

# PRESS RELEASE

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## Human-centered, resource-efficient, resilient – R&D solutions for future-proof production

**The manufacturing of the future will be data-driven, but in order to get there, there is still a lot of development work to be done. Fraunhofer IPK presents research projects, technologies and solutions that respond to the challenges and needs of manufacturing companies.**

Volatility shapes today's manufacturing industry. In early 2020, climate change was considered the biggest challenge for production. Since then, various international crises have disrupted established production structures. Location conditions and supply chains have changed radically. The shortage of skilled workers and international competition are also increasingly putting pressure on companies to rethink their methods, processes and technologies. Resource efficiency, regulatory requirements and demographic change are calling for flexible, sustainable approaches that promote corporate resilience.

Against this backdrop, the Fraunhofer Institute for Production Systems and Design Technology IPK discussed future technology and innovation needs in manufacturing with executives from a variety of industries. Now, the institute is presenting R&D projects and solutions which provide answers to industry's most pressing questions along five topics:

- Data management, networking and analysis
- Manufacturing systems and production control
- Intelligent mechatronic systems technology
- Knowledge and assistance in production
- Sustainability and environmental compatibility

### **Data – an invaluable goldmine**

Data-driven solutions lead to more efficient processes and new business models. When data is networked, intelligently analyzed and integrated into higher-level systems, it provides the basis for comprehensive management of industrial processes from product development to shop floor and all the way to sales. When data is made accessible beyond corporate boundaries, it enables a truly circular economy, keeping raw materials or entire products in use for longer.

Select solutions for this topic:

- Data and architecture concepts for consistent data continuity throughout the product life cycle
- Digital twins for products, processes as well as technologies, machines and systems
- Machine learning and AI for curating large amounts of data

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**Manufacturing efficiently with flexible processes**

In the factory of the future, network nodes are as important as machine chucks – because integrating systems into end-to-end manufacturing processes is purely IT-based. This way, machines, robots, mobile equipment and even manual workstations can be rearranged into ever changing sequences. As a result, the production environment becomes product-agnostic, allowing the cost-effective conversion to different product variants, even in small quantities. Cockpits and similar solutions for process control provide the necessary overview.

Select solutions for this topic:

- Blue Print Plant Model for integrated modular factory processes
- Human-technology solutions for empathetic production systems
- Application laboratory »Digitally Integrated Production (dip)« for secure testing of new digital solutions

**Machines – the heart of the factory**

Machine tools, robots and other systems are constantly reaching new levels of efficiency through digital upgrades or process adaptations. Whether energy- and resource-efficient turning, milling and grinding in large machining centers, assembly with perceptive robots, manufacturing new types of geometries or processing innovative materials in entirely new processes: There is a lot of research potential in machine and system technology on the shop floor.

Select solutions for this topic:

- Machining technologies for micro and macro production
- Fraunhofer Dynamic Mixing Technologies for series production in pharmacy, chemistry and biotechnology
- Sensors and AI for cognitive robotics

**Support for the human resource**

Skilled workers on the shop floor are key to a company's success, but in many places they are in short supply. Manufacturing companies often rely on lateral entrants or temporary workers who lack the specific know-how for the existing systems. Context-based multilingual assistance systems provide knowledge on processes or machines as needed and support the execution of set-up or maintenance work. AI-based tools also help companies identify appropriate training programmes.

Select solutions for this topic:

- Semantic data structures for optimized information and data flow within companies
- App-based assistance systems for machine operation as well as maintenance and servicing
- AI-based role navigator for in-company training

**Towards a green production**

Businesses that operate with less energy and other raw materials in their production

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**FRAUNHOFER INSTITUTE FOR PRODUCTION SYSTEMS AND DESIGN TECHNOLOGY IPK**

benefit financially and at the same time make an important contribution to securing the future of our planet. Legal regulations also require companies to reduce greenhouse gas emissions or make products traceable. Companies can maximize their impact if they consider how and from where raw materials and semi-finished products are procured or under what conditions a product will be manufactured already during product development.

Select solutions for this topic:

- Systematic climate management for SME
- Digital product passports for circularity and data economy
- Real-world laboratory for testing environmentally friendly technologies for electro-mobility

»All in all, it will take more than individual technological solutions for individual sectors to ensure the resilience and competitiveness of German and European companies in global markets,« says Prof. Eckart Uhlmann, director of Fraunhofer IPK. »We need to develop holistic, integrated system solutions to meet current and future challenges.« According to the production expert, this requires interdisciplinary teams, close cooperation between academia and industry, and long-term investment in research and innovation.

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**Further information:**

The publication with all background information, reports, project portraits and interviews can be found online at [www.ipk.fraunhofer.de/en/expertise-and-technologies/industry-trends.html](http://www.ipk.fraunhofer.de/en/expertise-and-technologies/industry-trends.html). We will be happy to send you a free print copy of our publication on request.

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