2nd Conference on Learning Factories

Competitive production in Europe through education and training

May 10th 2012
Vienna University of Technology

TU W I E N  I F T  M I V P  i m w

Fraunhofer AUSTRIA
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Agenda

09:00 Opening of the conference
  Rector of the Vienna University of Technology, Prof. Sabine Seidler
  Chairman: Vice president of the "Initiative on European Learning Factories"
  Prof. Wilfried Sihn [Vienna University of Technology]

Block I  Universities

09:15 Session 1: Potential of Learning Factories as education and innovation centres for universities and the production industry
  Speaker: Prof. Kurt Matya (TU Vienna)

09:45 Session 2: Hands-on Training Center for Industrial Engineering in Higher Education
  Speaker: Prof. Jochen Deuse (TU Dortmund)

10:15 Session 3: 5 years Process Learning Factory CiP at TU Darmstadt - Concept, Results, Experiences and still new Challenges
  Speaker: President of the "Initiative on European Learning Factories" Prof. Eberhard Abele (TU Darmstadt)

10:45 Coffee break

11:15 Session 4: Green Factories Bavaria
  Speaker: Prof. Gunther Reinhart (TU Munich)

Block II  Industry

11:45 Session 5: Multi-Dimensional Networked Learning within the ESB Logistics Learning Factory - Innovative approach, teaching-learning concept and engineering project games
  Speaker: Prof. Vera Hummel, Prof. Harald Augustin [Rautlingen University]

12:15 Lunch

13:15 Session 6: Learning shopfloor – continuous improvement
  Speaker: DI Rudolf Hamp (Opel Wien GmbH)

13:45 Session 7: Excellent Qualified and Trained Employees - The Key for the successful implementation of Lean Production
  Speaker: DI (FH) Frank Werz, MBA

14:15 Coffee break

14:45 Session 8: Sometimes cold or wide, sometimes fast or dark - boosting changeability by learning factories
  Speaker: Klaus Zimmermann (Festo Didactic GmbH)

Block III  TU Vienna Learning Factory

15:15 Session 9: Education for the 21st century - impacts for teaching and learning
  Speaker: Dr. Markus Tomaschitz (Magna International Europe AG)

15:45 Session 10: Vision and implementation of the Learning and Innovation Factory of the Vienna University of Technology
  Speaker: Prof. Wilfried Sihn, Prof. Friedrich Blaicher, Prof. Detlef Gerhard (TU Vienna)

16:10 Closing of the conference

16:20 Transport to the Institute for Production Engineering and Laser Technology

17:00 Visit and inspection of the Learning and Innovation Factory of the TU Vienna

18:00 Transport back to the Vienna University of Technology

19:30 Dinner event at the Vienna city hall
Impressum

Offenlegung gemäß § 25 Mediengesetz:

Institut für Managementwissenschaften, Bereich Betriebstechnik und Systemplanung, an der TU Wien, 1040 Wien

Leiter des Bereiches Betriebstechnik und Systemplanung

Univ.-Prof. Dr. Wilfried Sihn
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Wilfried Sihn, Univ.-Prof. Prof. eh. Dr.-Ing. Dr. h.c. Dipl.-Wirtsch.-Ing., is Professor at the IMW since 2004 and Head of the Institute since March 2009. Before starting his career at the TU Wien, he was Deputy Director of the Fraunhofer Institute for Manufacturing Engineering and Automation (IPA) in Stuttgart, and is Director of Fraunhofer Austria since December 2008. He has been active in the field of applied research and consulting services for more than 25 years now. His areas of expertise include production management, corporate organization, enterprise logistics, factory planning, order management, and business process reengineering. Prof. Sihn was instrumental in developing concepts as the Fractal Company. As well, he is Vice-President of the "International Society of Agile Manufacturing" and International Editor of the journal "Agility and Global Competition", as well as Guest Editor of the "International Journal of Technology Management (IJTM)". He holds lectures on the above-mentioned topics at national and international conferences. His more than 200 publications also include several books, making him an active player in scientific and practice-related discussions.
Fraunhofer Austria Research GmbH is performing applied and industry oriented research. Projects are dealing with the planning and optimization of the structure, organization and management of industrial and service enterprises or their logistics networks and is specialised in structuring and optimisation of production and logistics processes in a high-tech and highly automated environment. Special emphasis is given to the matching of IT systems with the requirements of operational domains in particular with respect to the organisation of socio-technological systems. FhA is co-operating with the Institute of Management Science of the Vienna University of Technology and maintains numerous contacts to industry, academia and research institutions in Western, Eastern and South-Eastern Europe.

