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RESEARCH NEWS

Hannover Messe 2017: Interconnected process systems

The process industry on the way to Industrie 4.0

As far as the process industry is concerned, the road to Industrie 4.0 is still long. Fraunhofer researchers and engineers are working on interconnecting process systems so that they can be serviced and maintained predictively. They are combining operating data with employees' knowledge. The researchers and engineers will be presenting their development at Hannover-Messe (Hall 2, Both C16/C22) from April 24 to 28.

A lot of time is lost compiling relevant information and documents or gathering experienced employees' knowledge during troubleshooting in process systems, for instance. Important know-how from maintenance and manufacturing staff is also tremendously insecure because it is unavailable whenever employees are ill or is lost to a company entirely when employees depart. It would be desirable to have it constantly available for automated system control, instead. Industrie 4.0 solutions can help here.

Industrie 4.0 is still in its infancy in the process industry, though. There are only sporadic research projects. This is why many companies in the chemical, pharmaceutical, steel and cement industries as well as their suppliers fear falling somewhat behind in technological development. Researchers and engineers are developing a new digital monitoring system in a project at the Fraunhofer Institute for Factory Operation and Automation IFF, which will enable the process industry to use Industrie 4.0 technologies as well. It will simplify process system maintenance and servicing significantly in the future. The researchers and engineers are doing this by digitizing system monitoring and interconnecting every relevant level of operation in several ways.

The researchers and engineers are using a fluidized bed granulation plant as their technology demonstrator. Such plants produce granular pesticide, for instance. "The envisioned interconnectivity of systems is based on their digital twin," explains Dr. Nico Zobel, a research manager at the Fraunhofer IFF.

The process being developed by researchers and engineers at the Fraunhofer IFF will interconnect plants in three dimensions in the future for maintenance. The first dimension spans the life cycle. The experts use plant engineering documents (e.g. the three-dimensional CAD model created as the plant was engineered) for equipment operation. Workers in need information on a particular component such as a pump can scan the pump's QR code using a tablet computer on which every available planning document on the component is displayed. Workers can additionally view the pump's stored

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operating data, e.g. temperature and pressure curves. The digital twin also helps with troubleshooting: The researchers and engineers intend to issue an interactive recommended action for every problem the control system reports. This will guide employees as they localize problems and digital instructions will tell them how to eliminate problems step by step.

Vertical Interconnectivity: Operating Data Linked with Employee Know-How

The second level of interconnectivity the researchers and engineers intend to implement is vertical interconnectivity. "The sensors installed in a plant send the data they collect to the cloud. Any data can already be incorporated in the planning of maintenance actions at this early stage," explains Nico Zobel. This makes it possible to implement predictive maintenance in such process plants, too. Injectors such as those found in granulation plants furnish an example. Injectors clog from time to time, thus bringing a plant to a standstill. The more sensors send their data to the cloud, the more precise the base of data is, which the system uses to ascertain the next scheduled servicing of an injector. This boosts the accuracy of predictions.

The researchers and engineers not only take operating data as the basis for the second level of interconnectivity but also combine them with employee know-how. The researchers and engineers ask the employees specific questions in order to collect their know-how. They use the responses to their surveys to develop a mathematical model of probabilities of wear or failure. They additionally link this model with artificial neural networks, which are used to develop correlations between sensor data and a component's wear allowance based on the system's historical data. This provides a basis for delivering good forecasts of the future performance of individual plant components.

Horizontal Interconnectivity: Linked with the Supply Chain

The third level of interconnectivity is intended to link current production with the supply chain. If, for instance, a seal in equipment has to be replaced, employees are instantly notified if it is in stock. If it is not, the purchasing process is started automatically.

The researchers and engineers will be presenting their development at Hannover-Messe from April 24 to 28. They will primarily be demonstrating a plant's digital twin, which they developed (Hall 2, C16/C22). Visitors will be able to scan a component's QR code with a tablet and view related documents or alter the plant physically, e.g. by disconnecting compressed air, and view this problem on the digital display.

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Digital plant monitoring for predictive maintenance. The requisite interconnectivity of plants is based on their digital twin. © Fraunhofer IFF | Picture in color and printing quality: www.fraunhofer.de/en/press