



Smart Maintenance for heavyweights with PREMAS® 4.0 Predictive Maintenance Solution

Predictive maintenance instead of standstill: Together with Siemens, the start-up PREMAS, which is based in Switzerland, Baar ZG, has developed a smart solution that monitors the belt bucket elevator of a cement plant and thus optimally controls maintenance.



The belt of a belt bucket elevator, which transports ground raw material for clinker production, is exposed to enormous loads. With PREMAS® 4.0, the bucket elevator can be monitored and the best time for a maintenance can be forecasted.

It is the world's most widely used material and even the Romans in the 3rd century BC knew it as "Opus caementicium": cement. The mixture of limestone and marl is the basis for concrete production and is used in construction activities around the globe. According to estimates, 4.1 billion tons of cement were produced worldwide in 2020.

No wonder, cement plants all over the world run around the clock to meet the huge demand. If a machine fails due to damage or malfunction, an entire plant stands still for hours or even days. Clinker production is interrupted and with every hour in which no cement is delivered, the financial damage increases – time is also money here.

Downtime does not have to be

It must be possible to prevent such downtimes with modern technologies, said the small start-up company PREMAS Preventive Maintenance Service AG. Managing Director Michael Bruckhaus comments: "Our goal is to predict when heavily stressed parts of a plant have reached their lifetime or show signs of fatigue. In this way, unwanted downtimes can be prevented, and maintenance can be optimally planned – not too late, not unnecessarily early, but just when it is necessary."

With the vision of a standardized and easy-to-install system that can be put into operation without much specialist knowledge, the young company developed PREMAS® 4.0 for its first customer, the AUMUND Group. AUMUND manufactures various conveyor machines and systems and sells them to cement plants all over the world. The compact PREMAS® 4.0

enables "predictive maintenance" especially for machines that are in operation 24/7 or where inspections are difficult or impossible to carry out. These include, among other things, so-called belt bucket elevators, which AUMUND develops and sells. These are vertical material conveyors that transport, for example, the ground limestone for clinker production in the cement plant. These machines, which are up to 170 m high, are equipped with a belt made of steel cables and rubber to which the cups – containers in the shape of a shovel – are screwed on. Some plants transport 10,000 tons of material at about 80 degrees Celsius every day, and the load on the plant components is enormous. A critical point for damage is the connecting piece of the belt, a screwed clamping connection. Bruckhaus describes what happens when a belt tears: "Within seconds, a gigantic bucket salad of up to 680 buckets and 340 m of belt is created in the bucket elevator chimney – it is probably useless to mention that this cannot be dealt with within a few hours."

Optimal maintenance thanks to the Internet of Things

The system developed by PREMAS uses sensors inside the machines to collect all the necessary data to determine the operating status and maintenance requirements of the system. For this purpose, PREMAS® 4.0 uses the information from the machine's own sensors. For example, it measures the motor current, detects whether a belt is going wrong, and determines the stress factor of a belt based on the number of starts of the machine. PREMAS has also equipped its system with additional sensors and developed an algorithm that can predict its service life with temperature and length measurements of the belt. Because the rubber becomes brittle over time and the belt must be replaced every five to ten years, depending on the load. "We are constantly developing the solution," says Carlos Pinzon, Product Manager Digital Solutions at PREMAS, "by critically testing existing and new sensor technologies and optimizing the system."



The PREMAS® 4.0 Predictive Maintenance Solution developed based on Siemens MindSphere is a compact and user-friendly solution for cement plants and other industrial plants.

Tight data handling thanks to Siemens

The heart of PREMAS® 4.0 is a Simatic IoT2050 gateway. It collects the data and makes a bundling. This edge computing application, i.e. initial data processing directly on site, is important. This is because the cement plants are located on all continents and sometimes also in remote areas, where the grid connection is not always good or the transmission of large amounts of data becomes costly.

After the machine data has been sensibly bundled by the robust and compact gateway, it is transferred to the MindSphere cloud platform, where it is collected and analyzed. This means that the plant operator always has all the necessary information about his systems and machines available in the clear dashboard application EasyDash. He can plan a necessary belt inspection in advance and sees – displayed in a user-friendly manner – whether everything is in the green area during operation. If the system identifies a fault or a critical machine condition, the responsible internal or external service employee is immediately notified.

Technology in brief

The combination of the compact Simatic IOT2050 Gateway and the industrial IoT-as-a-Service solution MindSphere allows a high degree of flexibility and optimal data processing. For each application in the cement plant, it is possible to individually determine which data is recorded, processed, or harmonized locally and which is then processed in the cloud.

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"The cloud solution offers numerous advantages," Bruckhaus is convinced. In addition to the operator, who always keeps an eye on the condition of his system, the machine manufacturer, in this case AUMUND, also benefits. "Thanks to PREMAS® 4.0, data from machines from all over the world come together. In this way, AUMUND can provide its customers with optimal and proactive support and incorporate the knowledge gained from the data into the

development," says Bruckhaus, describing the win-win situation. Last but not least, the MindSphere IoT platform is always up to date, as the updates are carried out automatically. "Another advantage of our system is that we do not process any confidential data and do not have to access the company's internal control system," adds Pinzon.

This year, at least 150 PREMAS® 4.0 systems around the world will go into service; the prospects for the future are promising: Thanks to the modular system, in principle any system can be equipped with the innovative solution – especially critical machines that have not yet been monitored are predestined for the use of PREMAS® 4.0. No wonder, the developers are making ambitious plans: "With the growing amount of data, we will definitely push advanced machine learning for data analysis in order to be able to offer our customers even greater added value."

A partnership that brings joy

PREMAS and Siemens are a good match, says Bruckhaus: "At the beginning, we were concerned with the question of how much of PREMAS® 4.0 we develop ourselves from the ground up," he recalls. The effort required to apply for separate licenses and approvals for all countries ultimately prevented PREMAS from relying entirely on in-house developments: "So we scoured the market for a suitable provider who offers us a kind of modular system with modern, IoT, cloud solution and supplementary modules." PREMAS tested several systems in the field, and finally the Siemens product range convinced with its consistency, the predefined cloud connection, and the compact gateway solution. The excellent customer service and engineering support also spoke in favor of Siemens.

"At first, we weren't sure whether a giant like Siemens would be a good fit for our small, agile start-up," smiles Bruckhaus. "But the supposed elephant immediately turned out to be a nimble rabbit – we could never complain about a lack of flexibility on the part of Siemens!" The responsible customer advisor Reto Amstad from Siemens Digital Enterprise Services can only return this praise: "Predictive maintenance in industry is on everyone's lips, but not many companies drive it forward with such innovative strength and determination as PREMAS – accompanying such projects is really fun."

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Customers

PREMAS Preventive Maintenance Services AG

The start-up from Baar develops flexible IoT systems and combines them with the machine knowledge of its customers to create a predictive maintenance solution. One of its main customers is the internationally active AUMUND Group, which is specialized in the conveying and storage of bulk material and is one of the leading suppliers in the industry with more than 22,000 systems sold.

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