rexroth
A Bosch Company

Predictive Analytics & Maintenance Optimization

Definition, context and effects

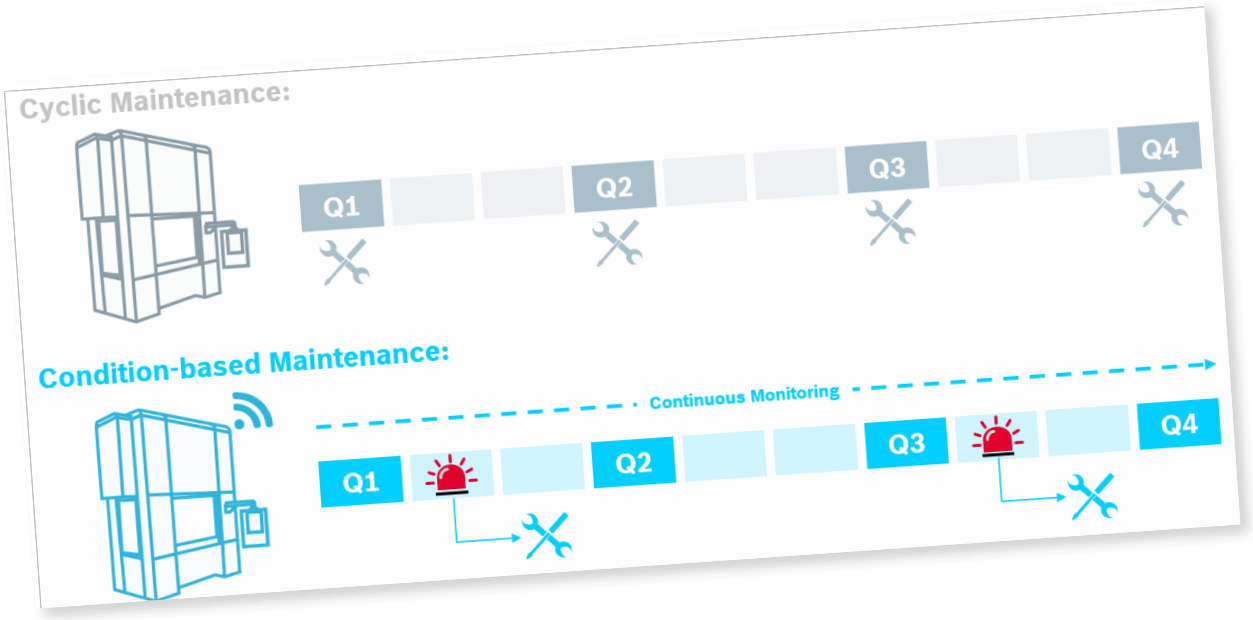
Low product quality due to failed components, impairment of production due to long downtimes - in times of artificial intelligence and machine learning this is a thing of the past. How maintenance can be optimized and how this manifests itself in everyday production, you will learn in the fourth and last whitepaper on the subject of "Predictive Maintenance".

01 The competence of ODiN consists of machine learning and expert know-how

WHAT DOES MAINTENANCE OPTIMIZATION MEAN AND WHY IS IT RELEVANT?

Maintenance optimization involves improving the maintenance work on a plant in three ways. The previously time- and cost-intensive maintenance processes are shortened, thereby saving money and resources. This is possible by early planning of maintenance activities. In particular, the duration of a machine downtime can be shortened, resulting in less disruption to production.

An improvement can also mean – depending on the system – an optimization of the redundant operation, whereby the failure of a machine can be completely avoided by connecting the redundant component at an early point in time. This results in cost savings due to reduced downtime on the one hand, and on the other hand by performing a factory overhaul instead of purchasing a new component. But also the time saving is an essential advantage, which is guaranteed by a faster availability of the reconditioned component, because the customer does not have to expect long delivery times. The third aspect that can be modified in the area of maintenance is a change in cyclical maintenance, which is replaced by condition-based actions. This enables the machine operator to carry out more effective and thus more cost-effective maintenance.



