Fraunhofer IPA

FRAUNHOFER INSTITUTE FOR
MANUFACTURING ENGINEERING AND AUTOMATION IPA

## STATUS COLLOQUIUM
## 3–4 MAY 2011

# KNOWLEDGE-BASED MANUFACTURING

A NEW APPROACH FOR PRECISION ASSEMBLY INDUSTRIES


SIXTH FRAMEWORK PROGRAMME

# PREFACE

Are you interested in new concepts of manufacturing and their feasibility in the automotive, aeronautics and electrical areas? Would you like to discover the potential of the new factory of the future?

The XPRESS Consortium invites you to discover a new concept for knowledge-based manufacturing. It is based on a co-ordinated team of autonomous objects called "Manufactrons" which enclose functionality and expert knowledge. By embodying installations, plant components and operators as independent units, Manufactrons are the building blocks of a collaborating factory. Thus, they adopt task-orientated production planning, simulation and manufacturing execution in a distributed way. To do this, Manufactrons execute generalised task descriptions instead of process parameters and return the quality data of the executed task. The translation of a task to the optimal mode of processing under given boundary conditions is a core functionality of the Manufactron itself. Along the production process, resulting quality data is evaluated and integrated to provide valuable input for future production planning.

Experts from inside and outside of the XPRESS consortium will present the challenges of future flexible production and the concepts of Manufactronic production. Workshops during both days with respect to Workflow, Factory Organisation and Task driven Manufacturing will provide the opportunity to look at the underlying concepts in detail. These aspects will be shown in dedicated sessions, showing the Manufactronic demonstrators.

Furthermore, the XPRESS partners will present their expertise and dedicated XPRESS results in the forum. This will also provide the space for networking and a final discussion dedicated to the question: How can research results as generic as a manufacturing concept be brought into industrial application? The results of this discussion will be documented and made accessible to the participants.

# THE EVENT

**Objectives of the colloquium**
Experts from inside and outside of the XPRESS consortium will present the challenges of future flexible production and the concepts of Manufactronic production. Workshops during both days with respect to Factory Organisation, Scheduling & Workflow and Task driven Manufacturing will provide the opportunity to look at the underlying concepts in detail. These aspects will be shown in dedicated sessions, showing the Manufactronic demonstrators. Furthermore, the XPRESS partners will present their expertise and dedicated XPRESS results in the forum. This will also provide the space for networking and a final discussion dedicated to the question: How can research results as generic as a manufacturing concept be brought into industrial application? The results of this discussion will be documented and made accessible to the participants.

**Target groups**

The Colloquium will present the knowledge-based approach for flexible manufacturing in two perspectives:

The first day is dedicated to the scientific community. Scientific concepts and solutions of the Manufactronic concept will be presented to the participants.

The second day is dedicated to the industrial community.
The participants will be introduced to the industrial applications of Manufactrons.

**Event leader**
Michael Peschl
Branch Manager Karlsruhe, Harms & Wende GmbH & Co. KG

**Guest Speaker**
Prof. Dr. Paul Valckenaers
University Leuwen

Prof. Dr. Alexander Verl
Fraunhofer Institute for Manufacturing Engineering and Automation IPA, Stuttgart

# PROGRAMME
# TUESDAY, 3RD OF MAY, 2011
# SCIENTIFIC COMMUNITY

9:00 **Welcome**
Keynote – Prof. Dr. Paul Valckenaers
Overview on XPRESS – Michael Peschl

10:30 Coffee Break

11:00 **Parallel Workshops**

**1. Factory organisation**
This workshop will cover re-using planners expert knowledge, identification of similar factory layouts for optimisation, automatic initiation of simulation jobs and the generation of workflows based on the production planning.

**2. Workflows in precision assembly production**
This workshop will cover technological concepts (Windows workflow foundation), the realisation of dynamic routing and scalability of decision processes.

**3. Task driven manufacturing**
This workshop will cover the task-to-method transformation for finding best suitable methods for performing a production and the structure of the Manufactron's knowledge system.