Founded in 1815, the Vienna University of Technology is renowned for its long tradition. It finds high international and domestic recognition in teaching and research and as partner of innovation oriented enterprises. The Institute of Management Science / Department for Industrial Engineering and System Design (IMW) can offer expertise in the main areas such as Production Management & Logistics Management as well as Quality-, Process- and Product Management. Research concentrates on the processing of scientific findings for practical applications. Numerous positive results both in application-oriented research projects as well as industry projects proof the reliable methodological background of the department and form a broad basis of satisfied partners and customers.

Vision and implementation of the Learning and Innovation Factory of the Vienna University of Technology
Univ.-Prof Dr.-Ing. Detlef Gerhard (born 1969) studied mechanical engineering with a focus on Computer Integrated Manufacturing at the University of Paderborn (Germany). He received his PhD in 2000 after five years as a research assistant at the Department of Information Technology in Mechanical Engineering at the Ruhr-University Bochum (Germany). In February 2006 he was appointed professor at the Vienna University of Technology (Austria) and leads the Mechanical engineering Informatics and Virtual Product development (MIVP) research group at the Institute of Engineering Design and Logistics Engineering. Previously, he was in industry in senior positions in the field of IT consulting, project leading and development of enterprise-wide software solutions. In his latest industry position, he served as overall responsible for the technical and business IT at a worldwide operating manufacturer of conveyor systems and special purpose machinery. Prof Gerhard is elected member of the WiGeP (Wissenschaftliche Gesellschaft für Produktentwicklung) Scientific Society for Product Development based in Germany. His main research interests are methods and IT tools for information management in product creation processes with special focus on semantics.
Our Research group is part of the institute of Engineering Design and Logistics Engineering at Vienna University of Technology and focuses on Virtual Product Development which in our understanding can be defined as complete description and illustration of real products and their characteristics in form of computer models with the aim to validate and verify designs and characteristics by simulation and digital prototyping. This is our core competence area and comprises management of data, processes and IT tools within the complete product lifecycle (PLM). Our research focuses on the application of information technologies and informatics methods in the creation processes of machinery, vehicles and equipment. The central objective is to explore new technologies, processes and methods with a significant added value for applications in the context of cooperation and multi-disciplinary engineering processes in industrial environments. Within all research projects which are preferably conducted with partners from industry aspects of process and organisation are looked at alongside the modelling and software implementation.

Vision and implementation of the Learning and Innovation Factory of the Vienna University of Technology
After studying Mechanical Engineering he started as a scientific assistant at the Institute of Production Engineering, Vienna University of Technology. "Doktor technicae" in Mechanical Engineering in 1996 and habilitation for Production Engineering in 2001; since 2001 Associate Professor at the Institute for Production Engineering. In 2009 he gets the professorship for Machining Technology and is head of the Institute of Production Engineering and Laser Technology at Vienna University of Technology. The main topics of research are covering machining processes with geometrically defined and undefined cutting edges, process automation, development and optimization of machine tools, ECM-technologies and rapid manufacturing.
Institute of Production Engineering and Laser Technology

The Institute of Production Engineering and Laser Technology (IFT) of the Vienna University of Technology covers a wide range of production processes, machine tool techniques and automation in the field of production engineering.

