



FRAUNHOFER INSTITUTE FOR MACHINE TOOLS AND FORMING TECHNOLOGY

# PRESS INFORMATION

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E3-Research Factory Resource-efficient Production of the Fraunhofer IWU:

## The factory of the future opens in Chemnitz

**From April 7-11, 2014, at the HANNOVER MESSE, the Fraunhofer Institute for Machine Tools and Forming Technology IWU will present research subjects of the new "E3-Research Factory Resource-efficient Production". The presentations will take place at the joint stand of the Fraunhofer-Gesellschaft (Hall 2, Stand D18) and at the stand of the Fraunhofer Group for Production (Hall 17, Stand F14). Based on a new concept for industrial production, the model factory will provide a place for researchers and industry partners to study sustainable solutions for future production technologies in three competence areas: "Powertrain", "Car Body Construction", and "Energy Management 2.0".**

"E3" stands for the three central areas of study where Chemnitz scientists are looking to turn visions into real technological innovations in the coming years: Aside from **E**nergy and resource efficiency in production through development of new machines and technologies, the concept includes the idea of an **E**mission-neutral factory as well as rethinking the way of **E**MBEDDING people into the manufacturing process.

Using a VR-based and interactive 3D model of the new "E3-Research Factory Resource-efficient Production", visitors of the joint stand will get the chance to look inside the model factory and explore possible solutions for these core challenges for the very first time. Exhibits on how to save energy and resources will be shown at the stand of the Fraunhofer Group for Production.

### Taking production into the future using the E3 concept

The E3 approach has been developed at the Fraunhofer IWU. Based on shifting the dictum of production from "maximize profits with minimal expenditure of capital" towards "maximize value with minimal input of resources", scientists seek to turn energy- and resource-efficiency in production into an competitive advantage for the German industry.

By rethinking future production, the E3 approach includes relevant and important societal mega trends, such as increasing costs for energy and resources, demographic changes, changing requirements for mobility, and international competition. Together with industrial partners, solutions for concrete problems in manufacturing are being researched.

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#### Editor

**Hendrik Schneider** | Fraunhofer Institute for Machine Tools and Forming Technology IWU | Phone +49 371 5397-1454 | Reichenhainer Strasse 88 | 09126 Chemnitz | [www.iwu.fraunhofer.de](http://www.iwu.fraunhofer.de) | [hendrik.schneider@iwu.fraunhofer.de](mailto:hendrik.schneider@iwu.fraunhofer.de)



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The concept has been transformed into a “Fraunhofer Lighthouse Project” in November 2013. In these types of cooperation, several Fraunhofer Institutes combine their experience and skills in order to work on common societal challenges. The Lighthouse project “E3-Production” includes a total of 12 Fraunhofer Institutes in the areas of Production, Materials and Components, Surfaces and Photonics, Information and Communication Technologies, and Life Sciences.

In order to transfer scientific results into industrial applications more quickly and raise the overall awareness in key industries, four demonstrators and pilot applications are being developed in Germany until 2016.

### **From vision to competitive advantage: The “E3-Research Factory Resource-efficient Production”**

After a construction time of two and a half years and an investment of about 20 million euros, one of these demonstrators is in its final start-up phase. The “E3-Research Factory Resource-efficient Production” at the Fraunhofer IWU in Chemnitz will focus on new technical innovations, engineering processes and factory planning designs. Together with industrial partners, solutions will be studied and tested in three main fields of research: “Powertrain”, “Car Body Construction”, and “Energy Management 2.0”.

#### *Ultra-short process chains*

The design and implementation of ultra-short process chains is the area of focus in the competence area “Powertrain”. By replacing manufacturing and machining processes with more resource-efficient technologies or by saving process steps, scientists can reduce energy use, material consumption, and overall process time. Potential savings will be investigated and demonstrated on a sample production line for a gear shaft, which is responsible for the transmission of rotary motion and torque from the engine to the transmission of an automobile.

#### *More flexible and intelligent car body construction*

The competence area “Car Body Construction” focuses on the future of automotive manufacturing. In close cooperation with Volkswagen AG, scientists have replicated an assembly line for a car door, similar to what is used in series production. They are researching how energy, time, and costs can be reduced under realistic conditions. One of the scientists' visions is to design a completely flexible body construction operation, meaning a production line that could be rapidly reconfigured for any number of different models. Furthermore, the development of software tools and training concepts for supporting the technical staff are topics of research.

#### *Energy self-sufficient and emission-optimized production*

The vision of the third competence area “Energy Management 2.0” is to shift a factory from an energy consumer into a more active player on the energy market. Based on the volatility of energy supply, more flexibility in the demand can help industry not only

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**Hendrik Schneider** | Fraunhofer Institute for Machine Tools and Forming Technology IWU | Phone +49 371 5397-1454 |  
Reichenhainer Strasse 88 | 09126 Chemnitz | [www.iwu.fraunhofer.de](http://www.iwu.fraunhofer.de) | [hendrik.schneider@iwu.fraunhofer.de](mailto:hendrik.schneider@iwu.fraunhofer.de)



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save but earn money. Therefore solutions for a more intelligent load, storage and forecasting system need to be developed and tested.

