

On the Way to Research Factory Karlsruhe

KIT and Fraunhofer Establish a Development and Demonstration Center for the Factory of the Future – Reference Project for German Federal AI Strategy



Dr. Olaf Sauer, Prof. Jürgen Beyerer, Prof. Holger Hanselka, Prof. Jürgen Fleischer, and Prof. Frank Henning at the groundbreaking ceremony (from left to right). (Photo: Amadeus Bramsiepe, KIT)

The construction of the Research Factory Karlsruhe was started with the joint groundbreaking ceremony of the cooperation partners Karlsruhe Institute of Technology (KIT) and Fraunhofer-Gesellschaft. In the 15 million plant on KIT's Campus East, new production technologies are to be planned, tested and transferred to industry much faster than before using the latest digitization methods. The project, which will start at the end of 2020, will make an important contribution to the recently adopted Artificial Intelligence Strategy of the Federal Government and is considered to substantially strengthen Germany's innovative power.

Germany owes much of its prosperity to its ability to quickly and again bring innovative products to the world market. In the age of global competition, digitization, and artificial intelligence, the production of these products must constantly reinvent itself. On the one hand, to maintain scientific and technological advantages over competitors and imitators. On the other hand, in order to survive in the

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conflicting areas of new technologies, complex manufacturing processes, increasing individualization, and extreme variant diversity. Against the background of this challenge, KIT with its wbk Institute of Production Science and Fraunhofer-Gesellschaft with its Institute for Chemical Technology ICT and its Institute of Optronics, System Technologies and Image Exploitation IOSB have agreed to build the Research Factory Karlsruhe on the premises of KIT's Campus East.



Making immature production processes ready for series production at a new speed is the program of the Research Factory Karlsruhe currently under construction. (Photo: Heinle, Wischer und Partner)

"The Research Factory Karlsruhe is a model case of interdisciplinary cooperation between strong partners for the benefit of our country's vital innovative capacity," says KIT's President Professor Holger Hanselka. "Through the targeted and early integration of small and medium-sized enterprises into the Research Factory, we are also strengthening the attractiveness of the city and the region," Hanselka emphasizes.

Dr. Raoul Klingner, Director of Research at the Fraunhofer-Gesellschaft, says: "We are pleased to bring our particular strength in application-oriented research to this close cooperation with KIT in the fields of materials, manufacturing and process engineering as well as in automation, sensor and information technology".

Objectives and scientific approach

The aim of the Research Factory Karlsruhe is to systematically work out and expand the lead in new, challenging manufacturing processes. The researchers want to learn how to manufacture high-quality products at a very early stage, i.e. when the manufacturing processes required for a new product are not yet fully understood and mastered. With the help of state-of-the-art measurement, sensor and control technology, they want to develop methods that are suitable for

quickly converting new production technologies into safe and profitable industrial manufacturing processes. Production can start very early because intelligent process controls ensure that the first, qualitatively flawless product copies are produced despite the still immature production technologies.

In concrete terms, this is done as follows: Machine learning and artificial intelligence methods use the data collected by sensors to identify correlations between quality-related data and process parameters. In this way, the production plant, which is already in operation, "learns" which parameters produce good results. It is the declared goal of the Research Factory actors to apply machine learning and artificial intelligence not only to individual production steps or to processes that directly follow one another, but for capturing and improving entire process chains.

By thus significantly shortening the "time-to-market", small and medium-sized companies in particular are expected to be present with new products much earlier than before on target markets. The participating institutes wbk (KIT), ICT and IOSB (Fraunhofer) provide the expertise in production, manufacturing and process technology as well as in automation, sensor and information technology that is necessary to implement this scientifically demanding objective. Fields of application of the Research Factory are electromobility and lightweight construction, but also other innovative fields for which it is necessary to establish an intelligent and economical production technology with industry 4.0 and AI methods.

"The rapid industrialization of new, innovative production technologies is essential to strengthen Germany as a production location," emphasizes Professor Jürgen Fleischer, head of the wbk Institute of Production Science at KIT and Director of Machines, Equipment and Process Automation at wbk. "The unique feature of the Research Factory Karlsruhe is the interdisciplinary cooperation of production research, automation technology and information technology in one location."

Professor Frank Henning, deputy head of Fraunhofer ICT and holder of the Chair for Lightweight Construction Technology at Institute of Vehicle System Technology at KIT, sees "the interdisciplinary nature and efficient use of process data in complex processes to be the key to sustainable manufacturing in Germany".

Professor Jürgen Beyerer, head of Fraunhofer IOSB and holder of the Chair of Interactive Real-Time Systems at the Institute for Anthropomatics at KIT, points out another unique selling point of the Research

Factory: "What is decisive is the combination of comprehensive sensor technology and the evaluation of the data obtained with it, among others with methods of machine learning and their comprehensible visualization. On this basis, immature manufacturing processes can be explored, understood, and optimized in a much more targeted way than today".

"The Research Factory and the methods and tools of machine learning and targeted search for process parameters to be developed there are initial expressions of the goals formulated in the current AI Strategy of the German government," explains Dr. Olaf Sauer, who, as deputy of the head of institute at IOSB, coordinates the planning of the Research Factory Karlsruhe on the part of the Fraunhofer-Gesellschaft.

Cooperation with industrial partners

The method of rapid industrialization of new production technologies to be developed at the Research Factory Karlsruhe promises decisive advantages in global competition for numerous innovative small and medium-sized companies in Baden-Württemberg. In order to transfer results purposefully and quickly, interested companies will be involved right from the start – through close cooperation, joint projects, and workshops. At the same time, KIT and Fraunhofer assume that the Research Factory with its attractive working conditions for employees in the applied research environment will make a long-term contribution to building up and maintaining the innovative leadership of the TechnologyRegion Karlsruhe in materials, production and information technology. Through teaching at the wbk Institute of Production Science, the Research Factory is also linked to the next generation of engineers.

Key data on the construction of the Research Factory

The Research Factory Karlsruhe will be located on KIT's Campus East. A total budget of around 15 million euros is earmarked for implementation of the construction project. The cooperation partners KIT and Fraunhofer each contribute half of this amount; in addition, investments are made in the initial equipment of the production halls, laboratories, and offices. Following the laying of the foundation stone in summer 2019, the L-shaped building will house around 70 scientists on two floors and an area of 4500 square meters from the end of 2020. In addition, it offers 50 jobs for cooperation partners from the industry. The opening is planned for the end of 2020.

The Research Factory Karlsruhe project is funded by the Federal Ministry of Education and Research, the Ministry of Science, Research and the Arts Baden-Württemberg, the Ministry of Economic Affairs, Labor and Housing Baden-Württemberg, and the European Regional Development Fund.

Being “The Research University in the Helmholtz Association“, KIT creates and imparts knowledge for the society and the environment. It is the objective to make significant contributions to the global challenges in the fields of energy, mobility and information. For this, about 9,300 employees cooperate in a broad range of disciplines in natural sciences, engineering sciences, economics, and the humanities and social sciences. KIT prepares its 25,500 students for responsible tasks in society, industry, and science by offering research-based study programs. Innovation efforts at KIT build a bridge between important scientific findings and their application for the benefit of society, economic prosperity, and the preservation of our natural basis of life.

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