CUSTOMER CASE STUDY

RHI Magnesita: Cool calculations for hot furnaces

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

Challenge

- Use production data to improve quality, efficiency, and maintenance

Solution

- A process information management system based on PI System™

Result

- 70,000 data signals stored and coordinated in real time so anyone can access it to answer questions or make decisions

RHI Magnesita, a global leader and supplier in the refractory industry, uses a process information management system based on PI System to optimize its production processes. After a first deployment in a single plant, the system has gradually expanded into a global Industry 4.0 infrastructure with predictive maintenance and manufacturing analytics.

"Our experts can have analytical insights from everywhere. The burning and mixing temperatures, the mixer speed, the press force or the press time can be displayed in real time as well as historically. In addition to improving energy efficiency, it also saves travel time and immense costs..."

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Daniel Neubauer,
Team Manager Business Applications R&D/Quality Management and PIMS Application Manager

Steel, copper, aluminum, glass, plastics: Modern material production methods involve extreme heat. Anyone who drinks coffee, reads the news on a smartphone, or drives to work in the morning uses goods produced at temperatures hotter than the inside of a volcano.

The process of turning raw materials into usable products often relies on highly specialized equipment that must withstand temperatures up to 2,000°C. To serve that need, RHI Magnesita, headquartered in Vienna and operating 35 global production sites worldwide, specializes in so-called refractory products, which retain their strength and function at high temperatures. The company has 14,000 employees, manufactures approximately 120,000 different products, and delivers to more than 10,000 customers worldwide.

In the refractory business, quality control is critical. "The production of our products is a highly complex process, and to ensure quality, it is critical to maintain the exact same firing temperatures and constant pressure," says Thomas Reiterer, department head and R&D Process Technology Project Manager for RHI Magnesita.

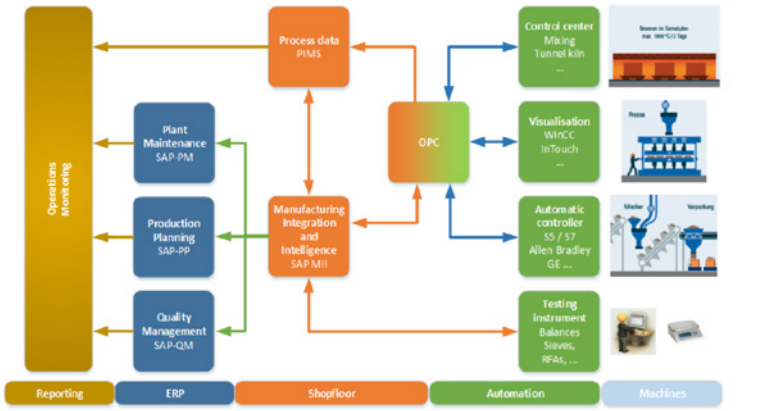
From an isolated solution to central digitization

Worldwide, the company captures thousands of signals from approximately 400 different production machines in real time. Thanks to the centralization of the company's data with the PI System, managers can now look across all of RHI Magnesita's assets and answer questions in real time: Does the furnace's gas consumption per ton of refractory material decrease as a result of the optimization? Are the control parameters for the burners in the oven correct? How many press cycles have been completed?

Until recently, that wasn't possible. "Prior to the central digitization, isolated solutions for machines or production lines in the factories did exist, whose data were stored locally and manually queried and processed. It was impossible to get an overview of exactly what happened where and how to improve efficiency or quality at individual points," Reiterer says.

In 2006, RHI decided to implement a process information management system (PIMS) for the evaluation and use of its process data. The impetus for the project was the construction of a new plant in the city of Dalian, China. The commissioning of the plant was coordinated and optimized from Austria so as not to have to send several expert teams to China for a longer period of time. After a successful first deployment at the factory in Hochfilzen, the solution was implemented in Dalian and then rolled out globally.

Data flows and interfaces



PI System Components Used:

PI Server™
- Data Archive
- Asset Framework (AF)
- Event Frames
- PI Notifications

PI ProcessBook™

PI DataLink™

PI Manual Logger™

PI Vision™

Tracking and understanding of production parameters

The most important task of the PIMS is to track, analyze and understand production parameters, such as electricity and gas consumption, as well as press forces in the very heterogeneous machine landscape. Ease of use and access were top priorities for RHI Magnesita.

The PI System was selected because it met RHI's key criteria for accessibility and ease of use. The system is designed to give tools to production staff as well as business managers and decision makers with built-in visualization, calculations, and analysis. The archiving of process data is fully automated, and the system makes real-time as well as historical data available to users. Control data could be connected via the OPC standard – which is widely used in automation technologies – as well as with SAP modules, operating data pools, evaluation databases, and other business systems. Additionally, the PI System structures sensor data in such a way that engineers and managers can locally leverage the resulting insights to increase productivity or use them in applications such as predictive maintenance to accelerate deep learning and machine analysis.