12:30 Lunch break

13:30 **Demonstration and Fair**
Movies and presentation on project demonstrators showing quality inspection, process monitoring, path generation, worker guidance and highly flexible and multi-variant production.

15:00 Coffee break

15:30 **Exploiting project results**
This session will bring together knowledge and experience of all participants in order to identify strategies for transferring project results into industrial application.

17:00 **End of Day 1**

17:30 **Evening programme**

# PROGRAMME
# WEDNESDAY, 4TH OF MAY, 2011
# INDUSTRIAL COMMUNITY

9:00 **Welcome**
Keynote – Prof. Dr. Alexander Verl
Overview on XPRESS – Michael Peschl

10:30 Coffee Break

11:00 **Parallel Workshops**

**1. Factory organisation**
This workshop covers increasing planning efficiency, optimisation of production lines and designs and tracking of overall product quality.

**2. Workflows in precision assembly production**
This workshop covers the scalability of the concept from small to large production lines, the product itself, its quality tracking and identification as well as the multivariate production.

**3. Task driven manufacturing**
This workshop covers reduction of machine configuration effort, usage and commercial exploitation of expert knowledge, approaches to assess the quality of a process, easy integration of Manufactrons in a production line, approaches for the synchronisation of Manufactrons.

12:30 Lunch break

13:30 **Demonstration and Fair**
Movies and presentation on project demonstrators showing quality inspection, process monitoring, path generation, worker guidance and highly flexible and multi-variant production.

15:00 Coffee break

15:30 **Exploiting project results**
This session will bring together knowledge and experience of all participants in order to identify strategies for transferring project results into industrial application.

17:00 **End of Day 2**

# WORKSHOPS

On both days three workshops will be held in parallel. They cover the project results with respect to factory organisation, workflow in precision assembly production and task driven manufacturing. The topics on both days vary with respect to the target groups. The conceptual background is as follows:

**1. Factory Organisation**
This workshop covers the automatic initiation of line simulations. Starting from a first layout, the line will be optimised with respect to given objectives such as costs, cycle time, reliability and validity. The optimisation is based on expert knowledge which has been stored in a knowledge system and the ability of Manufactrons to communicate their capabilities. The result is an optimised line layout with respect to the usual KPIs and the definition of the production sequence for the respective product and the related quality goals. During production the system tracks each product and its quality allowing for a global quality management.

**2. Workflow**
A very flexible workflow concept which is easy to maintain and highly scalable will be introduced in this workshop. The applicability ranges from small to large production lines. Product tracking and identification allows for assigning quality and process data to a product. Thus, dynamic routing of the product in dependence of the evaluation of quality data and process states becomes possible. The complexity of underlying evaluation procedures can vary from low to high.

**3. Task driven Manufacturing**
The configuration of production equipment in the presented concept is based on the exchange of task descriptions instead of process sequences and parameters sets. This requires an automatic transformation of the given task description into an appropriate method for performing a production job. This has been realised by encapsulating expert knowledge on processes in the knowledge system of a Manufactron. To enhance their knowledge system, Manufactrons are able to simulate processes.

# DEMONSTRATION

The research and development work carried out within the XPRESS project results in four industry-relevant Demonstrators which will be presented in detail during the event.

**Demonstrator 1: Quality inspection and process monitoring as well as worker assistance in aeronautic industry**
This Demonstrator shows the 100% quality assurance of production processes by embedding quality assessment software for the riveting process. This includes the feedback of quality information to CAD Data by the visual representation of quality information in virtual CAD environments as well as the reactive production with closed-loop control sequences and the flexible and fault-tolerant reaction by the dynamic adaption of process parameters based on the quality assessment.

**Demonstrator 2: Planning process and automatic robot path generation in automotive industry**
This Demonstrator shows the semi-automated path generation for robots during the planning phase and a visual inspection of the robot path during the production process.

**Demonstrator 3: Worker guidance and worker behavior interpretation in automotive industry**
This Demonstrator shows the worker integration scenarios and focuses on the 100% quality assurance of production processes by monitoring the correct sequence of handling tasks by humans. It also demonstrates the flexibility and fault-tolerance in production by the identification of wrong or faulty components using video inspection.

