

Overview of Research Areas and Key Contacts

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Corporate Management

Digital Factory
page 5

Product and Quality Management
page 6

Factory Planning and
Production Optimization
page 7

Corporate Logistics and
Order Management
page 8

Remanufacturing
page 9

Automation

Robot Systems
page 11

Orthopaedics and Motion Systems
page 12

Production and Process Automation
page 13

Ultraclean Technology and
Micromanufacturing
page 14

Technical Information Processing
page 15

Testing Systems
page 16

Surface Technology

Coating Technology
page 18

Coatings and Pigments
page 19

Process Engineering of
Functional Materials
page 20

Electroplating
page 21

Application Center Rostock
page 23

Project Group Bayreuth
page 24

Project Group Zilina
page 24

Fraunhofer Austria Research GmbH
page 25

Foreword



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We understand the importance of keeping in touch with you.

Integration of the Research Institute for Pigments and Coatings (FPL) in the Fraunhofer IPA represented a major boost to our portfolio at the end of 2009. The FPL's activities have been consolidated in the new Coatings and Pigments department within the field of Surface Technology. This acquisition further strengthens our expertise as a fully-fledged systems provider for coating technology along the entire process chain. Taken together with our work in Corporate Management and in Automation, the Fraunhofer IPA now has 15 individual departments working in areas that cover key aspects of manufacturing engineering. This is reinforced by our close cooperation with two university partners: the Institute of Industrial Manufacturing and Management (IFF) and the Institute for Control Engineering of Machine Tools and Manufacturing Units (ISW).

Our creative network is rounded off by project groups in Bayreuth, Vienna and Zilina and our Applications Center in Rostock.

An overview of the research and related work carried out by our individual departments – and by our partners in the innovation network – can be found in a separate brochure. It also tells you who heads up each department, so you can always be sure you are speaking to the right person.

We look forward to discussing your interests in person with you.

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Companies can only survive today's dynamic and globally competitive environment if their business processes are perfectly coordinated and versatile. These processes not only support the rapid development of innovative and customer-oriented products – backed up by efficient and flexible production and assembly processes – but also the real-time flow of information and a need for flexible and stable logistics networks.

Our activities in the field of corporate management aim to achieve fully integrated coordination of the factors that make a company successful, while taking an all-encompassing approach to shaping relevant structures and processes. This is why we consistently apply a life cycle model to all our fields of work.

We apply this model not only to products – beginning with the generation of ideas and the creation of products through to product recycling – but also to factories and manufacturing systems. This means we take a close look at all phases involved in a life-cycle approach to location planning and factory operation, and to restructuring and relocation. This all-round approach is underpinned by the way the supplier and customer interface is organized, ensuring that the logistical structures and business processes are optimally harmonized with the company's in-house production processes and production logistics.



Digital Factory

Factories are complex, long life products which have to be permanently adapted to the changes of new products, markets and technologies. The digital manufacturing technologies and tools enable the acceleration of factory and process planning and the increase of the planning quality. The »Digital Factory« research group focuses on the research, development and application of methods, instruments and tools for modeling, simulation, visualization and optimization of products, factories, manufacturing resources and processes. The »Grid Engineering for Manufacturing Laboratory – GEMLab« is an innovative planning environment, integrating self-developed and state-of-the-art commercially tools. The factory data models, tools, simulation applications and computing resources are integrated and distributed by employment of grid technologies.

Factory Life Cycle Management

- Continuous and holistic planning of factory, equipment and processes along their life cycle: methodology for strategy, structure and process planning, factory operation and equipment management
- Integration of early phases of product and equipment design
- Methodology for evaluating and optimizing of factory performance and of site and network planning

Factory Data Management

- Digital modeling of networked and knowledge-based factories, equipment and processes
- Analysis and systematic structuring of factory data
- Systematized, continuous and standardized Factory Data Management

Digital engineering tools

- Synchronous investment and factory performance planning
- Selection of the ideal value-added production network
- Process-oriented calculation of variant costs and complexity costs
- Setting up of Key Performance Indicator system (KPIs)
- Static and dynamic material flow simulation of internal and external logistics

- Automatic and RFID-based identification and localization of products and resources (planning objects) in the production environment – context-aware applications
- Workflow Management Systems in planning and production environments
- Immersive VR applications and intuitive, multimodal interfaces
- Resource modeling using graph-based modeling languages

IT-based maintenance and asset management

- Maintenance planning and optimization
- Modern maintenance organization (e.g. TPM)
- Optimization of production equipment
- Increasing overall effectiveness of plant and equipment

Grid Engineering for Manufacturing

- Distribution and networking of data, tools, applications and computer resources in planning and production with the aid of grid computing technologies
- Holistic integration platform for the continuously integrated modeling, simulation, optimization and visualization of networked and knowledge-based production systems



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Projects, products and R&D services

»Digital Production« Innovation Cluster (Baden-Württemberg)

- Grid computing-based Factory Life Cycle management for holistic and continuously integrated factory, equipment and process planning

Networking the Digital Factory based on digital design using graphical modeling languages (Baden-Württemberg Foundation)

- Rule-based modeling of products and resources

Smart Factory – NEXUS (German Research Foundation, Collaborative Research Center 627)

- Context-aware applications for manufacturing

Web-based simulation services and business models for SMEs – simKMU (German Aerospace Center)

- Innovative and generic simulation environment oriented towards SMEs

Design of customer driven shoes and multi-site factory – DOROTHY (EU, FP7 NMP)

- Business and Factory Data Reference Model for multinational shoe manufacturers

Holistic, extensible, scalable and standard Virtual Factory Framework – VFF (EU, FP7 NMP)

- Generic and standardized reference model for factory life cycle and data management

New Industrialized Construction Process for transport infrastructures based on polymer composite components – Trans-IND (EU, FP7 NMP)

- Planning of energy-efficient infrastructure, materials and production relating to large FRP components

Maintenance restructuring for a pharmaceutical company (industry project)

- Restructuring and optimization of production equipment maintenance tailored to production requirements

Product and Quality Management



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In our industrial and research projects, we support you in developing and optimizing your products, processes and technologies – both over the entire product life cycle or within specific phases of that cycle. Management concepts enable us to optimize your products and services in relation to the cost, time, quality and environmental issues that span the entire business process. One of the greatest strengths of the department is its ability to develop methods that tackle specific problem areas faced by industry, calling on many years of experience in the application of such methods.

