



PLATFORM OF THE INSTITUTE FOR INTELLIGENT PRODUCTION

ACHIEVE MORE
THROUGH RESEARCH & DEVELOPMENT

Achieve more with Austria's strongest research University of Applied Sciences

Successful businesses can tell you from experience: Every euro which goes into research and development pays for itself a thousand times over.

This is because innovations give those businesses a decisive competitive edge, generating revenue and securing jobs in the long-run.

The research location of Upper Austria is in the fast lane, and the University of Applied Sciences Upper Austria (FH Upper Austria) has evolved into a powerful engine. Austria's strongest research University of Applied Sciences offers four schools with around 400 professors and academic staff to innovative businesses.

Currently, over 300 projects in 16 specialist areas are being implemented. The practice-oriented topics range from IT (FH Upper Austria Hagenberg Campus), to Medical Engineering and Applied Social Sciences (FH Upper Austria Linz Campus), as well as Management (FH Upper Austria Steyr Campus), and Engineering (FH Upper Austria Wels Campus).

Perfect networking of the schools ensures that it is possible to achieve an optimal complete solution for each project.

The strategic programme "Innovative Upper Austria 2020 – Research. Business. Future" was accommodated by the Platform for Energy. This Platform's projects provide support in achieving strategic key objectives:

» **Upper Austria 2020 is a leading industrial region in Europe** and, due to competitive products and services, is able to withstand the pressure of globalisation.

» **Decisive in this regard is technological leadership and the consequent increase in productivity and flexibility** in the sector of industrial production processes and procedures. In the course of this, innovative sustainable production methods are implemented, which facilitates the largest possibility energy and resource efficiency (circular economy/material flows)

» **Through technologically leading, adaptive and high-quality production processes**, we safeguard high value-added shares and, thus, jobs.



Dr. Josef Pühringer
Governor of Upper Austria



Mag. Thomas Stelzer
Vice Governor

Upper Austria has introduced the possibility for joint initiatives in the sectors of education – research – business through the strategic economic and research programme "Innovative Upper Austria 2020", in order to ensure that Upper Austria has a clear competitive edge.

In order to appear a strong partner on the international stage, it is important to further develop regional projects, so that it is possible to ensure a competitive edge with innovative industrial production processes. Topics such as intelligent production and industry 4.0 are of particular importance for the business location of Upper Austria.

With the FH Upper Austria as a long-term, reliable partner in the sectors of research & development, the State of Upper Austria is provided with support in achieving the implemented, strategic key objectives.



Achieve more: Cooperation made easy

With its 400 plus researchers, the FH Upper Austria is on hand as a flexible and reliable partner for businesses and institutions from industry and society when it comes to problems in research & development. The possibilities of cooperation are diverse:

- » applied R&D projects with business partners
- » academic research projects
- » international R&D projects
- » symposia and workshops
- » students' bachelor's papers and master's theses

The project time frame can range from a few months to up to five years.

The FH Upper Austria's R&D offers are aimed at businesses and institutions from industry and society.

On the one hand, this addresses those businesses which lack personnel resources or have limited financial resources for their own research and development activities (e.g. small and medium-sized companies).

On the other hand, solutions for companies which need support in specialist fields are also developed (e.g. in the form of specific devices). Above all, a joint project is, for the FH Upper Austria's cooperation partners, a financially straightforward and efficient undertaking.

Geared towards the needs of the client, innovative solutions are developed, which can be put directly into practice.

Dr. Gerald Reisinger
University of Applied Sciences Upper Austria
President

Prok. FH-Prof. Priv.Do. Dipl.-Ing. Dr. Johann Kastner
University of Applied Sciences Upper Austria Research & Development
Chief Technology Officer



Achieve more through intelligence and innovation

Intelligent production processes lead to intelligent products. These products serve as guarantors for businesses, but also as the prerequisites necessary in order to remain competitive in the future. As an innovative industrial partner, the IIP (Institute for Intelligent Production) is specialised in research and transfer concerning the topic of intelligent production. The coordination and networking of all the relevant departments facilitates a lively exchange of information between the schools (Hagenberg, Steyr and Wels), both with regard to R&D as well as diploma and master's theses. This enables, for example, the implementation of pilot and demonstration projects regarding the topic "Innovative Industry Applications 4.0" together with Upper Austrian businesses.

