the following pages:

The maintenance team was able to view the easily understood machine status on the mobile app and web-based dashboard.
Availability was ensured at all times and in all locations, on any terminal device with an internet connection – such as on a mobile phone, next to the machine in the workshop, or even on a screen in the control room. Ultimately, immediate action was possible as a result of the alarm: Had the milling cutters failed as a result of the pump damage, parts of the production line might have had to be shut down. This, in turn, would have generated considerable material waste.



What makes comprehensive condition monitoring a success – detailed view

First and foremost, it is important to highlight the cost efficiency and simplicity of the OPTIME condition monitoring solution used in this example. The low acquisition costs, combined with simple installation and commissioning, made it possible to monitor a huge percentage of the machines in the paper mill. The sensors are activated by smartphone and app with the aid of an NFC interface. Following NFC activation and the assignment of the sensor to a machine in the OPTIME app, the rest of the system setup runs automatically. Each sensor is installed in mere minutes.
Once activated, the sensors connect automatically to the other sensors and form a mesh network with the nearest gateway. Network configuration and maintenance is completely automatic. Each MEMS sensor starts acquiring data and generating various characteristic values – no manual configuration required. The network even restores itself in the event of connection problems during operation.

Furthermore, a time signal is recorded every 24 hours for further analysis. Measurement data is then sent from the gateway to the cloud via MQTT*, where the data is automatically analyzed. The algorithms used for the analysis are based on Schaeffler's decades of rolling bearing knowledge, condition monitoring know-how and machine-based learning. First, the model learns the limit values autonomously. Then the user receives the characteristic trend and the corresponding alarms. A comprehensive overview of the machine's status is also generated, which is presented in the form of an easily understood call to action utilizing the alarm levels "Normal," "Suspect," "Warning" and "Severe." If damage is detected, the root cause analysis is facilitated by displaying the most likely causes.
Using this information, problems can be identified – easily and without any prior expertise – and appropriate corrective action can be taken.

As a reminder ...

In the right combination, new technologies and models such as mesh technology, NFC, cloud computing, machine-based learning and MEMS can make comprehensive and economical condition monitoring possible. Not only do these technologies help to significantly reduce the cost of the condition monitoring system, they also take on many condition monitoring tasks themselves – which ultimately simplifies the use of the solutions considerably. For this reason, implementing condition monitoring no longer means also having to invest in training or recruiting experts. Instead, maintenance teams are given a tool that will make their job easier and relieve them of a complicated task.

*MQTT (Message Queuing Telemetry Transport) is a message protocol for limited (low-bandwidth) networks and IoT devices with extremely high latency. In IoT and IIoT, MQTT is used through to the connection of cloud environments.

Success factors

Items for you to consider

To ensure the successful implementation of a comprehensive monitoring solution, it is necessary to determine how a potential provider analyzes the results, how the data transmission takes place, what (hidden) costs you will be faced with as well as the expertise your new provider possesses.

Analytical results

1 Comprehensive solutions should help maintenance teams automatically obtain unambiguous results and action plans regarding the condition of their many machines. Moreover, this should be easily accomplished without any prior condition monitoring knowledge.

2 Comprehensive solutions should provide more than just a key value. If machine monitoring is reduced to merely a characteristic value (RMS), this raises the risk of a) damage remaining completely undetected, or b) an alarm (key value has been exceeded) only being triggered in the event of serious damage.

3 Condition monitoring solutions which require the user to determine the limit value also require the requisite technical know-how. A lack of experience may result in the limit values being set incorrectly, which, in turn, could cause the alarms to be triggered prematurely or too late. Even if you do have the relevant expertise, consider whether you want to determine the limit values for several hundred measurement points yourself – this can take months while requiring a high level of commitment from your maintenance managers.

4 Ideally, your solution will provide high-level information on the machine's condition and determine the cause in the event of damage. This will enable you to take the right action immediately.

In addition to automatically analyzing large quantities of data, a comprehensive condition monitoring solution must also take over large elements of the interpretation process automatically. This includes the automatic selection of limit values, the automatic specification of the type of damage, and high-level classification of the machine's condition. Of course, this is only possible when one has access to a broad parameter base, machine-based learning, and strong analytical logic for interpretation, thus allowing the focus to remain on machines that are extremely critical.