Integrated product and process development

- Design, optimization and control/monitoring of product development processes
- Method-based product and process development
- Risk management in product and process development
- Designing energy-efficient production processes
- Developing energy management systems and energy management manuals

Quality management

- Setting up and introducing QM systems
- Risk management in the production environment and supply chain
- Value-adding quality management

Product recycling and management of hazardous substances

- Design for the Environment (EuP)
- Pollution Management (REACH, RoHS, ELV, etc.)
- Material and product recycling concepts (WEEE, etc.)
- Planning recycling technologies and processes

Knowledge management

- Knowledge development, structuring and analysis
- IT systems for knowledge management
- Development of e-learning concepts

Developing and applying methods throughout the product life cycle

- Scenario techniques
- Technology roadmapping
- Quality Function Deployment (QFD)
- Theory of Inventive Problem Solving (TRIZ)
- Value analysis, Target Costing (TC)
- Life Cycle Costing (LCC)
- Failure Mode and Effects Analysis (FMEA)
- FMEA monitoring
- Fault Tree Analysis (FTA)
- Failure Process Matrix (FPM)
- Mechatronics FMEA
- FMEA for machinery and equipment (KV-FMEA)
- Statistical Process Control (SPC)
- Design of Experiments (DoE)
- Life cycle assessments and cumulative energy demand
- Measuring process efficiency and effectiveness

Projects, products and R&D services

Lean office/administrative value stream

- Drawing up company-wide implementation strategies
- Analysis and optimization of administrative processes on the basis of the value stream approach and lean principles
- Workplace design from the perspective of 5S

Development of safe mechatronic systems

- Implementation of the requirements designed to ensure »functional safety« as stipulated in IEC 61508 and ISO DIS 26262
- Development of methods and concepts for systems design, requirements management, risk analysis and test plan organization

Expert forums: product recycling and management of hazardous substances

- Providing a link between manufacturers, the recycling industry, local authorities, public authorities and legislative bodies (more than 60 companies)
- Current topics: WEEE, RoHS and German Electrical and Electronic Equipment Act (ElektroG), EuP, REACH and support in practical implementation

Development of voice applications and integration in company IT systems

- Platform-independent VOICE API interface
- Connection to CAQ systems
- Designing efficient voice applications

Factory Planning and Production Optimization



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Successful companies operate their factories at the threshold of what is technically and logistically feasible. We offer innovative solutions designed to boost the efficiency of factories and manufacturing processes, in order that you, too, rank among the successful producers. And that includes optimizing your on-going factory operations. We aim to provide you with a sustainable means of meeting your goals – low costs, high productivity and availability, efficient value streams, short lead times, and minimal stocks – while maximizing your responsiveness.

Integrated factory and logistics planning

- Location planning and site selection
- Evaluation and comparison of locations
- Factory layout development and general construction plans
- Logistics design and layout planning
- Developing production strategies and manufacturing segmentation
- Restructuring and reorganization

Production management and value stream mapping and design

- Analyses of potential and factory evaluation
- Using value stream mapping and design to boost efficiency and cut costs
- Process optimization with lean production systems
- Energy stream analysis and energy stream design
- Lean order management in the value stream
- Implementation and training

Assembly planning and assembly optimization

- Process planning and assembly system design
- Workplace design and planning of manufacturing equipment
- Material supply and logistics planning
- Support for implementation and commissioning

Asset management and resource efficiency

- Maintenance planning and optimization
- Total Productive Maintenance TPM
- Optimization of production assets (TCO, LCC, Lean Assets)
- Increasing Overall Equipment Effectiveness OEE
- Increasing energy efficiency
- Setting up key performance indicator systems

Methods and tools

- IPA Planning Table for layout planning
- 3D modeling and visualization
- Simulation for factory planning and factory operation
- EMUL: Design and dimensioning of assembly systems
- POC: Process-Oriented Calculation of variant costs and complexity costs
- Lean Energy Toolbox

Training courses and seminars

- Value stream mapping and design
- One-piece-flow assembly
- Optimizing setup times – SMED
- Order and cleanliness – 5S

Projects, products and R&D services

Reducing inventory by realigning the production process

- 50 percent reduction in lead time and inventory plus enhanced logistics efficiency at a manufacturer of semi-finished copper products
- Complete realignment of the production process
- Key leverage: product-oriented segmentation, process-oriented organizational structure

Development of a production system for a manufacturer of power tools

- Standardization of processes at all sites with the aid of a production system
- Increase in efficiency of up to 30 percent
- Gathering and evaluation of different methods for all logistical and organizational issues (e.g. material supply in the workplace)
- Derivation of standards based on size of location and product range

Introduction of value stream mapping and design

- Compact training workshop with first-time application
- Pilot projects with implementation based on the lean factory
- Training in how to apply lean thinking

Increase in productivity of 20 percent through value stream-optimized assembly and logistics

- High-mix capital goods
- Reducing lead time by 75 percent
- Safeguarding results through simulation
- Implementation during ongoing production

Optimizing the maintenance of production assets

- Assessing risks of complex assets in the process industry using »Damage Mode and Effect Analysis (DMEA)«
- Higher rates of equipment availability
- Using cost benefit analysis to optimize the maintenance budget and to monitor maintenance more efficiently

Corporate Logistics and Order Management



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Flexible order management and production – underpinned by robust supply chains for information and materials – are critical to a company's success. Our goal is to help you design a highly efficient value chain in line with your specific objectives. We contribute our extensive experience to address your specific needs. This experience encompasses all-round expertise in logistics and order management, from design through to production, including administrative tasks such as procurement and sales, and extending to in-depth familiarity with production networks.

Network logistics

- Optimization of performance through targeted network planning and control
- Optimum distribution of value-added in manufacturing networks
- Efficient business processes for inter-enterprise supply chain management
- Modeling, visualization and simulation of production and logistics networks
- Feasibility studies, planning and implementation of supplier parks, industrial parks and supply centers

Supply and supplier management

- Supplier selection taking into account cost, risk and value creation
- Supplier management and development
- Planning of supply processes to improve supplier integration
- Variant management

Production logistics

- Efficient order management processes
- Lean organization of order and order processing
- Design of production logistics
- Implementation of real-time production and logistics
- Selection, introduction and optimization of production information systems

Methods and tools

- Simulation-based factory and network design
- Software-based logistics cost analysis
- Software-based variant cost analysis
- Logistics technologies
- Software systems (ERP, SCM, PPC, APS, MES, product configuration tools)
- Business process optimization
- Training methods and coaching

Projects, products and R&D services

Increasing the efficiency of production networks

- Standardized order management and optional distribution of value-added over multiple sites
- Efficient design of processes and organizational structures
- Selection and integration of supporting IT systems

Customized supplier management

- Strategic supplier selection
- Design of critical interfaces in development and series production processes
- Industry know-how extends from mechanical engineering to the automotive industry

Reliable supply chain solutions

- From traditional methods (MRP, lot size model) to JIT/JIS
- Strategies for managing supply chain risks
- Tailoring supply chain processes to ensure smooth production start-ups

Lean order management

- Across networks and locations
- From analysis of organizational requirements to selection of software systems through to logistics staff training

Rapid visibility of logistics costs

- Cutting logistics costs with the »Stuttgart Logistics Cost Model«
- Software-based analysis at product and process level

PIT: Producing in Takt Time – the customized production system for one-off and small-batch manufacturers

- Lean, customized order management
- Efficient structures on the shop floor

Remanufacturing



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The reconditioning of automotive assemblies on an industrial scale (e.g. engines, gearboxes, ignition systems, steering systems, mechatronics assemblies, etc.) – generally referred to as remanufacturing – is currently experiencing worldwide growth. We are familiar with the latest global trends in remanufacturing – and indeed help shape them – so you can be sure of quickly acquiring a level of know-how and expertise comparable to that of international technology and market leaders in this field. Drawing on our extensive experience, we can guide you through the entire process – from the business development of remanufacturing, to technical implementation of the process steps involved, through to cost-effective remanufacturing in your own company. Our method is equally applicable to automotive spare parts as it is to machinery and equipment.