The specialist areas of the work of the Platform for Intelligent Production come from the following three departments:

Distributed intelligence and adaptive production systems

It is thanks to the "Internet of Things and Services" that assignments, machines, tools, equipment, means of transport, and products are "intelligent". This means that they can identify their status, can communicate with each other, can store rules, behavioural patterns, as well as decision trees, and can make displaced, intelligent decisions. The goal of this specialist area of work is to research models for planning, process, control, production systems, and facilities, which make best use of distributed intelligence.

- » **Adaptive planning and control:** displaced decision mechanisms, integrated escalation mechanisms, event-triggered, anti-fragile, adaptive, self-optimising, self-configuring, scalable, and self-learning
- » **Adaptive processes and production:** self-configuring process automation as well as data acquisition systems; intelligent maintenance systems
- » **Adaptive facilities:** scalable, modularised and reconfigurable facilities, machines and tools; automatic adjustment to altered framework conditions, particularly to change of material and product, quantity changes and disruptions
- » **Bionics in production organisation:** resilience, adaptability, self-organisation and swarm intelligence transferred to the production processes
- » **Innovative forecast methods:** forecast and production planning; exploitation of the potential of suppliers and customers
- » **Maturity model industry 4.0 incl. benchmark databases:** procedure models and appraisal for determining the nominal and actual position of a business in the dimensions of usage of distributed intelligence and adaptive production systems
- » **Model region Upper Austria:** initiation and operation of a cross-organisation and cross-site industry 4.0 model region

Virtualisation: modelling, simulation and optimisation

The goal of this specialist area of the work is, by developing innovative modelling, simulation and optimisation approaches and, in particular, by combining the approaches, to facilitate the holistic consideration of processes and to exploit the optimisation potential regarding flexibility, resource requirements and efficiency. Furthermore, new demands regarding real-time capability and predictive modelling arise from the constantly increasing volatility of modern production scenarios.

- » **Integration of real and virtual data:** connection of real and virtual sensor values, sales and demand forecasts as well as tracking of supply components in real-time
- » **Prognosis modelling with the aid of large amounts of data (Big Data):** processing and structuring of the resulting amounts of data in order to make them usable for prognosis modelling
- » **Hybrid approaches to simulation and optimisation in real-time:** development of new, hybrid simulation approaches which fuse process data and sensor values from the real and virtual worlds to holistic, real-time and dynamic modelling in terms of cyber-physical systems
- » **Visualisation and analysis of process data:** Graphical preparation and analysis of process data from real and virtual sensor networks

Advanced manufacturing and generative production

The three megatrends: shortage of resources, contraction of product life-cycles and individualisation of products. This means: shorter development cycles and increasing competition for raw materials. The development of efficient and intelligent products will be more important than ever. More component variants with lower quantity numbers and simultaneously contracted innovation cycles require “generative production procedures” (3D printing, additive manufacturing) as key technologies.

- » **Expansion of infrastructure:** acquisition and installation of a new SLS-facility (Selective Laser Sintering) for the processing of titanium and aluminum alloys
- » **Connection of generative production to automated processes:** development of business models for the commercial utilisation of generative production; integration of SLS-facilities into the entire process chain
- » **Intelligent processes, products and tools:** development of sensors in products during generative manufacturing with the goal of making online monitoring possible; development of high speed generation also for automated processing of composite materials and hybrid components; development of new materials; processing of bio-plastics
- » **Quality and security standards:** encryption of data transmission between customers and manufacturers; integration of computer tomography for quality control of products

