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RHI Magnesita modernizes maintenance scheduling and reduces carbon emissions with AVEVA™ PI System™ and cloud-based predictive analytics

RHI Magnesita - www.rhimagnesita.com
Industry - Mining and metals, materials

Goals

- Improve parts management and asset performance for industrial customers.

- Increase maintenance efficiency and reduce costs.

Challenges

- Managing refractory material stock for over 1000 refractory application machines at customer sites across the world.

Solution

- AVEVA PI System

- CONNECT

Results

- Predictive maintenance relieves supply bottlenecks and reduces downtime.

- Machine learning models enable refractory consumption predictions for six months with an accuracy of more than 80%.

- Expected reduction in carbon dioxide emissions by more than 4,200 tons per year.

Production in metal refining and fabrication depends on keeping high-temperature furnaces operating safely and efficiently. The walls of electric arc furnaces need to stand up against extreme heat – upwards of 1200°C – to prevent liquid steel from endangering plant personnel. If heat wears a furnace's walls too thin, workers must take the furnace offline for repairs. Taking a steel furnace offline for just one day can cost manufacturers tens of thousands of euros. For RHI Magnesita, a supplier of refractory materials and an operator of refractory application machines, cloud-based predictive analytics has allowed the company to improve its customers' production processes, alleviate supply bottlenecks, and even reduce carbon emissions.

Keeping up with the machines

RHI Magnesita is a world-leading refractory materials supplier for high-temperature industrial processes. It supplies more than 2.9 Bn tons of refractory products worldwide to many different industries: steel, cement, glass, as well as energy, environmental, and chemical (EEC) applications. RHI Magnesita's customers all depend on high-heat vessels – from kilns and converters to furnaces and more – and the lifetime of the vessels' refractory lining can be short. For example, steel refractory products, which account for 60% of RHI Magnesita's business, must withstand extreme heat and last from as little as twenty minutes up to a maximum life span of only two months.

When the lining of heat-sustaining vessels requires on-site maintenance, RHI Magnesita's refractory application machines can repair the refractory lining of vessels at customer sites. Preventative maintenance to thicken a vessel's walls extends the remaining useful life of that vessel.

The trick, however, is knowing when to perform that maintenance, especially when the machines operate in such extreme conditions. With AVEVA PI System and CONNECT RHI Magnesita is modernizing its maintenance and asset management with predictive analytics to minimize clients' unplanned downtime.

RHI Magnesita's refractory application machines prepare refractory lining for the production or repair of the lining of clients' vessels or furnaces during a short pause in production. These shorter, planned pauses in production, as opposed to unplanned downtime, allow RHI Magnesita's clients to extend production schedules and maximize output.
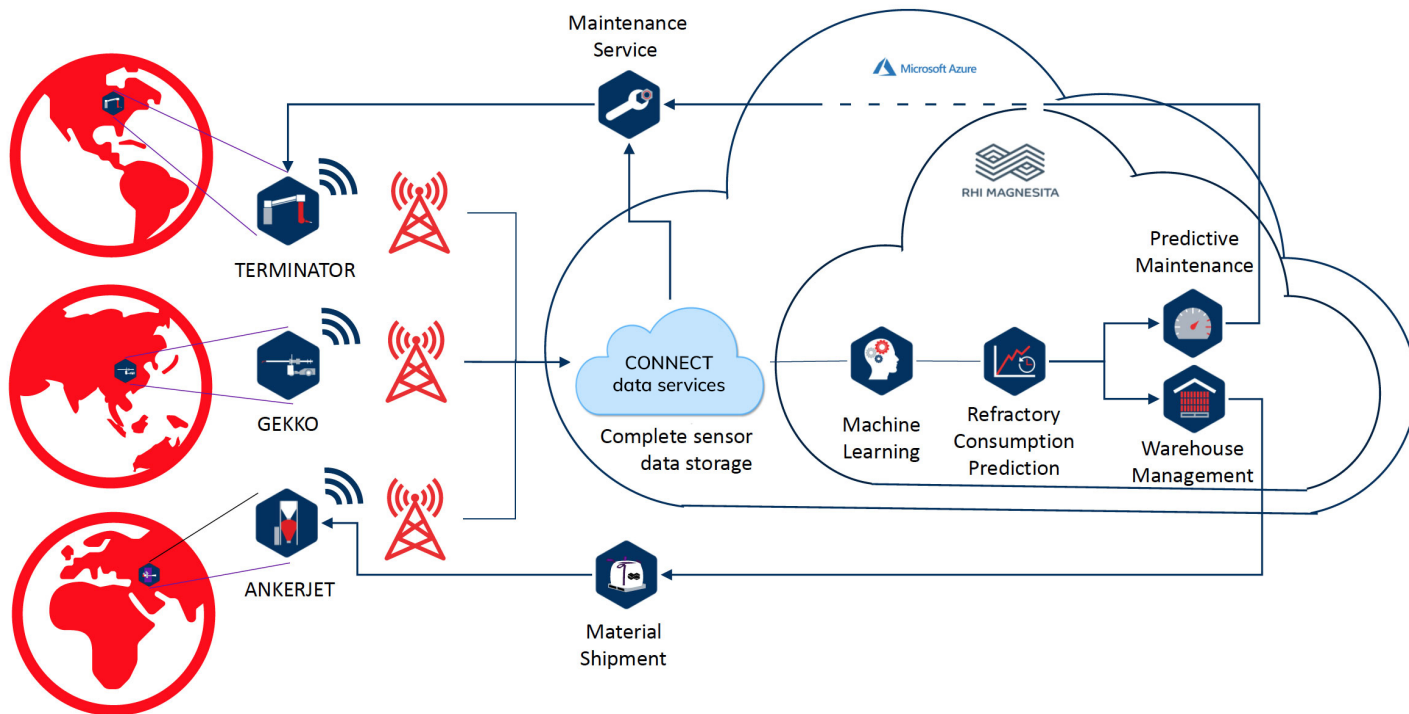
From reactive to predictive maintenance