▲ **02 Cyclic maintenance versus condition-based maintenance by means of Predictive Analytics**

THIS WILL BE ILLUSTRATED WITH AN EXAMPLE:

Thomas is Maintenance Manager at the ABC Metallurgy Group and, together with his team, he is responsible for smooth production at the Munich plant. The five-member maintenance team already has many years of professional experience in the hydraulics, mechanics and electronics of existing machines.

Thomas is currently satisfied with his employees: after years of experience, the frequent downtimes are rectified as quickly as possible by identifying any faults that occur, ordering spare parts and installing them. However, the production manager is breathing down his neck, complaining about the declining quality of products due to damaged components, as well as the unplanned and long downtimes of the plants during maintenance work. Only the cyclical, quarterly maintenance rounds can be planned in advance by the product manager, but the unplanned downtimes between these activities are becoming more frequent and longer because Thomas´ team is temporarily understaffed and the team will not be expanded with new specialists.

If a shutdown occurs, Thomas´ team is informed, whereupon the available employees organize themselves and examine the plant. As soon as the fault is detected, which in the worst case can take several hours, the corresponding spare part is ordered from the supplier. This is delivered within a few weeks, depending on availability. During this time, production cannot be continued on the relevant machine, which results in considerable losses.
But Thomas has organized his team in the best possible way and he cannot change anything about the delivery time of the spare parts, so how can he still optimize maintenance?

WHICH REQUIREMENTS DOES THE MAINTENANCE OPTIMIZATION NEED?

Maintenance can be optimized by taking short-term measures appropriate to the condition of the machine. This requires a system that enables predictive analytics, for example with the aid of machine learning algorithms. Such solutions, like ODiN from Bosch Rexroth, help the machine operator to plan maintenance activities at an early stage. However, this is only possible by connecting machines or systems to collect and evaluate data. A forward-looking analysis is therefore only possible with the help of machine data.

HOW DO YOU GET THE DATA FOR A SIGNIFICANT FORECAST?

For this purpose, the machines to be monitored must first be equipped with suitable sensor technology so that they can collect the relevant data from the machine for analysis. The data is then temporarily stored and pre-processed in an IoT Gateway until it is finally transferred to the cloud. There, the analysis of the collected machine data takes place. This data analysis is used to process the complex interrelationships, which are difficult for humans to understand, and to convert them into information that is relevant for the decision-maker. Ultimately, once the system has detected a deviation, the human expert is responsible for diagnosing the machine status and recommending appropriate actions.

If a service provider like Bosch Rexroth is involved in this process, the experts make a recommendation for their customer, who decides independently on the implementation. Depending on the type of contract, implementation is carried out by the service provider or the customer himself.

All this data and the experience gained during the analysis process help to continuously improve the analysis tool. The more data is made available to the system for "learning", the more "intelligent" it becomes and the faster and more precise decisions can be made in the future.