Data transmission

1 A pure point-to-point solution that establishes a connection between the sensor and gateway, should be viewed in a more critical light (e. g., Wi-Fi). As a general rule, this is less suitable for comprehensive monitoring, which often requires a large number of gateways. Moreover, a point-to-point solution does not allow connection problems to be rectified independently during operation. Each connection problem must be solved manually by the user, which generates expenses that are not proportional to the solution.

2 Before making a purchase decision, you should ensure that the initial setup is straightforward. For each measuring point, installation should take only a few minutes. With hundreds of measuring points, every minute counts. For example, the network should configure itself automatically. Wireless sensors are also easy to install and substantially reduce the amount of work involved.

3 An interface* can simplify the integration of a condition monitoring system into existing maintenance systems. It enables data from your condition monitoring solution to be easily transferred to your systems.

There are also major differences associated with the transfer of data to the cloud. For example, a built-in SIM card can be used to establish a secure connection via the mobile network. Complex integration of the solution into the IT system is no longer required and safety risks can be minimized.

*API (Application Programming Interface) is an example of an interface: In simple terms, API works like a virtual "middleman," forwarding information from one interface – such as a mobile app – to another.
By definition, API is a set of commands, functions, protocols, and objects used to create software or interact with an external system.

Effort and costs

1 To make comprehensive condition monitoring economical, the outlay involved in incorporating sensors and maintaining the network should be minimal. Incorporating the sensors and configuring the network should be almost fully automated, requiring minimal manual intervention. Future condition monitoring system expansion efforts should also be straightforward.

2 Not only do pure point-to-point networks incur high financial expenditures, due to the many gateways required, their setup and maintenance requirements are also several times higher than highly automated solutions.

The more automatic functions that are built into the solution, the more cost-effective and reliable it becomes.

Service providers

1 Experience with comprehensive solutions in the process industry is key to a successful condition monitoring program. For this reason, you should ask incisive questions:

- Can the provider provide practical examples that offer added value to your plant or company?
- What expertise can the provider draw upon?

In a best-case scenario, the provider not only has condition monitoring experience, but also broad application knowledge in bearing design across a variety of industries.

2 How long has the provider been operating in the market? Can you expect your provider to still be around to support you five years from now? Looking into the company's background and size can help give you an idea of the provider's long-term prospects.

3 The success of your comprehensive condition monitoring solution is largely determined by how well the solution is tailored to your needs. Therefore, when choosing your provider, pay attention not only to the available hardware and software, but also to service and support offerings as well as proven experience.

Providers of comprehensive solutions should have expertise in vibration analysis, be able to respond quickly to the market, and always tailor the solution to your requirements.
If the solution is not scalable, then exercise caution. Pay particular attention to the services offered.

One advantage of working with a provider of comprehensive condition monitoring solutions is definitely the software that also allows for in-depth analysis. This enables the selective examination of measuring points for critical machines. Acquiring such software can make sense if sufficient expert knowledge is available at one's own plant.

The practical application (part 2)

Why are companies increasingly opting for comprehensive condition monitoring?

The real-life example on page 16 has shown that condition monitoring with new forms of technology can be eminently worthwhile, opening up new condition monitoring opportunities for maintenance engineers – especially in the process industry. The following examples show how maintenance engineers and service providers alike benefit from comprehensive solutions.

Avoiding unplanned downtime

To avoid unplanned downtime caused by motor failures and wear in mil ling machines at a Romanian plant, over 100 sensors were installed on the facility's 38 milling and grinding machines.

› € 49,000

Annual savings after allowing for acquisition costs

more

Fewer machine failures, less scrap

High temperature and constant operational readiness are the key contributors to excessive motor wear at Schaeffler's Brașov plant. To avoid unplanned downtime, more than 200 sensors were installed on the heat treatment machines and other assets.

€ 46,000

Annual savings after allowing for acquisition costs

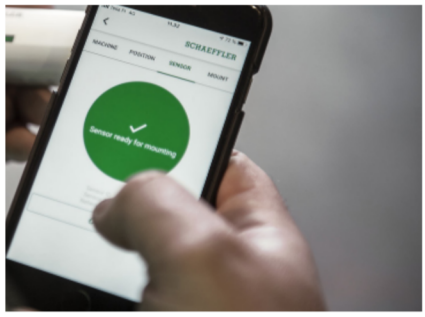
more

A directive to drastically reduce approximately 90 machine failures per year

When machine failures occur, production is at a standstill for up to two hours: precisely the reason why a Finnish cement manufacturer opted for a comprehensive solution. Unable to find a cost-effective, wireless condition monitoring system, a comprehensive solution was not implemented until 2020.
But the cement manufacturer finally did find a solution.