Achieve more through pioneering infrastructure

- » Blade sever system (concerning efficient execution of elaborate optimisation tasks)
- » CAVE for 3D visualisation and interaction (3x4m)
- » CONCEPT-model Z 510 (Z Corporation) (3D printing)
- » 3D digitising system ATOS 1 (GOM)
- » Turning machine CTX 400 E (DMG)
- » HeuristicLab (Framework for the usage of heuristic optimization methods)
- » HSC-3 axis milling machine (Niigata)
- » Hydraulic 4-pillar forming press, "Type HS4-63" (Firm: Dunks)
- » Industrial robots, i. a. Kuka KR15/2, Fanuc M-iA10, Stäubli RS80, ASEA IRB 1000
- » Plastics processing: blown film facility, thermoforming station, PA-CVD plasma nitriding facility
- » Laser cusing M1 (Concept Laser) (direct metal laser melting facility) – "3D metal printing"
- » MES-laboratory
- » Die-sinking machine ROBOFORM 350 and wire-eroding machine (FANUC)
- » SimGen (framework for DISP parameter optimisation and capacity planning)
- » Workshop production planning with RFID readers regarding nominal data acquisition
- » Programmable logic controllers (B&R, Rockwell, Allen-Bradley, i. a.)
- » Parts transfer system "TS2" (Firm: Bosch)
- » Laser cusing M2 with installation space heating 550°C (Concept Laser) (direct metal laser melting facility) – "3D metal printing" – installation space 250x250x280mm
- » FDM 3D printer with 1000W heat output, HAGE 3Dp-A2 – (3D plastics printing) – installation space 620x400x290mm
- » X-Ray computed tomography RayScan 250E, GE Nanotom and Bruker phase-contrast CT

Achieving more: current research projects

- » **HOPL** – K-project for Heuristic Optimization in Production and Logistics / COMET K-project / partners: voestalpine, Rosenbauer, MIBA, Gebrüder Weiss, carvatech, JKU Linz, University of Vienna, RISC Software, Profactor, V-Research
- » **Heureka!** – Josef Ressel-Center for Heuristic Optimisation / Josef Ressel Centers / partners: voestalpine, Rosenbauer, AKH Linz, carvatech
- » **GP** – Genetic Programming for the Design of Virtual Sensors / FWF (The Austrian Science Fund) Translational / partner: JKU Linz
- » **PROCOMPOSITE** – development of methods for the automation of operative production control from the point of view of sustainable management / FFG (The Austrian Research Promotion Agency) / partners: PROFACTOR, University of Vienna, Arbeitsleben, ABF Industrielle Automation, Schneegans- Silicon, ASMA
- » **ZPT+** – K-project for non-destructive testing and tomography / COMET K-project / partners: RECENDT, TU Wien, Borealis, Böhler Schmie-detechnik, Böhler Edelstahl, Delphi Automotive, EKB, FACC, ÖGfZP, voestalpine Stahl, Carl Zeiss Industrial Metrology, Kolbenschmidt, ZF Friedrichshafen AG
- » **Embedded CONWIP** – development of an adaptive production planning and control system / FFG Bridge / partners: BRP Rotax, KTM Kühler, MIBA Sinter Austria
- » **HPP** – robust strategies for Hierarchical Production Planning / FWF Translational / partners: Research, University of Vienna
- » **AdCAVE** – Adaptive assembly simulation and planning by means of CAVE technology / partners: MAN, Fraunhofer-Institut Magdeburg
- » **SimGen** – Simulation Generator for the simulation of production systems / FFG – COIN (Cooperation and Innovation) / partners: MIBA, Polytec, MARK, ZF
- » **ProdNet** – flexible production / Interreg – Upper Austria-Bavaria 2007-2013 / partners: Mechatronik Cluster, Deggendorf Institute of Technology
- » **FORMTOOLING** – deployment of rapid tooling processes for the manufacturing of serial forming tools, FFG – COIN
- » **VPSIM** – deep-drawing and DLC coating development, FFG / partners: MARK Metwall-warenfabrik GmbH, Rübzig

Achieve more: Studies with reference to the topic of production



School of Informatics, Communications and Media, Hagenberg Campus

Embedded Systems Design	M
Human-Centered Computing	M
Information Engineering and Management	M
Mobile Computing	B M
Secure Information Systems	B M
Software Engineering	M



School of Management Steyr Campus

Accounting, Controlling and Financial Management	B M
Digital Business Management	M
Global Sales and Marketing	B M
International Logistics Management	B
Marketing und Electronic Business	B
Operations Management	M
Production and Management	B
Supply Chain Management	M



School of Engineering Wels Campus

Automation Engineering	B M
Mechanical Engineering	B M
Materials and Process Engineering	B M
Innovation Engineering and Management	B M
Mechatronics and Business Management	B M
Product Design and Technical Communication	B
Process Engineering and Production	B

B – Bachelor's Degree Programme, M – Master's Degree Programme

At your service: Your contact partners



Head of "Intelligent Production" and "Distributed intelligence and adaptive production systems"

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