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### *Rethinking the embedding of people in production*

A fourth important research focus is to rethink the role of people in future industrial production. Challenges arise as a result of demographic trends, increasing automation, and the new opportunities offered by information and communication technologies. Age-appropriate production environments, new designs for human-machine interaction, and strategies for re-integrating people into the production process are some of the key questions being addressed in the model factory.

### *The intelligent factory*

In order to uncover and leverage existing potential savings, processes need to be observed in their entirety in manufacturing companies, and manufacturing steps will first have to be broken down into individual increases in efficiency: starting from individual processes, and proceeding to process chains all the way to the factory level. A holistic analysis and optimization depends on the availability and utilization of information about all necessary resources as well as material and energy flows in the factory. This data is being collected in the "Control Center" of the E3 Factory. Scientists can visualize and assess this data in real time using 3D presenters. The information can also be called up throughout the production environment using mobile end-user devices.

"Successful implementation of our vision of future production requires that the professional world as well as the broad public is sensitized to the challenges and solutions", **Dr. Welf-Guntram Drossel, Acting Director of the Fraunhofer IWU**, says. "That is why we understand the E3-Research Factory Resource-efficient Production as an open and flexible research field for new technologies and processes. Together with partners from industry, we can establish and demonstrate promising innovations to strengthen German industry."

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#### Editor

**Hendrik Schneider** | Fraunhofer Institute for Machine Tools and Forming Technology IWU | Phone +49 371 5397-1454 | Reichenhainer Strasse 88 | 09126 Chemnitz | [www.iwu.fraunhofer.de](http://www.iwu.fraunhofer.de) | [hendrik.schneider@iwu.fraunhofer.de](mailto:hendrik.schneider@iwu.fraunhofer.de)



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**Image:** The energy values of machines and equipments are to be captured in a production management system and linked to planning and operating data. This information flows into an energy-sensitive control system which is used by management personnel to optimize resource flows and material flows centrally through coordinated control. Source: © Fraunhofer IWU | Image source in color and print quality: on the enclosed flash drive.



**Image:** All data of resources needed, such as compressed air, water, electrical energy, and machines and process data come together at the factory level in the „Control Center“. Scientists can visualize the information in real time on a dashboard and can thus design processes to save energy and raw materials. The transparent glass monitors are reminiscent of “holodecks” and can be controlled by means of gestures.

Source: © Ines Escherich / Fraunhofer IWU | Image source in color and print quality: on the enclosed flash drive.

### Editor

**Hendrik Schneider** | Fraunhofer Institute for Machine Tools and Forming Technology IWU | Phone +49 371 5397-1454 | Reichenhainer Strasse 88 | 09126 Chemnitz | [www.iwu.fraunhofer.de](http://www.iwu.fraunhofer.de) | [hendrik.schneider@iwu.fraunhofer.de](mailto:hendrik.schneider@iwu.fraunhofer.de)



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Image: Construction work on the 1,640-square-meter "E3-Research Factory Resource-efficient Production" started in June 2011. This investment in the future was funded with 20 million euros from the European Union, the German Federal Government, and the State of Saxony. Source: © Ines Escherich / Fraunhofer IWU | Image source in color and print quality: on the enclosed flash drive.



Image: The Fraunhofer IWU is developing its skills in the area of energy and resource efficiency at the E3-Research Factory Resource-efficient Production on the Campus E3 Production in Chemnitz. Source: © Fraunhofer IWU | Image source in color and print quality: on the enclosed flash drive.

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### Editor

**Hendrik Schneider** | Fraunhofer Institute for Machine Tools and Forming Technology IWU | Phone +49 371 5397-1454 | Reichenhainer Strasse 88 | 09126 Chemnitz | [www.iwu.fraunhofer.de](http://www.iwu.fraunhofer.de) | [hendrik.schneider@iwu.fraunhofer.de](mailto:hendrik.schneider@iwu.fraunhofer.de)



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The new "E3-Forschungsfabrik" of the Fraunhofer Institute for Machine Tools and Forming Technology IWU is one of the awarded projects in the competition "Landmarks in the Land of Ideas". The initiative has honored projects exemplifying German innovation and creativity.

<http://www.land-der-ideen.de/en/projects>

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"Research for the Future" is the motto of the Fraunhofer Institute for Machine Tools and Forming Technology IWU. This is exemplified by the Institute's strong emphasis on application-oriented research and development in the field of production technology for the automotive and mechanical engineering sectors.

With an annual budget of about 34 million euros and over 580 highly qualified engineers and scientists, combined with laboratories for machine tools, forming and joining technology, mechatronics, precision technology and Virtual Reality in Chemnitz, Dresden, Augsburg and Zittau, Fraunhofer IWU is recognized as one of the leading contractual research and development institutions across Germany in our specialized fields of work.

### Other contacts

**Jan Müller** | Phone +49 371 5397-1462 | [jan.mueller@iwu.fraunhofer.de](mailto:jan.mueller@iwu.fraunhofer.de) | Fraunhofer Institute for Machine Tools and Forming Technology IWU, Chemnitz | [www.iwu.fraunhofer.de](http://www.iwu.fraunhofer.de)