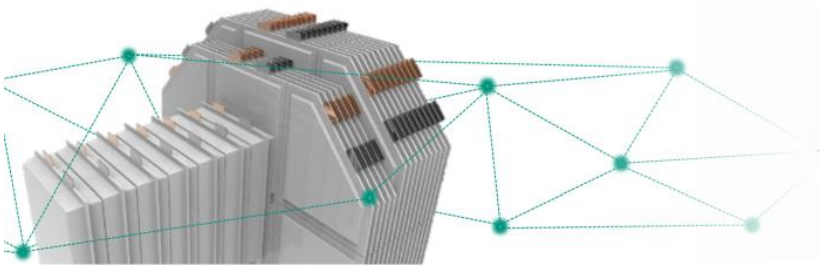
AgiloBat: Flexible Production of Battery Cells

The Research Project AgiloBat Focuses on Future Battery Production in Germany



Within the AgiloBat project, a system to produce tomorrow's battery cell is developed. It is dynamic and can be adapted flexibly to various designs. (Graphics: wbk, KIT)

So far, rigid production processes and product lines have characterized battery production for various applications, from e-mobility to the power tool. The AgiloBat research project will facilitate a flexible battery production in terms of format, material, and number of pieces. Researchers of Karlsruhe Institute of Technology (KIT) cooperate with partners to develop an agile production system. The project is funded by the Baden-Württemberg Ministry of Science, Research, and the Arts (MWK) with up to EUR 4.5 million. For the next project stage, funding with up to EUR 14 million is envisaged by the Federal Ministry of Education and Research (BMBF).

Production of high-performance and mobile battery cells today represents the backbone of several economic sectors. Batteries, however, are mainly produced in Asia and North America. "As regards electric mobility, Germany as a car-manufacturing country faces the question of how we can catch up with international competitors in battery production," says the President of KIT, Professor Holger Hanselka. "Within the AgiloBat research project, KIT researchers and our partners from science work on finding a strong answer. Technological leadership can be achieved with innovative production systems that are highly flexible and technology-open and, hence, can quickly react to requirements of industry and new findings made in fundamental

KIT Energy Center: Having future in mind

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research. With this, we are setting the course for increasing the added value in Germany and in particular in Baden-Württemberg."

"Baden-Württemberg promotes battery production in Europe. Our present battery research efforts give rise to a major impetus that is acknowledged worldwide," says Baden-Württemberg Science Minister Theresia Bauer. "The existing network of science and industry is the basis to rapidly translate the vast know-how into added value. For this purpose, we need pioneer projects, such as AgiloBat, which enrich the network and push its growth. This is what we are doing together with the BMBF within the framework of the overarching battery research factory concept."

From the Product to the Battery System

Existing systems for producing battery cells cannot manufacture various formats or variable numbers and they cannot use various materials. They produce standardized cells that are of high quality, but have not been adapted specifically to the wishes of customers. Professor Jürgen Fleischer, project head and Head of KIT's Institute of Production Science (wbk), says: "We want to get away from the rigid transfer line and proceed towards agile and flexible production systems. As the lifecycle of individual products is becoming shorter and shorter and requirements are getting more diverse, production systems for batteries have to be adapted to these new conditions. Within the AgiloBat research project, we will study and develop agile and modular systems under the aspect of integrated manufacture by parallel development of product and production system. Together with our partners, we will establish a system to produce flexible formats of battery cells from several materials."

The project approach, hence, differs significantly from established battery manufacture and design. The focus lies on a holistically optimized cell in terms of resources, cost, and performance. The basic idea is to optimally adapt the battery system to the application and the available space. A battery for an electric vehicle, for instance, has to meet other requirements than a battery in a power tool. In the future production process, these requirements will be translated into parameters for battery cells. Cells of flexible shape, which are optimized for various requirements, are combined in an appropriate battery system. In this way, also energy density or quick charging capacity can be adapted. Smart interconnection and modular production will enable both manufacture of smaller numbers of customized cells for medium-sized companies as well as economically efficient large series production. A pilot plant will be designed for establishing lithium-ion technology. New material concepts, however, will be integrated rapidly into the adaptive production system. These diverse requirements will

significantly affect the entire production chain and the individual production steps. “Existing understanding of the individual process steps has to be extended for the production of various cell designs in flexible steps,” Fleischer says. “Moreover, the individual production steps have to be combined in a process ensuring successful prototype production at a pilot plant.”

To cope with this complex task, the researchers use modular robot cells with universally applicable process modules, standardized interfaces, and a planned scaling concept. The modular production system also reduces the investment risk, as further production modules can be installed, if necessary. AgiloBat lays the foundation for companies wishing to produce battery cells at competitive costs in Baden-Württemberg in the future.

More Information on AgiloBat

Within the AgiloBat research project, scientists from eight KIT institutes and partners from the Center for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW) and the Fraunhofer Institute for Chemical Technology (ICT) are working on the new production system. They develop and set up machines and plants for agile, flexible, and highly efficient production. AgiloBat is an element of the Innovation Campus “Future Mobility” and is embedded in the “Strategy Dialog for the Automotive Sector.” The project is scheduled for a duration of four years and funded with up to EUR 4.5 million by the Baden-Württemberg Ministry of Science, Research, and the Arts (MWK) and EUR 1 million at least by industry. The Federal Ministry of Education and Research (BMBF) has envisaged funding of up to EUR 14 million.

Information on the Innovation Campus:
https://www.kit.edu/kit/english/pi_2020_001_production-technology-for-sustainable-mobility.php

Information on the Strategy Dialog for the Automotive Sector:
https://stm.baden-wuerttemberg.de/de/themen/strategiedialog-automobilwirtschaft/ (in German)

More about the KIT Energy Center: http://www.energy.kit.edu

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