High-tech solutions for all five steps in the remanufacturing process

- Disassembly
- Cleaning
- Testing and diagnostics
- Reconditioning
- Reassembly

Technology and strategy

- Market analyses
- Product evaluation for remanufacturing
- Life cycle studies
- Technical feasibility studies
- Profitability studies

Production organization

- Assembly-line production for small batches
- Successful management of high-mix environments using flexible production structures
- Reducing the complexity of production planning and production control
- Team-oriented production and remuneration
- Targeted automation of sub-tasks
- Continuous and coordinated optimization of individual areas

Factory and layout planning

- Collecting data and key performance indicators
- Ideal case and reality-based planning

- Optimization of rough and detailed layouts
- Value stream analysis and design
- Warehouse planning and material flow planning
- Material flow simulation
- Organization of work
- Workplace design
- 3D visualization

Lean remanufacturing

- Value stream mapping and design
- 5S
- SMED
- Standardization
- Separating logistics from production
- Visualization
- Segmentation
- Leveling, aka Heijunka

Used parts logistics and the supply chain

- Supply chain, material planning and inventory concepts
- Transport, transfer, storage, conveying and handling processes
- Process planning, material flow planning and simulation
- Production planning and control
- Procurement strategies
- Procurement and supplier management
- Make-or-buy analyses
- Risk management

Projects, products and R&D services

Development of technologies for the testing and diagnosis of remanufacturing in automotive mechatronics and electronics

- Selecting and procuring reference products
- Optimizing used part logistics
- Carrying out test runs
- Developing diagnostic technologies

Automotive powertrain remanufacturing

- Market analysis in the field of powertrain remanufacturing
- Product-based development of processes and technologies for remanufacturing
- Design and construction of test beds
- Life cycle analysis
- Launch and development of a new business line
- Quality management and Six Sigma
- Training and qualifying employees

Development and production of a test bed for the remanufacturing of power steering pumps

- Hardware development
- Software development
- Production and assembly

Thermographic diagnostics for remanufacturing of power steering pumps

- Pattern recognition and error detection
- Automation of testing and diagnostics
- Construction of a versatile test bed

Development of high-temperature cleaning for diesel particulate filters for remanufacturing

- Establishment of a cleaning research unit
- Performance of tests
- SEM imaging
- Implementation at industry partner's site

»Automotive Diagnostics« technology alliance

- Evaluation of breakdown statistics

Automation

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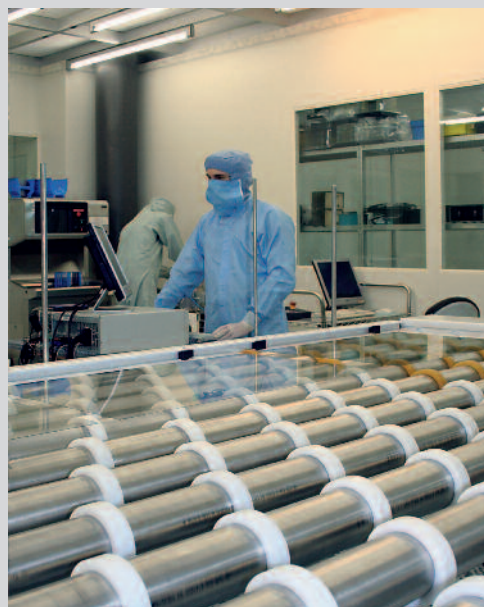
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More complex products and processes, combined with shorter product life cycles, are placing ever-greater demands on the flexibility, availability and cost-effectiveness of automation solutions.

Our automation specialists develop and implement automation systems and components for: intralogistics, processing, handling and assembly; the » lab to product« process; clean room manufacturing and micro fabrication, and for »rapid manufacturing«. We develop and apply innovative automation solutions in the following areas:

- Industrial robots
- Service robots
- Flexible automation
- Human-machine cooperation
- Signal and power transmission
- Shop floor IT for the semiconductor industry
- Reverse engineering and 3D data processing
- Measurement and test technology, in particular »Industrial image processing«
- Process monitoring and digital signal analysis for quality assurance
- Clean manufacturing technology
- Micro-assembly technology
- Micro and nano production





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The »Robot Systems« department designs automation solutions for industrial applications and for the services sector. Key technologies are developed and implemented for innovative industrial robot systems, service robots and intelligent machines.

Thanks to 40 years of experience in robotics and automation, multi-disciplinary teams, a uniquely qualified network, comprehensive know-how and superbly equipped laboratories and workshops, we are able to offer an impressively wide range of services:

Key technologies for industrial robots

- Development of grippers and tools
- Development of software for object-positioning identification and for process monitoring and control
- Development of new programming systems (using speech, graphics, haptics)
- Development of safety systems for robots
- Development of controllers for tools, robots and systems
- Development of robot kinematics
- Simulation and visualization of robot cells and automated material flow systems

Applications for industrial robots

- Robot cells for 3D processing
- Robot cells for assembly tasks
- Robot cells for handling tasks
- Robot cells for intralogistics
- Human-robot collaboration/ assistance systems
- Cooperating (multi-)robot systems

Key technologies for service robots

- Controllers, software architecture and system integration
- Autonomous navigation
- Integration of mobile service robots in the home infrastructure (ambient intelligence)
- Manipulation in dynamic environments
- Recognition and understanding of surroundings
- Image processing, 3D sensor systems and learning
- Intuitive user interfaces
- Embedded control
- Innovative drive concepts
- Lightweight robots

Service robot applications

- Household assistance
- Rehabilitation
- Entertainment
- Small robots for the home and garden
- Monitoring and inspection
- Façade cleaning
- Farming
- Robot swarms

Projects, products and R&D services

Our services

- Analyses of potential; market and feasibility studies
- Preparation of requirements and technical specifications
- Simulations and visualizations
- Development of automation components and systems
- Prototype development
- Implementation and optimization of existing automation and robot systems

WiMi-Care: Supporting the Knowledge Transfer for a Participative Design of the Care Work Sector through Microelectronics. A joint research project with the German federal ministry of education and research (BMBF)

- Needs-based development of application scenarios for the use of service robots to provide support in the care sector
- Implementation in the form of the Care-O-bot® 3 robotic home assistant, including evaluation in a residence for the elderly

Trumpf reference project: Development of a software tool for planning automated sheet metal forming cells with direct access to storage (industrial project)

- Development of a simulation-based system configurator to verify technical feasibility
- Additional integration of a module for simulating equipment costs and evaluating cost efficiency
- Result: a tailor-made software solution in support of product sales

Amadeus reference project: Autonomous Manipulator Device for Strengthening Manufacturing in Europe (EU & BMBF)

- Development of an autonomous mobile robot featuring an integrated manipulator for production environments
- Integrated functions: Quality testing and handling tasks such as loading and unloading machines, bin picking, etc.

Orthopaedics and Motion Systems



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The Orthopedics and Motion Systems department develops technical solutions for measuring, monitoring and generating movement in orthopedic and non-medical industrial applications.

This not only encompasses research and development issues relating to technical orthopedics and orthopedic surgery, but also motion detection for industrial and consumer electronics applications.

The department's work is performed by an interdisciplinary team of specialists drawn from the fields of mechanical engineering, electrical engineering, mechatronics, cybernetics, orthopedic and medical technology, biology and medicine.

