

PRESS INFORMATION

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Industry 4.0 – Information technology is the key element in the factory of the future

Manufacturing has not yet consistently reached the digital world. Compared with many other branches, machinery and plant engineering have just taken a few steps in the direction of digitalization. The factory of the future is intended to function by means of spontaneously networkable and real-time capable software – with considerable effects on the method and structure of added value [1]. Therefore, every effort should be made to maintain and strengthen industrial engineering, manufacturing and added value in Germany. Germany needs a strong industrial basis for turbulent periods in global competition.

Changes in demand

In future, it will no longer be sufficient for business success to supply highly productive and reliable machines and plants. In fact, customers more and more prefer new »comprehensive packages«. For machinery and plant engineering companies this means that product-related services associated with the machine itself will become the center of interest. According to a study by the Ifo-Institute [2] on behalf of the European Commission, these additional services enhance the global competitiveness of the German machinery and plant engineering industry. These additional services induce new added value, thereby generating jobs for highly qualified personnel.

Advancing penetration by information technology

The keys to such new, product-related services are information and communication technologies (ICT). These technologies more and more penetrate traditional machinery and plant engineering, thereby creating potentials for innovative services. However, a lot of the machinery and plant manufacturers are not yet systematically prepared for the new ICT-based services. A study by the Fraunhofer IAO (Fraunhofer Institute for Industrial Engineering) [3] indicates that only one quarter of the machinery and plant manufacturers have elaborated an explicit strategy defining which internet-based services will be developed and expanded by them. And only one fifth of these companies have a suitable business model available.

Here is need for action, the more so as software will be an indispensable component of the product portfolio in the future. To name but a few examples: like remote maintenance for distributed plants via a browser, integrated installation instructions, regular machine-software updates, or the plant itself provides information on its

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availability, and the manufacturing results will be displayed on smartphones or other mobile devices.

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Dr.-Ing. Olaf Sauer of the Fraunhofer IOSB states: »The machinery and plant engineering industry in Germany successfully equips production sites and factories all over the world. For decades „Made in Germany“ has been a quality seal of German engineering work. But the German machinery and plant manufacturers and their engineers are more and more exposed to international competition – with its well-known pressure regarding cost and price, time and quality.«

The major challenges

from his point of view are:

1. Challenge **Interoperability**: Products, production plants and processes, their controls and directing applications will increasingly use internet technologies in the future. However, they evolve independently from each other. This is why, tomorrow and beyond, the manufacturing sector will need methods, tools and software components to synchronize these three essential areas of manufacturing enterprises and the supporting IT systems, namely PLM, digital factory and MES. To ensure a consistent data exchange between machines and IT systems, standards for the secure communication within the factory are required, such as OPC UA, a widely recognized and increasingly used communication standard for manufacturing organizations. Moreover, there is a need for interoperability within individual machines or production installations. These are composed of mechatronic elements, providing the basic information about the geometry, kinematics and logic of the installation. Since every mechatronic component contains some software-relevant parts which take the form of embedded systems or control code, the question of interoperability and consistent data management arises in this context, too.
 2. Challenge **Data Complexity**: The existing volumes of data resulting from shopfloor-related IT systems and the operation of plants, both of which are supplied by sensor data, contain hidden treasures waiting to be discovered – opening up potentials for cost efficiency and improvement. The increasing complexity of modern production plants results in a greater need for the automatic recognition of anomalies, of wear and tear and of defects in equipment. Today's data mining methodologies provide a first strategy to master the unprecedented volumes of data. In order not to overwhelm users
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with all the information delivered by the individual systems of a factory, the information must be made available in a role-based and distributed way. This means that all the users receive just the information they need to complete their tasks. To this end, every specialist unit has to be enabled to generate its own view on the basis of the role it has been assigned, allowing for a consistent visualization and modification in line with those of the other disciplines.

3. Challenge **User-centric Approach**: To prevent individual users from being »deluged« and overtaxed by all the information provided by the individual systems of a factory, the information must be made available as role-specific information and must be distributed accordingly. Each user is supplied with »specially tailored« information that he needs for his tasks. Intelligent data fusion, filtering and decision-support systems are necessary to that end.
4. Challenge **Security**: Sensible data must be protected against attacks by interception and modification at the earliest possible stage. Standardized security mechanisms like encryption, signing of data and authentication of data objects and control components make sure that only authorized components can »log on« to the production system.

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At the Hanover Fair 2013 Fraunhofer IOSB will exhibit a demonstrator in hall 2 illustrating »secure plug&work«-concepts.

Sources

[1] Kagermann, H.; Wahlster, W.; Helbig, J.: Umsetzungsempfehlungen für das Zukunftsprojekt Industrie 4.0 – Abschlussbericht des Arbeitskreises Industrie 4.0. Forschungsunion im Stifterverband für die Deutsche Wissenschaft, Berlin: 2012

[2] Vieweg, H.-G. (Ed.): An introduction to Mechanical Engineering: study on the Competitiveness of the EU Mechanical Engineering Industry. München: 2012.

[3] Münster, M.; Meiren, T.: Internet-basierte Services im Maschinen- und Anlagenbau. Stuttgart, Fraunhofer-Verlag, 2011.



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Requirements associated with the field of automation have always been important R&D topics for IOSB: from the measuring and control technology to embedded systems to complex monitoring and control and MES systems, IOSB has designed, developed, and supplied groundbreaking technology for industrial application.

IOSB has concentrated all its competencies regarding automation technology within its business unit Automation to be able to offer services from one single source to both industrial customers and public authorities. With its comprehensive service portfolio for the entire automation pyramid, IOSB provides future-oriented solutions for manufacturing companies of the production and process industry, for system integrators, and for automation suppliers.

The business unit Automation stands for efficient system solutions at any level of industrial automation with the vision of a consistent and integrated data and information management. The core theme of the business unit's work is: real-time IT for complex production processes.

All parties involved at the various levels of the automation pyramid should be able to log on to this communication autonomously. Vertical and horizontal integration as well as integration covering the complete life cycle of a factory and the associated automation system constitute the dimensions of consistency.

In cooperation with the Institute of Industrial Information Technologies (iIT) of the OWL (East-Westphalia-Lippe) University of Applied Sciences we use the Lemgoer Modellfabrik (Lemgo Smart Factory) to study, test and demonstrate future information

and communication technology (ICT) solutions in the field of automation. You may, for example, already see and experience adaptive and energy-efficient production systems in operation. Here, the consistent and integrated ICT concept, from the field level up to the control level, also allowing for visualization in an actual control room or for the reliable remote control/maintenance of distributed plants via internet and mobile communication technologies, will become immediately understandable.

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The **Fraunhofer-Gesellschaft** is Europe's largest application-oriented research organization. Under its umbrella 60 Fraunhofer institutes do research at different locations in Germany, where more than 20,000 people work with an annual research budget of 1.8 billion euros. 1.5 billion euros of this volume are generated through contract research. More than 70 percent of the Fraunhofer-Gesellschaft's contract research revenue is derived from contracts with industry and from publicly financed research projects. International subsidiaries allow for contacts with the most important areas of present and future scientific research and economic growth.