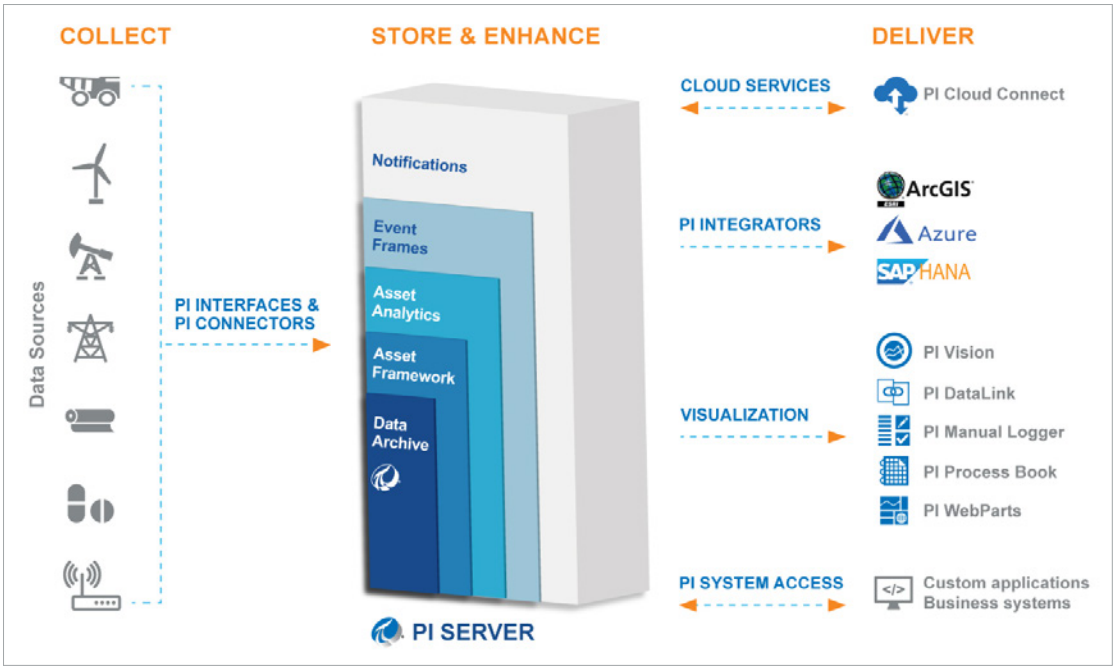
Fully operational within one week

After the solution proved its performance in initial tests in Vienna and Hochfilzen, the development partner installed it along with RHI's information management team in Dalian in just one week. Simple, redundantly working mini-servers are used as PI Interfaces. Hot standby technology guarantees that if one system fails, the parallel computer is switched on immediately. The system relies on a virtual server landscape that has been adapted to the company's increasing requirements over the years; the server has grown along with the global rollout.

There are currently approximately 430 machines in 26 production plants integrated into the PIMS. Collectively, they transmit around 70,000 data signals.

"Our experts can have analytical insights from everywhere. The burning and mixing temperatures, the mixer speed, the press force or the press time can be displayed in real time as well as historically. In addition to improving energy efficiency, it also saves travel time and immense costs", says Daniel Neubauer, Team Manager Business Applications R&D/Quality Management and PIMS Application Manager in the information management team.

Data from PIMS allows managers to analyze and optimize individual production parameters that influence product quality. The system has also enabled RHI Magnesita to make new strides in preventative maintenance.



The PI System collects, stores, enhances, and delivers data from a wide variety of sources to reporting and analytic tools.

“In the past, we have maintained the machines at fixed intervals. Based on the counter readings available in the PIMS, we can use performance-oriented maintenance by transferring the data to SAP on a daily basis and, for example, perform maintenance every 100,000 press strokes. That way, the machines will never be serviced too early or - even worse - too late,” says Neubauer. RHI Magnesita takes predictive maintenance even one step further: The system anticipates and reports problems based on the process data before a machine fails, preventing costly interruptions in operation.

The captured and analyzed information has also become an indispensable part of the continuous global optimization process in quality assurance and in the R&D area. For instance, the system uses the raw data to calculate peak and hourly average values for gas and electricity consumption, as well as deviations from default values, and makes them available to users on visualization displays in production, from machine operators to group managers and plant managers. In an emergency, the process data also triggers alarm e-mails.

“Based on these data, we can not only quickly detect problems such as any process deviations, but also eliminate them by simulations and experiments. Even new developments can now be implemented more easily across all divisions of the company because the increased data quality and availability enable the exchange of knowledge virtually at the touch of a button,” says Reiterer.