Key technologies for motion control systems

- Sensor systems for motion detection and for biometric measurements
- Sensor systems for recording bio-signals
- Sensor fusion concepts and adaptive (self-learning) systems
- Adaptive fusion and filter algorithms for motion detection
- Inertial object tracking for low-cost navigation
- Evaluation and calibration technology for navigation systems
- Design of actuators for medical systems
- Implementation of energy harvesting concepts involving human beings

Applications for motion control systems

- Human e-mobility
- Activity in Daily Living (ADL monitoring)
- Intelligent prosthetic control systems
- Recognition and adaptation to changing terrain
- INS-based motion analysis
- Computer Assisted Surgery CAS
- Motion detection in the production environment and in consumer electronics
- Training feedback systems

Key technologies for biomechanics

- Simulation methods for biomechanics
- Development of complex kinematics for natural motion sequences and motion sequences that imitate nature
- Creation and implementation of lightweight design concepts
- PCU technology for endoprostheses
- Functional test systems for orthopedics technology
- Test environment for human motion analysis
- Application research into bionic principles

Applications for biomechanics

- Methods/systems for high-tech orthotics and prosthetics
- Instruments for accelerated and quality-assured rehabilitation
- Minimally invasive methods of spinal column treatment
- Implant engineering and development of innovative surgical instruments
- Rehabilitation concepts and prevention concepts
- Development of test systems for biomechanics
- Training aids for competitive sports

Projects, products and R&D services

Reference project for the company ABS Peter Aschauer: Remote wireless trigger device for avalanche airbags (industrial project)

- Development of a remote wireless and group-specific trigger facility for avalanche airbags
- Modular and expandable life-saving system
- Radio-controlled group member trigger device

Reference project for the company Martin S.+A.: Bone punches based on bionic principles (industrial project)

- Development of a »resected specimen-swallowing« bone punch
- Design based on the mouth of the anaconda
- Far less effort required for the punching process

Fraunhofer Adapt Pro research project

- Research into concepts for voluntary control of prosthetic leg components
- Development of new types of sensor arrays and adaptive fusion algorithms for reproducible EMG signals designed to enable a real-time-capable human-machine control system
- Deployment as a human-machine interface in a range of industrial applications

Specialist R&D services

- R&D consulting services and contract research for orthopedics
- Development of biomedical mechatronic systems
- Contract research and feasibility studies for motion detection
- Testing expertise: Functional testing of robots, including testing of orthotics and prosthetics
- Development of sensor/actuator concepts
- Applying bionic concepts to solve technical issues
- Diagnostic, treatment and rehabilitation methods for orthopedic and trauma surgery
- Research operating room for developing new surgical procedures
- Sports engineering

Production and Process Automation



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Enhanced quality, accelerated execution and a higher throughput rate through automation: Innovative automation solutions can help optimize processes not only in the traditional production environment but also in research, testing and development laboratories. We develop automation solutions for these applications that extend from the design concept right through to short-run manufacturing. We specialize in biopharmaceuticals and medical devices.

»Mechatronics and process engineering«, »Measuring systems and test facilities« and »Networked systems« represent the three pillars of our expertise. They enable us to offer fully comprehensive automation solutions for equipment and tool engineering, process engineering, measurement systems and test engineering.

Mechatronics and process engineering

The task of automating a production process requires a constant stream of faster, more flexible and more cost-efficient solutions for handling and process engineering. Our work focuses on finding new methods and systems for handling and processing materials, in particular biological materials, which are sensitive and seldom retain their shape. We design, plan and construct mechatronic systems and components for our customers, ranging from individual parts for large pieces of equipment to microsystem components. Thanks to our unique infrastructure facilities, we can perform comprehensive testing – including tests involving biological materials – at a very reasonable cost, ensuring that our customers get the best possible final result.

Measuring equipment and test facilities

Greater flexibility, enhanced quality and improved traceability are some of the key reasons for applying innovative measurement techniques. Particularly in our key research areas of bioproduction, laboratory automation and medical devices, suitable commercial sensors and measuring equipment are often not available. This has led us to develop measuring systems and modules that enable equipment

and systems to operate automatically. We also develop test facilities capable of performing test runs automatically – to replace manual test processes, for example, or to conduct environmental audits.

Networked systems

An increasing demand for more flexible production plant, equipment and processes leads to a proliferation of individual components and functions. The resulting complexity must be handled reliably by the systems used to transmit signals and power and to effectively monitor control procedures. We develop concepts, hardware and software components for control systems, and can also provide complete packages that include transmission components. We specialize in solutions for complex system architectures with real-time requirements and solutions that require high-quality transmission.

Key focus: Bioproduction

Typical tasks in the field of bioproduction technology include optimizing laboratory processes using automation solutions, scaling up production processes for which no automation solutions are currently available, and designing and supporting the implementation of entire production systems. Our main focus is on developing innovative automation solutions that can be

deployed as equipment or modules in laboratories or plants. Development projects include work on systems for cell and tissue (skin) production, new metering solutions, techniques for rapid, cost-effective biochip production and for changing the format of microtiter plates.

Key focus: Medical devices

In the field of medical devices, we primarily specialize in applying automation technologies to effectively link up intervention and diagnostics. We have worked on numerous projects to develop instruments, equipment, effectors and mechatronic assistance systems for surgery, including tool-changing systems for minimally invasive surgery, wireless endoscopes, new microsystems for bypass anastomoses and a range of robots and manipulators. In the field of computer assisted diagnostics, we specialize in developing equipment for analyzing and describing organic states inline, i.e. directly within the operating theater. Example projects include fluorescence spectroscopic and biochemical methods of intra-operative tumor detection as well as endoscopic 3D laser scanning. We also tailor navigation systems to provide front ends for these types of medical devices and design user interfaces for use in the clinical environment.

Ultraclean Technology and Micromanufacturing



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The Ultraclean Technology and Micromanufacturing department specializes in the manufacturing technology issues typically encountered in miniaturized and contamination-critical production processes. The department's work ranges from the design of production equipment through to industrial implementation and production support. The department's R&D services focus on cleanliness and cleaning technology, contamination measurement systems, microassembly, plant development, production IT, logistics, production planning and production optimization.

Manufacturing processes

- Selective cleaning: CO₂, laser and plasma cleaning
- Contamination control on surfaces, in liquids and in gases
- Transport and component supply: handling of miniaturized and contamination-critical components
- Microassembly: gripping and joining of miniaturized and contamination-critical components
- Micrometering of viscous media

Production equipment

- Plant and equipment layout: material flow simulation, cleanliness-compliant design and materials suitable for cleanroom use
- System components and tools: intelligent tools and feed systems
- Equipment automation: sensor integration and equipment control
- Testing equipment: systems for surface testing and contamination control
- Qualification: cleanliness certification for equipment and material pairings

Series production for contamination-critical applications

- Analysis: process chains and manufacturing processes
- Layout planning and IT concepts: cleanroom planning, material flow simulation, APC framework, MES evaluation, fab scheduling
- Equipment procurement and production start-up (ramp-up): specification, testing and integration of equipment
- Production optimization: cleanliness technology, material flow, production control (MES)

Specialist R&D services

- Studies: trend and market potential; analysis of competitors, feasibility and cost
- R&D consulting services: selection of suppliers and production service providers, miniaturization potential, sources of funding
- Training: cleanroom personnel training, user seminars (VDA volume 19)

Projects, products and R&D services

Production concept for photovoltaics

- Handling of photovoltaic wafers and substrates
- Layout concepts for high-volume production
- Line control (MES/SPC)