› 150 sensors have been installed throughout the cement mill

more



Cost savings in a hardening facility

Scrap as much as	€ 6,800
Repairs as much as	€ 3,900
Downtime as much as	€ 4,300
Production losses as much as	€ 50,000
Total cost savings	**€ 65,000**

more

Sample calculation
A customer has a total of six hardening facilities. Assuming a failure rate of 30%, this gives a potential annual savings of

€ 117,000

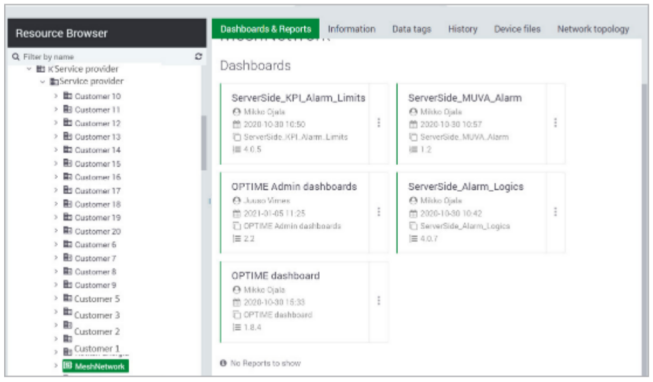
One-time acquisition costs and annual costs for the digital service are to be deducted from this figure.

Opportunities for service providers

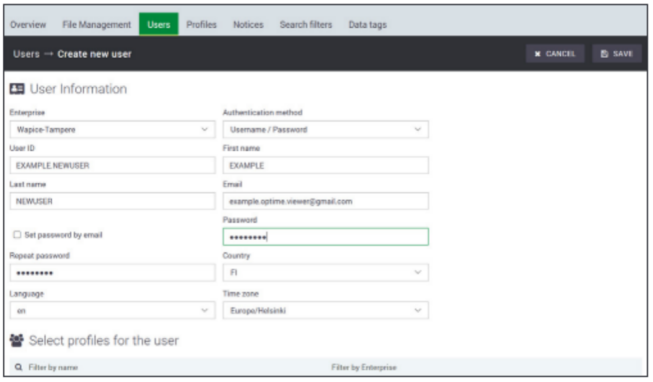
New technologies are not only of interest with respect to internal maintenance. New technologies also open up a wide range of options and opportunities for service providers.
An example: A comprehensive monitoring solution based on vibration analysis and the use of mesh technology and cloud computing opens up completely new avenues for the maintenance management team of a Polish company. Lucrative offers can be passed on to customers.
Daily service operations can run much easier and faster.

70% fewer customer visits, substantial savings

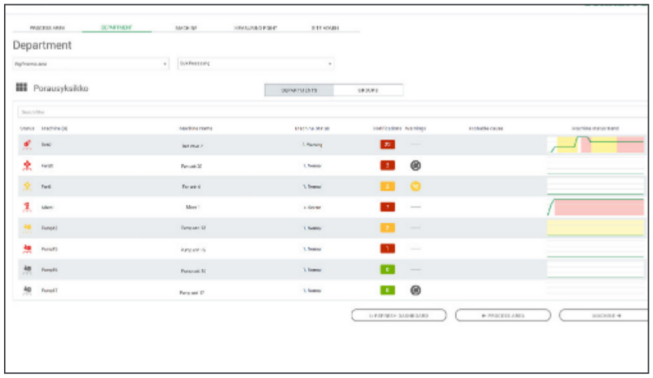
Insights into the solution



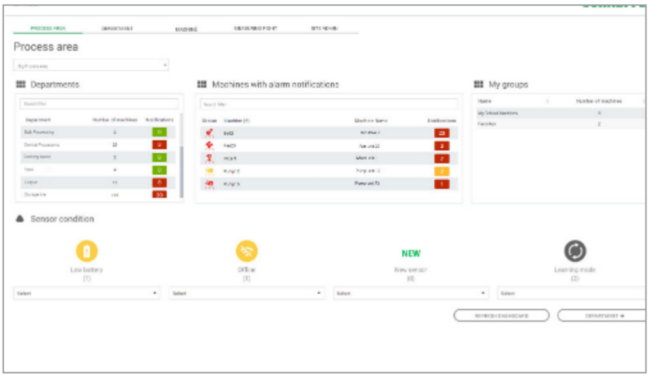
Simple customer registration and management



Easy-to-use roles and rights system



Detailed process views permit, for example, the simple generation of work lists for a customer visit.