"We have about 1000 machines in the field. The challenge, of course, is to keep up with them, maintain them, and supply them with the refractory lining material that they are applying on our customers' sites."

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Alexander Platzer
Head of Global Engineering and Simulation, RHI Magnesita

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With CONNECT and machine learning in the cloud, RHI Magnesita is driving continuous improvements in its predictive maintenance program and warehouse management.

To be able to plan its operations and best serve its clients, RHI Magnesita needed a transparent and accurate understanding of its refractory materials supply needs. Building on its longstanding use of PI System products, RHI Magnesita realized that its machines already recorded a wealth of information, including gunning weight, water flow rate, temperature, as well as 3-D positioning and scans of refractory materials within heat-sustaining vessels, such as the electric arc furnace. With further analysis, RHI Magnesita knew it could use this information to better support its clients by gauging their need for more refractory material as well as better servicing its own refractory application machines.

RHI Magnesita is using CONNECT data services, a centralized data hub in the cloud, to aggregate and contextualize its data, and then feed the relevant data into the company's own machine learning tool. RHI Magnesita created what it calls a "connected machines architecture" for predictive maintenance and supply chain management. While before teams often had to send representatives to manually collect data on site, the connected machines architecture can record refractory consumption from four types of machines in real time and predict future consumption. The solution also detects machine abnormalities, so RHI Magnesita can then optimize the maintenance of refractory application machines by scheduling maintenance to limit machine downtime, extending machines' working life and increasing its clients' overall productivity.

"From the hardware down to the virtual machine, they have all been done with the support of the PI System and its cloud data hub. It wouldn't have been possible if all of these solutions were not at hand and easy to use."
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Alexander Platzer
Head of Global Engineering and Simulation, RHI Magnesita

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New horizons of the connected future

Platzer emphasized that, thanks to AVEVA PI System, implementation was easy. "From the hardware down to the virtual machine, it has all been done with the support of [PI System technology]," he said. "It wouldn't have been possible if all of these solutions were not at hand and easy to use."

RHI Magnesita has only been working with the CONNECT for ten months but believes it will play a big role in the company's future. Since implementing this strategy, RHI Magnesita has greatly improved its accuracy in tracking refractory materials. While before it had to rely on big bag measurements of 1.5 tons, now it can calculate at the level of the kilogram. With this new level of granular detail enabled by the PI System, RHI Magnesita's data scientists have also improved its predictive model.

"With our machine learning model, we are able to predict refractory consumption for six months with an accuracy of more than 80%," said Platzer.

RHI Magnesita is now able to pass on the benefits of this analysis to its clients. Its predictive maintenance empowers the company to allocate service parts and workers in advance to relieve potential supply bottlenecks and reduce downtime. The company offers its clients advice on when to change components and when to reorder refractory materials.

Furthermore, improved data quality enables real-time and transparent accounting. Now, RHI Magnesita charges its clients strictly by the material they have consumed, down to the kilogram, and without the usual four-week delay necessary to take inventory. Not only has this improvement in data quality and management increased customer trust, but it has also made RHI Magnesita more sustainable. With AVEVA PI System and CONNECT, RHI Magnesita expects to reduce its CO_2 emissions by more than 4,200 tons per year.

Citation:

Platzer, Alexander. "Connected machines for refractory applications."

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