XPRESS (EU Integrated Project – IP)

- Adaptive control of manufacturing processes
- Continuous flow of information on process parameters and quality data
- Integrated system for simulation and planning, control level (shop floor) and equipment automation

CFD – flow simulation

- Cleanroom-compatible system and equipment design
- Verification and optimization of existing systems and equipment
- Precise configuration and arrangement of components and equipment

Assembly cleanliness in automotive manufacturing (industry association)

- Establishment and standardization of procedures and measurement methods for evaluating assembly contamination and the influences on surroundings of plants, personnel or conveyor technology

Minimal quantity metering technology (μl – nl – pl)

- Feasibility studies and customized applications
- Process automation and system development

Technical Information Processing



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Nowadays it is virtually impossible to imagine production and automation without data processing. Drawing on the technologies of image processing, digital signal analysis and additive manufacturing, the »Technical Information Processing« department performs basic methodological research and implements application and systems solutions. Interdisciplinary teams develop innovative solutions for applications in the realms of measurement and test engineering, quality assurance and quality forecasting, additive manufacturing and printing technology, and automation. Our state-of-the-art laboratories offer a range of services including consulting, design, development, implementation and metrological analysis.

Image processing

Basic research

- Pre-processing, segmentation and texture algorithms for 2D/3D image and data evaluation
- Measurement and best-fit algorithms for 2D/3D data
- Calibration, data fusion and data correction methods for 2D/3D sensor and multisensor systems
- Algorithms for 2D/3D image sequence evaluation
- Metamodels and data structures for 3D object modeling

Applications

- Error detection in textured/structured surfaces
- Test engineering in NIR and IR regions for solar cell manufacturing
- Measurement and testing software for quality assurance and computer tomography
- Object recognition and object-positioning identification for automation

Digital signal analysis

Basic research

- Modeling and optimization of technical processes
- Self-learning classification and prediction of technical signals
- Adaptive process control
- Reconfigurable sensor networks
- Deployment of mobile process testing technology

Applications

- Sensor-based process optimization
- Quality predictions for cyclical production processes (e.g. injection molding and ultrasonic welding)
- Adaptive sensor reconfiguration
- Energy monitoring in manufacturing
- Optimizing energy efficiency in technical processes

Additive manufacturing technologies

Basic research

- Design and load-optimized configuration of components
- Topology optimization and integration of bionic functions
- Automation of additive manufacturing processes
- Development of 2D/3D inkjet printing processes (DoD, piezo printing)
- Development of 2D/3D laser printing processes (xerography)

Applications

- Product design for orthopedics and medical devices
- Customized lightweight handling systems
- Printing technologies for processing nano and micro suspensions
- Printing technologies for manufacturing functional surfaces/structures
- Biochips from printers
- Development and implementation of non-standard, customer-specific systems

Projects, products and R&D services

Our range of services

Consulting, studies and measurement services

- Advice on designing solutions and systems
- Preparation of requirement and technical specifications
- Preliminary investigations and feasibility studies
- Component measuring using computer tomography software
- Creation of software architectures
- Development of customer-specific algorithms
- Implementation of customer-specific applications, systems and prototypes
- Methodical product design and construction
- System design and fabrication of prototypes
- Delivery of customer-specific systems

FlexKonfig (joint research project with the BMBF under the »KMU-Innovativ« scheme)

- Intelligent configuration system for flexible automation solutions in the production process
- Development of a modular assistance system enabling the flexible design, configuration and parameterization of sensor-based automation applications

EcoExtrude – Energy-efficient extrusion systems (BMBF project)

- Flexible energy monitoring with component-level data acquisition
- Identification of relationships between energy consumption and other operating data and development of a monitoring system designed on that basis
- Integration in a system for manufacturing roller blind sections

microprint (Fraunhofer Group project with the BMBF)

- Development of a flexible deposition process for microparticles and nanoparticles based on inkjet printing technology
- Development of an application for individualized ceramic decoration, gas sensor production with nanoscale ceramic functional materials and high throughput production of protein biochips

Testing Systems



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The »Testing Systems« department develops solutions and automated systems for industrial applications based on the most up-to-date methods of testing available. The use of thermography and shearography as test methods caters to complex and highly-specialized non-standard equipment. As well as non-destructive testing solutions and their technical implementation, the key focus of our work is on handling technology and carefully tailored mechanics.

Thanks to its superb grasp of basic physics and its expertise in developing suitable methodologies, the department is able to offer innovative, fully-integrated development services.

Key technologies for measurement and testing applications

- Development of methods and techniques for determining deformation and deformation gradients of surfaces
- Non-destructive diagnostics of semi-finished products and components using ultrasound excited thermography and induction excited thermography
- Use of optical and vibration excited shearography to quantitatively determine adhesion and cohesion properties of composites
- Modeling and simulation of joining and composite properties of composites and compound materials
- Development and construction of test equipment for rail wheel and wheelset testing

Key technologies for machine development

- Design of non-standard solutions for ultrasonic, thermography and shearography testing of components
- Development of non-standard equipment for process-integrated, non-destructive component diagnostics
- Development of customized control systems including maintenance and diagnostic tools

- Development and design engineering of tools for cutting and punching applications for adiabatic cutting

Services

- Consulting services in the field of process-integrated quality assurance
- Feasibility studies for material selection and manufacturing technologies
- Feasibility studies for functional coatings
- Planning, supporting and performing material analyses
- Shock and vibration tests
- Continuous oscillation and tribology tests
- Task definition, preparation of requirements and technical specifications
- Development of measuring and test concepts for non-destructive testing
- In-situ customer support for industrial implementation of test solutions
- Planning and designing non-standard equipment and developing suitable control systems
- Implementation of complex automation solutions
- CE-compliant machine and plant design
- Concept studies and development of assessment criteria for test methods

Projects, products and R&D services

BONDQUANT reference project: Quantitative determination of the adhesion and cohesion properties of glued compounds

- Development of a system for non-destructive and process-integrated diagnostics of adhesive joints
- Quantitative condition monitoring during use

BARRIER reference project: A new concept for improving the barrier properties of commodity polymers in thick sections

- Development of extrusion tools with integrated magnetic field generators
- Performance of material investigations to check barrier function

Project: Non-destructive testing of the quality of clutch plates

- Determining the properties of the adhesive joint between the steel backing and the friction lining
- Detection of delamination at adhesive interfaces with reduced adhesion

Project: Non-destructive testing of steel girder segment joints

- Examination of sample segment joints of different dimensions
- Planning of a shearography, thermography testing station for use in production

Project: Multi-spindle woodworking machinery center

- Development of the CNC machining center
- User-oriented HSC woodworking machining center
- Multi-parallel machining of blanks in a fully automated manufacturing process

Project: Wheel rim and solid shaft test facility

- Combined wheel rim and shaft test facility
- Automation concept tailored to the application and material flow

Surface Technology

The coating and modification of surfaces is increasingly evolving into an advanced interdisciplinary technology covering a complex array of different processes and equipment. It encompasses well-established systems as well as high-tech components such as nanomaterials and intelligent, selective, precisely dimensioned final coatings.

The largely empirical approach taken until now in the design and monitoring of surface modification and coating processes will be transformed in the years ahead by the need to draw on innovative developments that can meet the demand for high quality, novel products. Performing efficient R&D work to develop techniques for surface technology that offer high process reliability and reproducibility will require close collaboration in the development of materials, substrates, treatment processes and equipment.