The spectrum of working activities is covering production planning and manufacturing execution systems, process automation and NC-control technology, development and optimization of machine tools including innovative machine tool concepts like parallel kinematics, machining processes, particularly cutting with geometrically defined and undefined cutting edges or laser technology as well as ECM-technologies and rapid manufacturing.

Results of research work are directly fed into academic education, which allows a practically orientated training and guarantees a comprehensive insight into production engineering.

Vision and implementation of the Learning and Innovation Factory of the Vienna University of Technology
Vision and implementation of the Learning and Innovation Factory of the Vienna University of Technology

Department for Management Science / Fraunhofer Austria
Univ.-Prof. Dipl.-Wirtsch.-Ing. Dr.-Ing. Prof. eh. Dr. h.c. Wilfried Sihn

Department for Production Engineering and Laser Technology
Univ.-Prof. Dipl.-Ing. Dr. techn. Friedrich Bleicher

Department for Engineering Design and Logistics Engineering
Univ.-Prof. Dipl.-Ing. Dr.-Ing Detlef Gerhard

Introduction

Learning and Innovation Factory of the Vienna University of Technology

Learning Factory
- Higher education
  - "Integrative product manufacturing" Lecture, practical course (Bachelor Mechanical Engineering - Management)
- Advanced training
  - Methods focus: Lean Assembly, Lean Production & Logistics
  - Technology focus: RFID and pick-by-voice assembly support

Innovation Factory
- Innovation
  - e.g. process evaluation and optimization of Lean Assembly, development of innovative factory planning methods, etc.
- Service
  - e.g. use of innovative research and development facilities as high application and demo center

Students
Industry
Higher Education
„Integrative Product Creation”

- Lecture name: Integrative Product Creation
- Parts: Engineering Design – Manufacturing - Assembly
- Students: Bachelor Program (Mechanical Engineering - Management)
- Lecture: Theoretical preparation
  2 ECTS (5 days a 3 hours + exam)
- Practical course: Project implementation (analysis, planning and manufacturing)
  5 ECTS (10 days a 8 hours + final presentation)
- Targets: Holistic consideration of product creation process
  Understanding of inter-divisional coherences
  Impact of design based decisions for the production process

Integrated knowledge transfer and practice by the Faculty of Mechanical and Industrial Engineering
Faculty-wide learning factory through cooperation of:

**Industrial Engineering**  
Industrial and Systems Engineering in cooperation with Fraunhofer Austria

**Product Development**  
Institute for Engineering Design and Logistics Engineering

**Production Technology**  
Institute for Production Engineering and Laser Technology

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Institute for Management Science/Industrial and Systems Engineering & Fraunhofer Austria Research GmbH  
Business area Production- und Logistics Management

- Production Management  
- Logistics/SCM  
- Quality- and Process Mgmt  
- Project Management  
- Plant Design  
- Maintenance/Reliability  
- System Planning  
- Product-Management  
- Business-Games

**Method Competencies**

**Industry Competences**
- Automotive  
- Vehicle- and Agriculture machinery producers  
- Engineering and Plant Construction  
- Electronics Industry  
- Metall Industry  
- Energy Suppliers

**Theme Competencies**

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Higher education  
Research  
Development  
Realization  
Application
### Institute for Production Engineering and Laser Technology

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<th>Research area</th>
<th>Modeling and simulation</th>
<th>Experimental tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology and processes</td>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
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<tr>
<td>Machine tools and control technology</td>
<td><img src="image3.png" alt="Image" /></td>
<td><img src="image4.png" alt="Image" /></td>
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<tr>
<td>Production planning and quality</td>
<td><img src="image5.png" alt="Image" /></td>
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</tbody>
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**Optimization and application in industrial processes**

**Research and education**

**Development**

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### Institute for Engineering Design and Logistics Engineering Virtual Product Development Research Group

**Product**
- Hardware
- IT/Software
- Services
- ...

**Process**
- Eng. Design
- Production
- Usage
- ...

**Data/Information**
- technical
- administrative
- ...

**Mechanical Engineering Informatics and Virtual Product Development Research Group**

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Higher Education „Integrative Product Creation“ - Focus 1