**Demonstrator 4: Highly flexible and multi-variant production in electrical industry**
This Demonstrator shows a complex machine based on Manufactronic technology. It demonstrates the decrease of changeover time needed for new product variants as well as the XPRESS concept for 100% quality monitoring by gathering and assessing quality data of different processes.

# BOOKING INFORMATION AND LOCATION

**Information and registration**
Conference Office
Fraunhofer IPA
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70569 Stuttgart
Germany
Phone +49 711 970-1204 | Fax -1877
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**Organisation**
Fraunhofer Institute for Manufacturing Engineering and Automation IPA
www.ipa.fraunhofer.de

Steinbeis-Europa-Zentrum
www.steinbeis-europa.de

Harms & Wende GmbH & Co. KG
www.harms-wende.de

**Registration fee**
The participation to the status colloquium is free of charge.

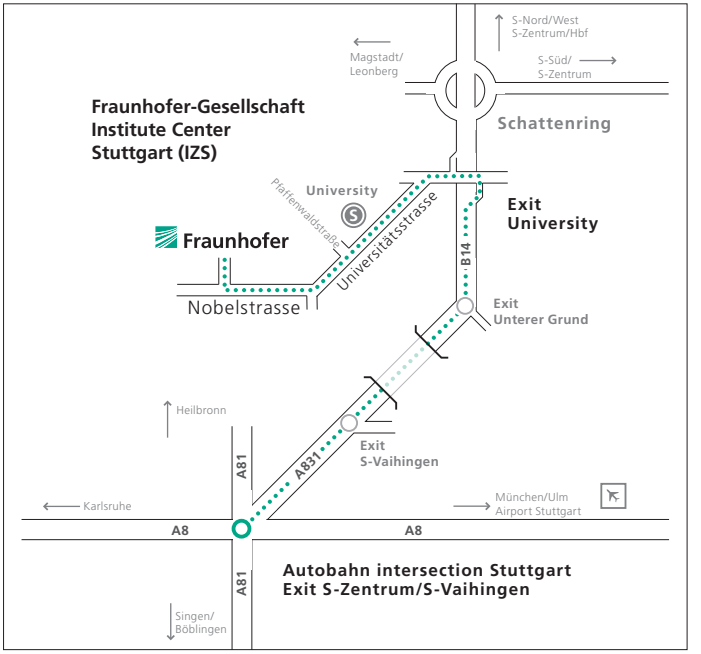
**Registration**
Please use the attached form to register for the event. The number of participants is limited. Registration will be on a first-come first-served basis.

**Accommodation office**
If you are looking for a accommodation in Stuttgart, please contact:
Regio Stuttgart Marketing- und Tourismus GmbH
Phone +49 711 22288-233 | Fax -251
http://www.stuttgart-tourist.de/ENG/search_book/apartments.htm

Next to the institute, we recommend you:
Relexa Waldhotel Schatten
Magstadter Str.
70569 Stuttgart
Phone +49 711 6867-0 | Fax: -999
E-mail Stuttgart@relexa-hotel.de
http://www.relexa-hotels.de

NB: Please mention that you are participating to an event organised by the Fraunhofer Institute. You will then benefit of the agreed special prices.

**Location**
Fraunhofer Institute for Manufacturing Engineering and Automation IPA
Nobelstrasse 12
70569 Stuttgart (Vaihingen), Germany



**THE XPRESS CONSORTIUM IS LOOKING FORWARD TO SEEING YOU**


















Status colloquium, 3–4 May 2011

**Knowledge-based Manufacturing**
**A new approach for precision assembly industries**

First Name

Last Name

Titel

Company

Department

Street

ZIP-Code/City

Phone/Fax

E-mail

**Registration:**

**Knowledge-based Manufacturing**
**A new approach for precision assembly industries**

Status colloquium, 3–4 May 2011

City/Date

Signature

**Registration**
Please send back by post
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**70569 Stuttgart**
Germany

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IPA

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