While increasing demand for top-class, innovative product quality and coating quality standards, new approaches are also being driven by a determination to achieve reproducibility, process capability, environmental protection and occupational safety in the sphere of surface technology. Sustainability standards require that this technology discipline adopts a socially responsible and consistently resource-efficient role within companies, for the benefit of society as a whole.



Coating Technology

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Process Engineering of Functional Materials

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Coating Technology



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Our R&D activities are targeted towards developing coating processes with top-class process reliability by closely matching material properties with coating technologies. We primarily focus on planning, developing, modeling and simulating coating processes and equipment and then implementing the results in a form that is tailored to the specific production environment. By paying careful attention to quality assurance measures, this approach enables us to achieve cost-effective, resource-friendly and energy-saving surface technologies.

Integrated analysis and implementation of surface technology processes and plants

- Planning and optimizing innovative, cost-effective coating processes and plants
- Analyzing weak points, identifying potential savings and selecting suitable technologies
- Recycling paints, minimizing energy consumption
- Providing personnel with information and training

Developing and testing coating processes and equipment tailored to specific production environments

- Designing pre-treatment processes
- Designing low-loss spray painting technologies
- Electrostatic painting of wood, plastic and other parts
- Application of powder coatings, for example on non-metallic or heat-sensitive components
- Production-oriented processing of nanomaterials
- Optimizing radiation curing of coating layers
- Verifying R&D results in the pilot plant under real production conditions

Modeling and simulation of coating techniques

- Numerical and practical testing and optimization of coating processes, air streams in booths and dryers, coating deposition through spraying and electrodeposition, curing in circulated air and through radiation

Supporting quality assurance

- Testing of paints, coatings and components
- Analysis of defective coatings
- Monitoring and control of coating processes and process baths
- Measuring the performance of coating equipment

Projects, products and R&D services

CoaTway® – A computer-assisted method

- CoaTway® helps you plan and optimize coating processes and equipment
- Focus on strategic optimization of technology, quality and costs
- Analysis of processes, plant components and coating quality in pilot plants under conditions similar to those of real production

TransApp® – Powder coating without spray guns

- Inline powder coating processes with ultracompact coating modules, throughput rates of up to approx. 150 m/min
- New applications for powder coatings cured by UV and electron beams

Coating facilities offering conditions similar to those of real production

- Coating line on an automotive industry scale for experiments and analysis of paints, equipment and systems
- MicroCoat system for precise, selective coatings with zero paint loss

DLS – Dynamic coating simulation

- Simulation tools for depicting and predicting painting processes
- Areas of application: air streams in painting booths and dryers, spray processes with/without electrostatics, air circulating curing and radiation curing of paint coats, plus adhesive, thickener and seam-sealing applications

Coatings and Pigments



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Application-oriented basic research and development in the field of paints, pigments and other components of organic coating systems has a long tradition at the Stuttgart site: The Forschungsinstitut für Pigmente und Lacke e.V. (FPL) – or »Research Institute for Pigments and Coatings« – thrived as a separate entity for almost 60 years before finally being integrated in the Fraunhofer IPA as the Coatings and Pigments department at the end of 2009. The Fraunhofer IPA now covers the entire process chain of surface technology, with the Coatings and Pigments department specializing in the fields of raw materials, coating materials and coating techniques.

Pigments and coatings

- Development of concepts for new types of particles and binders
- Surface design and engineering of nanoscale fillers and pigments
- New types of binders and coatings that offer high resistance to weathering and chemicals
- (Quick) Short term tests to evaluate nanoparticles and binders
- New raw materials for coatings
- New types of coatings with special functions
- Optimized development cycles and quality control

Applied product and testing concepts for paint technology

- Developing structure-property relations in surface preparation technologies, coating raw material technologies and coating technologies
- Development of a test method for paints and coatings
- Testing and simulation of the long-term behavior of coatings
- Development of new concepts for protecting coatings against corrosion, and for clean facade coatings
- Benchmarking for all stages of coating technology and surface technology
- For defective coatings: investigating causes and generating solutions for the coating process

Physical concepts of coating technology

- Evaluation of physical properties for new coating functions
- Developing methods designed to safeguard the quality of coatings, paints and coating raw materials
- Ongoing development of physical measurement methods
- Systematic research into the physical mechanisms of functional coatings
- Derivation of structure-property relations for the prediction of long-term behavior and for simulations
- Coatings with new functions
- Paring down the variety of testing techniques to generally accepted test methods

Development and application of coating-related analytical test methods

- Elaboration and execution of physical-chemical analysis programs designed to assess raw materials for paints, and to investigate coatings/coating materials and synthetic materials
- Diagnostics, understanding of failure mechanisms
- Customizing and developing standardized measurement methods for coating applications

Projects, products and R&D services

- Contract research and development in the fields of coating raw materials, pigments and paints
- Contract research and development in the field of surface-related test engineering
- Determining failure mechanisms in the coating sector
- Measurement and testing service in the field of coating raw materials, paints and coatings, including surface-related analysis
- Performance of accredited test methods

Reference project: »Optimizing the scratch resistance of automotive clearcoats«

- Research into how scratch resistance is affected by relationships on a molecular level
- Elaboration of optimization concepts
- Provision of test methods for basic experimental research (CSM nanoscratch)

Reference project: »Intrinsic laser marking«

- Development of a concept for marking coatings and other polymer materials with the aid of laser technology
- Anti-theft protection and intrinsic product labeling

AiF and BMBF projects in the field of coating and surface engineering technology

- Nanoparticulate components for corrosion protection and new product attributes
- Corrosion protection with aqueous coating systems
- Basic principles of UV-curable coating materials (including printing inks) for plastic and metal substrates
- Basic principles of the correlation between viscosity and material properties
- Basic research into correlations between paint/polymer structure and performance characteristics such as adhesive strength
- The impact of weathering on the product and performance characteristics of coating systems

Process Engineering of Functional Materials



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Nanomodified materials enable the development of innovative products – and carbon nanotubes (CNTs) look set to play a key role in this field thanks to their unique characteristics. The key to tapping into this new class of materials is to find reliable ways of processing and applying CNT composites. Our work focuses on the most commonly used inorganic and organic matrices of a wide range of viscosities. In addition to process engineering, our department also offers material-specific expertise in system integration – particularly in the design, simulation and energy management of the finished system.