Focus 1 - Content of teaching

- Engineering Design
  - Structuring of the product
  - Evaluation of design alternatives
  - Design for X approaches

- Fixture Development
  - Engineering Design of Assembly fixtures
  - Rapid Manufacturing with 3D Printer

- Product Data Management
  - 3D models, drawings
  - Operation and assembly plans
  - IT Tools handling
Higher Education „Integrative Product Creation“ – Focus 2

Focus 2 - Content of teaching

- Production Engineering
  - Design for manufacturability
  - Technology and process planning
    - Selection of processes, equipment and tooling
    - Definition of machining parameters, set-up instructions and quality assurance checkpoints
    - Sequencing of operations
    - Creation of Manufacturing BOMs and Routings
    - NC-programming
- Production Planning
  - Material requirements planning
  - Scheduling
- Machining
- Quality inspection

Higher Education „Integrative Product Creation“ – Focus 3

Focus 3 – Content of teaching

- Design for Assembly
  - Approaches
  - Product structure
  - Assembly process and operations
  - Implementation with examples
- Time Management
  - Time observation vs. MTM
- Manufacturing Costs
  - Calculation methods and practice
  - Potentials for cost reduction
Higher Education
"Integrative Product Creation" - Tasks

Task 1
Development and Planning
From prototyp
to series

Task 2
Product and Process optimization

failure frequency
quality
time
costs
production time
production costs

Task 3
Manufacturing & Assembly

Series (4 pieces / Group)

Higher Education
"Integrative Product Creation" - Tasks

Student's tasks

Analysis of slotcar prototype and characteristics
Baring of waste in manufacturing and assembly processes
Determination of assembly friendly product structure
Reorganisation of manufacturing and assembly process
Redesign and planning of slotcar series
NC - manufacturing
Assembly and quality check
Higher Education
„Integrative Product Creation“

Vision and implementation of the Learning and Innovation Factory of the Vienna University of Technology

LEARNING FACTORY AS ADVANCED EDUCATION TOOL FOR INDUSTRY
Advanced Education for Industry
Training with following project monitoring

Theory
- Thematically Introduction
- Hands-on Training
- Innovation Project

Implementation
- in the production company or the learning factory
- in the learning factory of the Vienna University of Technology
- in the production company

- Seminar / workshops
- Theoretically Background
- Basics to custom designed experts know-how
- Business and managements games
- Demonstration of the ideal situation
- Holistic approach
- Interactive explanation and application of methods
- Implementation of learned tools
- Optimization of operation values by trained employees
- Support by FhA experts

Training Model: Industry
5 + 1 steps

1. Introduction
   From basics to custom designed experts know-how

2. Inappropriate process run
   Exposing of waste and grievance by the participants

3. Process planning by participants
   Optimization of process on the basis of trained methods

4. Process implementation by participants
   Execution of all planning activities

5. Ideal process run
   Final run with expert support

Implementation in the production company
Ability to implement trained methods
## Advanced Education

### Focus

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<th>Production Technology</th>
<th>Industrial Engineering</th>
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<td>Assembly</td>
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<td>Innovation (research)</td>
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<tr>
<td>Service</td>
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### Innovation / Services
- Vision (5 years)
- Research Infrastructure
- Interactive demonstration center
- Company based development

### Custom-designed Training
- Company related topics
- Alternative training methods with interactive participation
- Hands-on training with real experience

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## Lean Assembly

**Advanced hands-on training**

- Training of expertise in methods for optimization of assembly and logistics processes in a "labour for lean methods"

### Existing content of teaching (modular):
- Assembly and process planning
- Time management and capacity planning
- Time device / frequency
- One Piece Flow, continuous flow production
- 5S, SMED, Poka-Joke
- Lean factory layout planning

### Current development:
- RFID time tracking

### Preview:
- Assembly / pick by voice
Lean Assembly
Advanced hands-on training

Contact Persons

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