Thanks to customer-specific views of alarms, notifications and activities, necessary measures can be taken quickly.

Read the whole story

more

Takeaways

A modern condition monitoring solution should meet the following requirements

Easy
Comprehensive condition monitoring should include preset limit values and machine-based learning. Integration into the IT system and the configuration of WiFi networks should not take place manually.

Automatic
When implementing a comprehensive condition monitoring solution, system maintenance and connection problems must be handled automatically by the network.

Scalable
Comprehensive condition monitoring solutions should be scalable and use a combination of different technologies. This ensures that the solution adapts to you and remains YOUR solution.

Self-explanatory
Comprehensive condition monitoring should not require expert know-how on the part of the customer.
The analysis and recommendations for action should be intuitive.

Wireless
Wireless sensors are highly recommended to ensure a successful comprehensive condition monitoring solution. This provides greater security.

Cost-effective
A comprehensive condition monitoring solution should be cost-effective. After all, you will need hundreds of sensors for your network.

Versatile
Comprehensive condition monitoring systems using cutting-edge technologies are perfect for both new and existing (retrofit solutions) equipment.

Comprehensive – yes or no?
When using comprehensive condition monitoring or other types of solutions, remember that it is not the machine's value that requires the greatest consideration. Instead, consider its criticality and accessibility within the manufacturing operation.

More useful information

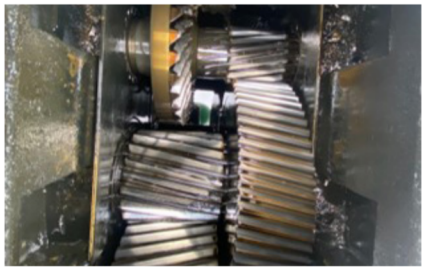
Comprehensive condition monitoring has enormous potential to prevent downtime and transform maintenance activities across many industries.







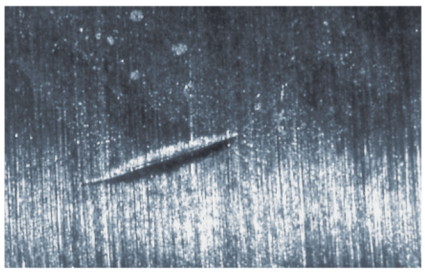

Cutting-edge technology enables these types of defects to be detected at an early stage:



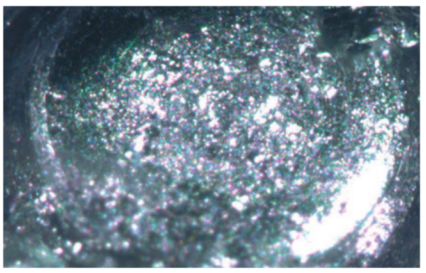
Gearbox damage

Gearbox wear

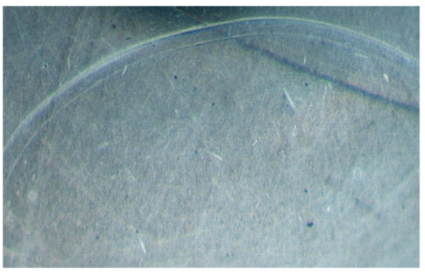
Bearing damage



Impact marks in an area not subject to overrolling



Abrasive wear on a needle bearing cage pocket



Edge running marks on a ball bearing raceway

More information to expand your knowledge on this topic

Manual
Expertise in Condition Monitoring

Further information about the book is provided in the interview
View the interview

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~83,000
employees (2021)

~200
locations

50
countries

›1,800
patent applications (2021)

~13.9
billion euros in sales (2021)