Developing processes for functional materials

- Theoretical study of feasibility
- Systematic selection of materials
- Preparation of specification requirements
- Functionalization and preparation of raw materials
- Optimization of manufacturing methods for new types of composite materials, particularly in the fields of sintering, hot-pressing, casting, mechanical dispersion, ultrasonic dispersion and extrusion
- Simulation and optimization of manufacturing methods for nanomodified dispersions
- Manufacture and evaluation of test specimens
- Quality assurance and appraisal of quality by means of mechanical and electrical materials testing

Integration of functional materials

- Design of overall systems and layout of components
- Software development, preparation of printed circuit boards and energy management systems
- Development of electroding and bonding methods
- Development of thermal and thermodynamic energy harvesting systems
- Design and construction of energy-efficient DCDC boards

- Development of specific test methods
- Development of CNT layers for sensor applications
- Development of CNT composite actuators
- Construction of functional models and prototypes

Application of functional materials

- Energy-optimized CNT heating elements for automotive and consumer applications
- CNT-reinforced structural materials for lightweight construction applications
- Electrically and thermally conductive layers and materials for automotive applications
- Simulation and assembly of fluid and thermo generators
- Development of energy-optimized CNT actuators
- Development of energy self-sufficient CNT sensors

Projects, products and R&D services

Our services

- Consulting services
- Systematic selection of materials
- Simulation and optimization of process parameters
- Feasibility studies and preparation of business plans
- Construction of functional models and prototypes
- Development support and implementation

Reference project: Design IT – Design, synthesis, growth and application of carbon nanotubes, nanofibers and nanoarrays for industrial applications (EU Integrated Project – IP)

- Development of an economically and environmentally optimized method of manufacturing high-quality nanotubes
- Manufacture of nanotubes with defined electrical and mechanical properties
- Development of sensor/actuator prototypes

Reference project: Völkl – Development of a production-ready method of integrating MWCNT compounds in a tennis racket (industrial project)

- Development of a CNT-based semi-finished product for the sport sector
- Scaling the semi-finished product manufacturing process to targeted dimensions suitable for industrial production
- Integration of the composite in sports equipment

Reference project: BMBF Hightecnano – Development of a CNT-reinforced ceramic fuser roller suitable for industrial production (BMBF project)

- Specification of requirements for an ecologically sound and energy-saving fuser roller as a replacement for oil-based systems
- Development of a manufacturing method for CNT-reinforced aluminum-oxide ceramics
- Construction of a prototype and analysis of the electrical properties of the new generation of rollers



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The successful use of electrochemical methods for coatings and in component manufacture not only requires that the technical characteristics of materials and their geometric properties be defined with ever greater precision; the application of these methods also calls for reproducible technologies based on robust and reliable processes. The Fraunhofer IPA's Plating Technology department responds to these requirements by ensuring strict, step-by-step adherence to the complete R&D chain, from process development right through to industrial systems engineering. This broad understanding, combined with our focus on electroplating, is of distinctive advantage when evaluating the benefits of the Fraunhofer IPA's plating technology expertise.

Process development and modification

- Analysis of requirements' profile from the perspective of materials science, the production environment and the specific application
- Definition of suitable material/layer structures (e.g. alloy, multilayer, dispersion)
- Development of a material deposition process; development of theoretical and experimental chemical and physical process parameters with a view to implementation
- Calculation of process boundaries and associated analytical techniques
- Portfolio of wet-chemical methods used in isolation or in combination with PVD techniques

Process chains

- Analysis of substrate materials, process requirements and production environment
- Experimental testing of the defined process chain

Quality assurance, damage analysis

- On-site logging of actual status
- Wet-chemical analysis of the relevant electrolytes and active components
- Materials science analysis of substrate and layer
- Derivation of possible causes of faults and development of remedial measures
- Practical implementation

Coating cells/reactors

- Novel plant concepts for production integration, high-speed plating and precision deposition
- Plant project planning
- Design of relevant critical processing units
- Prototype development
- Prototype operation and production of samples

Plant concepts

- Analysis of existing plants with regard to production reliability, capacity improvements and potential for savings
- Design of complete plants through to fully-fledged surface engineering operations
- Customer support in the procurement and implementation process

Projects, products and R&D services

Incorporation of fluids in metal layers – »Self-healing layer«

- Fluids are enclosed in nanocapsules
- The capsules are incorporated in the metallic matrix by means of dispersion deposition
- Result: metal surfaces with corrosion inhibitors, lubricants and indicators

Development of new types of alloy layers

- Replacement of undesirable alloy components
- Composition of new materials
- Process development
- Support through to market maturity

Development of molybdenum layers

- Use of non-aqueous electrolytes based on ionic fluids
- Innovative surface for applications in solar technology and hydrogen technology

Planning a new, energy-efficient hard chrome plant

- Using plant engineering measures to increase current efficiency
- Simultaneous voltage reduction leads to 30 % cut in consumption of electrical energy
- Consistent design engineering boosts efficiency and capacity

Robot-controlled selective coating

- Autonomous coating unit
- Residue-free selective on-site coating
- Automated brush-plating

Cooperation Partners: IFF und ISW

Institute of Industrial Manufacturing and Management (IFF) at the University of Stuttgart

The IFF supplements the Fraunhofer IPA's activities by providing basic research and training in the fields of industrial manufacturing and factory operation. This long-established institute takes a broad perspective of the entire process chain from design through to recycling. Its key focus is on novel manufacturing technologies and integrated production systems. The Chair for Microsystems Technology, led by Prof. Hermann Sandmaier, is affiliated with the IFF.

Main areas of research at the IFF

- Life cycle management
- Transformable production structures
- Advanced industrial engineering
- Modeling and simulation
- Micro- and nanoscale engineering

Facilities and equipment

- Smart Factory
- Learning Factory for advanced industrial engineering
- Digital Factory demonstration center
- Coating plant and equipment
- Laboratory for high-resolution measurements
- Production metrology

Institute of Industrial Manufacturing and Management (IFF)

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Institute for Control Engineering of Machine Tools and Manufacturing Units (ISW) at the University of Stuttgart

The ISW has carried out basic research and developed application-oriented solutions for more than 40 years. The institute plays a key role in optimizing the design of machine tools towards achieving greater processing speeds at top levels of precision. It has also contributed towards important advances in control and drive systems in production plant. Examples include the development of open control systems based on manufacturer-independent interfaces and the development of direct drives for machine tools. The ISW also plays a major role in the field of position control technology.

Key areas of research at the ISW

- Control engineering
 - Simulation and engineering methods
 - Control system architectures and control functions
 - Communication technology
- Mechatronics
 - Mechatronic systems
- Drive technology and mechanical engineering
 - Robots and sensor systems
 - Control engineering and drive technology
 - Mechanical engineering and machine technology

Facilities and equipment

- Machine laboratory
- SERCOS laboratory
- Drive laboratory
- High-performance PKMs
- Measuring machines
- Control engineering HIL laboratory

Institute for Control Engineering of Machine Tools and Manufacturing Units (ISW)

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Applications Center



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Large Structures in Production Engineering

The Applications Center for Large Structures in Production Engineering, which evolved in 2000 from the Rostock Project Group, is an interregional research institute that specializes in large structures. Large structures are technical systems that have special characteristics due to their dimensions, for example in regard to design, manufacturing technology, and quality assurance. The Center also works closely with the construction, railroad car, and aircraft industries and provides specific tasks in regional research services. In some cases development work in the facility is carried out in close collaboration with the customer, right through to the prototyping stage.

Over the years, the applications center built up extensive expertise in the areas of mechanical joining, metrology, sensor systems and robotics, large object geometry measurements, and company and production organization. As a result, this center is perfectly equipped to offer research services to the national and regional maritime industry and its service providers. The center is accredited as a test laboratory according to DIN EN ISO/IEC 17025:2005.

Further benefits are provided by the center's close collaboration with the production engineering department of the mechanical engineering and marine technology faculty at the University of Rostock.