▲ **03 The prerequisites for maintenance optimization**

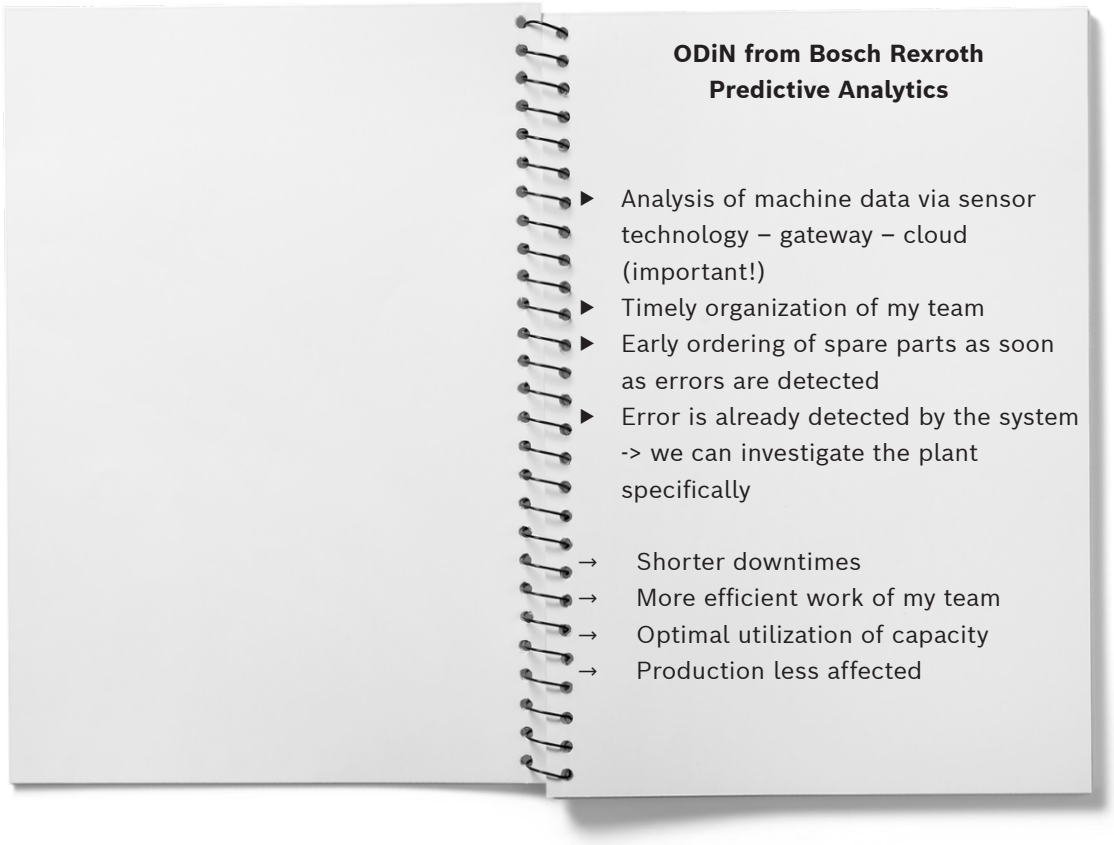
HOW DOES MAINTENANCE OPTIMIZATION SHOW UP IN EVERYDAY PRODUCTION?

If the machine data has been collected, analyzed by the system and assessed by an expert, then, in the case of a service contract (such as ODiN), the contact person generates a maintenance recommendation for his customer. The customer can then decide on the implementation. Other maintenance contracts, such as a spare parts management contract, which includes the stock of spare parts at the service provider or the delivery of a component within a maximum of 24 hours, offer the company additional advantages for fully utilizing maintenance optimization through predictive analytics. This enables the machine operator to perform condition-based maintenance, reduce machine downtime and minimize disruption to production.

HOW DOES THOMAS PUT MAINTENANCE OPTIMIZATION INTO PRACTICE?

The production manager has pointed Thomas a digital solution, a predictive analytics service that will help him and his team with maintenance. But Thomas is skeptical about the extent to which this can have a positive effect on his work.

From a sales conversation with a Bosch Rexroth employee, he learns that they offer a predictive analytics solution for Bosch Rexroth hydraulic products. Interested, Thomas writes down the advantages of the system.



This solution will drastically change the daily work routine of Thomas and his team.
After suitable sensor technology was used and tested on the systems by Bosch Rexroth, Thomas received a warning message just two months later that the hydraulic pump was damaged and would probably fail completely in two weeks. He immediately ordered the spare part from Bosch Rexroth and organized two of his service technicians to carry out maintenance on Saturday in eight days.
The pump is replaced within one hour, which means that production is only slightly affected at the weekend.
This enables the ABC Metallurgy Group to carry out maintenance work efficiently and in an optimized manner, to save costs and time during shutdowns, to reduce the amount of scrap in production and ultimately to improve its competitiveness on the market.

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