Schaeffler – We pioneer motion

As a leading global supplier to the automotive and industrial sectors, the Schaeffler Group has been driving forward groundbreaking inventions and developments in the fields of motion and mobility for over 75 years.
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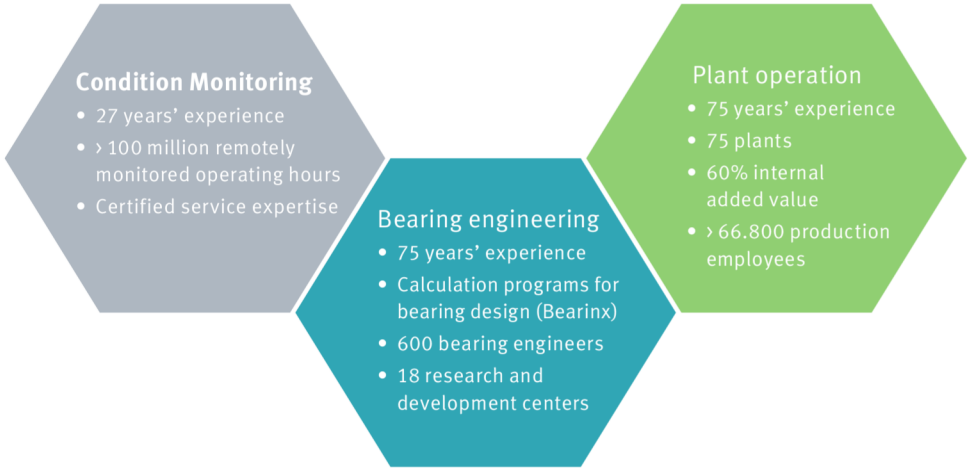
The technology company produces precision components and systems for drive train chassis applications as well as rolling and plain bearing solutions for a large number of industrial applications. The Schaeffler Group generated sales of approximately EUR 13.9 billion in 2021. With around 83,000 employees, the Schaeffler Group is one of the world's largest family companies. According to the German Patent and Trademark Office (DPMA), Schaeffler was ranked as the second-most innovative company in Germany in 2021, submitting more than 1,800 patent applications.



27 years expertise in Condition Monitoring

Schaeffler is not just a manufacturer and supplier of rolling bearings and linear products. Schaeffler also has many years' experience in vibration and measurement technology and is a holistic provider of condition monitoring solutions.

What can we do for you?

Contact us

Frank Mignano

SGservices-na@schaeffler.com

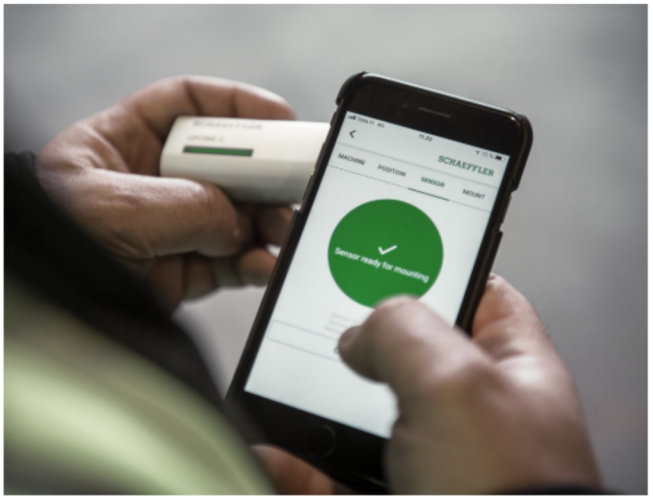
(803) 548-8955

On a personal note ...

As a holistic provider with decades of experience in bearing design, Schaeffler is not only familiar with the machine requirements spanning a wide variety of sectors, we also know how to precisely monitor them.
Our vibration experts use offline or online solutions, remote services, digital services, cloud computing, inspections, and even troubleshooting to achieve the desired result.
And, of course, Schaeffler always has the right lubrication solutions and tools to hand.
In short, Schaeffler offers a wide range of products and services for a variety of industry sectors and companies – both big and small. Of course, we also utilize all of our solutions on the machines in our 75 plants.

Link

We look forward to hearing from you.
Your first point of contact is Frank Mignano.



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Want to develop your own know-how and become a vibration expert? Have a look at our training offerings.
Training program I (DIN ISO 18436-2)
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Schaeffler Technologies AG & Co. KG
Georg-Schäfer-Straße 30
97421 Schweinfurt
Germany
medias.schaeffler.de/en
industrial-services@schaeffler.com

Telefon +49 2407 914966

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