Large Structures		
Ships, Offshore	Building Industry, Steel Industry, Aircraft Industry, Railed Vehicles	Regional Research

Specific skills and services

- Development of large maritime structures for ships and offshore
- Design and implementation of large structures for the construction industry, structural steel engineering, aircraft construction, and construction of rail vehicles
- Optimization of product development, company organization, and quality management
- Prototype development

Special facilities and large equipment for the following purposes (shared with the University of Rostock):

- Mechanical joining technology
- Welding technology
- Test engineering
- Robotics
- Machine tools
- Production machinery
- Mobile equipment for measuring large structures

Applications Center for Large Structures in Production Engineering

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Project Groups

Bayreuth Project Group

The Bayreuth Project Group is run as an independent »Remanufacturing« department within the Fraunhofer IPA. Based at the University of Bayreuth, it primarily works with medium-sized companies from the eastern part of Bavaria, helping them to achieve measurable improvements in productivity through process innovation.

For more information on specific research areas relating to remanufacturing (automotive replacement parts production), please see page 9.

Bayreuth Project Group

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Zilina Project Group

In production engineering and automation, where personal contact with the customer is regarded as highly important, access to markets in Eastern Europe can only be successfully achieved through a local presence. This is why the IPA decided to set up a new unit in Slovakia in the form of the Zilina project group. This group works in close cooperation with the University of Zilina.

Skills and services provided by our Project Group

- Introducing innovation management
- Implementing advanced industrial engineering
- Optimizing production planning and control
- Selecting, deploying and optimizing supply-chain management systems
- Applying modern production methods, processes and technologies
- Supporting small and medium-sized German enterprises in the development of collaborative ventures and business relations with Eastern European companies and research institutes

Zilina Project Group

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Fraunhofer Austria Research GmbH Fraunhofer Project Group for Production Management and Logistics

The Fraunhofer Austria Project Group for Production Management and Logistics offers research and consulting services that aim to comprehensively optimize the performance of industrial companies and service providers.

Divided into three main areas – Production Management, Logistics Management, Service and Processes – the Project Group focuses on markets in Austria, Central Europe and Eastern Europe, offering a range of services specifically designed to benefit its industrial clients. Fraunhofer Austria has been eligible to apply for Austrian research program funding since 2009 and is conducting extensive research into the topic of »Optimization of value creation in production networks«.

Specialist skills and services

- Organization of production, logistics and supplier networks
- Planning locations and factory structures
- Designing, improving and introducing procurement and production logistics
- Optimizing order handling processes in the manufacturing and service industries
- Implementation and further development of lean methods
- Improving how industrial companies offer their services

Fraunhofer Austria Research GmbH

Fraunhofer Project Group for Production Management and Logistics
Management

Univ.-Prof. Dr.-Ing. Dr. h.c. Dipl.-Wirtsch.-Ing. Wilfried Sihm

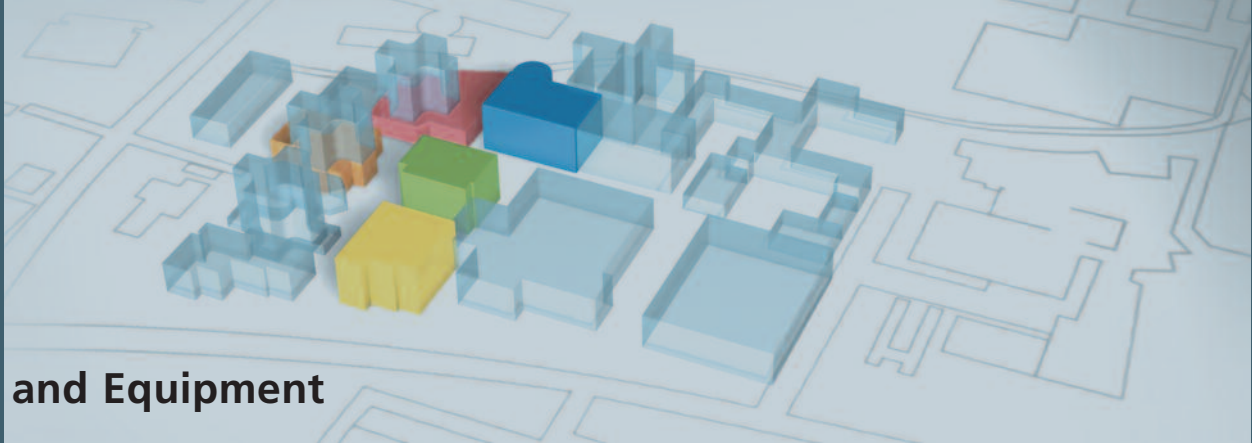
Dipl.-Ing. Daniel Palm

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Facilities and Equipment

Laboratories for

- equipment and process development: life sciences, food processing industry
- measurement and testing of signal and power transmissions
- applications of computer tomography: job-order measurements, design of systems for industrial use
- industrial image processing
- rapid product development: functional prototypes, short-run manufacturing, reverse engineering
- virtual production planning and 3D visualization
- demonstration of the Digital Factory
- BioPoLis: Bioproduction laboratory for medical devices and biotechnology

Test facilities for

- construction of prototype automation systems
- testing of assembly, handling and machining processes
- construction, testing and optimization of robots, in particular service robots
- demonstrations of automation solutions

Center for Ultraclean Technology and Micromanufacturing

- Technical cleanliness: automated and manual test rigs for testing cleaning performance, methods of analysis (gravimetric, microscopic), material analysis systems (REM, spectrometer), pressure inspection and inline measurement systems
- Cleanliness-compliant equipment: particle counters; flow measurement technology, visualization and simulation; cleanrooms (ISO 1, 200m²); vibration, surface inspection and electrostatic measurement systems
- Microassembly: assembly, dispensing and gripper systems, topographic measurement techniques, test systems

Surface engineering facility for

- coating technology: coatings under real production conditions, testing and analysis methods
- plating technology: electrochemical and gas-phase-based deposition techniques, materials science and wet chemical analysis

Personnel

Scientists	190
Laboratory and administrative staff	108
Research assistants	296
Institute of Industrial Manufacturing and Management (IFF) at the University of Stuttgart	44
Institute for Control Engineering of Machine Tools and Manufacturing Units (ISW) at the University of Stuttgart	45

Press and Public Relations

Our Press Office keeps you in touch with the latest research and development work at the Fraunhofer IPA.

We can send you free publications including

- our annual report (German only)
- our »Fraunhofer IPA Interaktiv« customer magazine (German only)
- information leaflets on our focal fields of research
- background information on the departments and their research topics
- detailed information on the institute's symposiums (German only)

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Fraunhofer Institute for Manufacturing Engineering and Automation IPA

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Information



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How to Find US

By car

Take the A8 autobahn (the highway that runs from Karlsruhe to Munich) until you reach the Stuttgart autobahn intersection. Turn onto the A 81/A 831 and follow signs to »Stuttgart-Zentrum« until you reach the »Universität« exit. Turn left at this exit into the road »Universitätsstrasse«, which subsequently turns into »Nobelstrasse«.

By public transport

From Stuttgart main railway station or Stuttgart airport, take the rapid transit rail system (S-Bahn) lines 1, 2 or 3 in the direction of Vaihingen.

Exit the train at the »Universität« stop. Leave the station via the »Wohngebiet Schranne/ Endelbang« exit and continue some 500 m on foot to reach the institute.

By taxi

Distance from the airport to the Fraunhofer-Gesellschaft Institute Center: approx. 13 km.

Distance from the main train station to the Institute Center: approx. 12 km.

