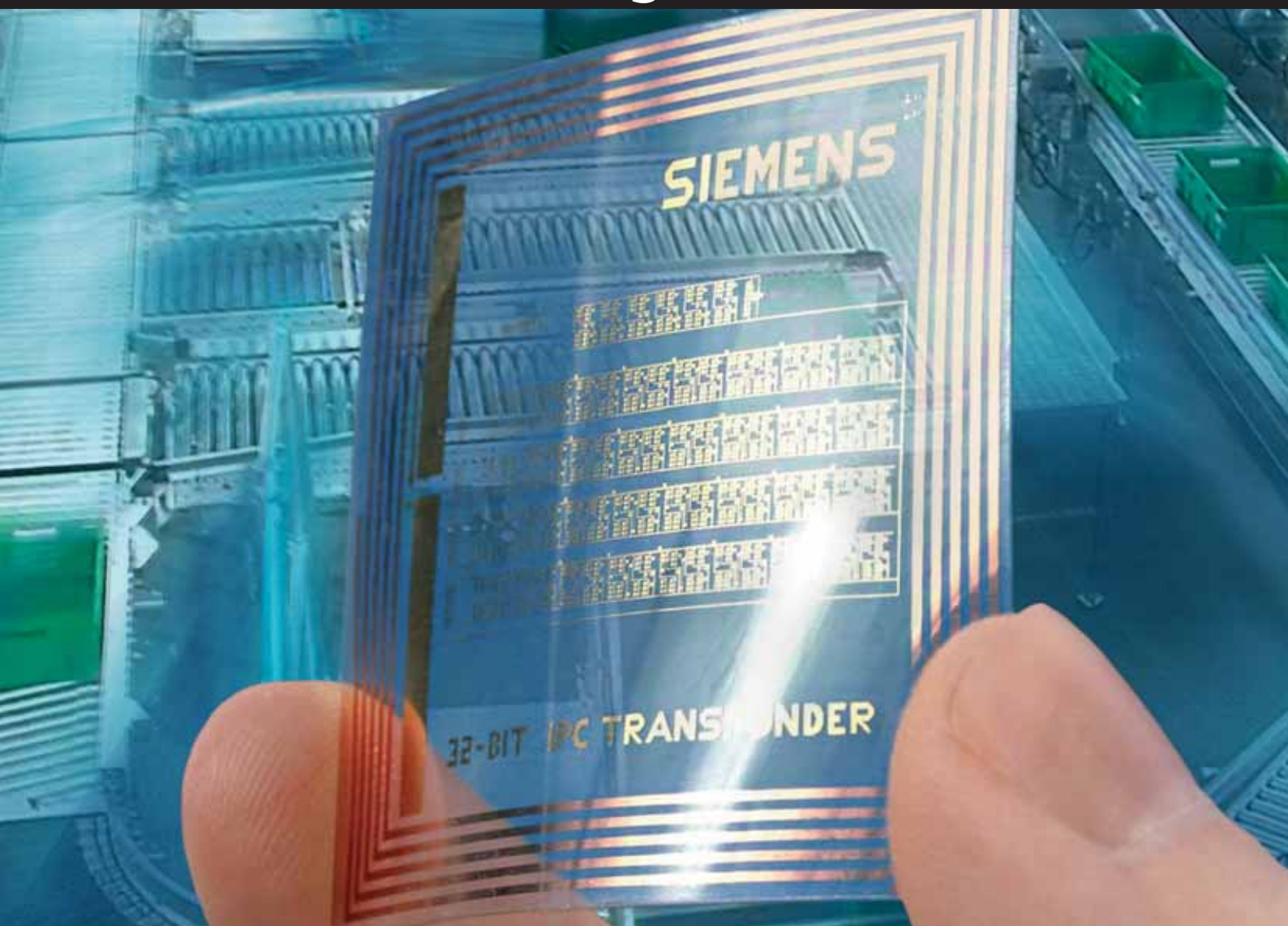




# *IFFOCUS*

1/2006

## Logistics Connects



## Secure Processes with RFID

RFID Certification

Container Management

Smart Maintenance





Prof. Michael Schenk  
Director, Fraunhofer IFF

Dear Readers,

Logistics is growing in scope and complexity – and the dynamic of this development is intensifying. Reasons for this are increasing global flows of goods and production networks, shorter innovation cycles and mounting customer requirements. Markets are developing dynamically and requiring companies to react rapidly and be adaptable in the international environment. Logistics is an integral part of industrial manufacturing and cooperation between companies and is increasingly developing into a crucial competitive factor for companies.

We are facing the challenges of logistics with intelligent concepts and solutions in which modern information and communication technologies play a central role. RFID – identification with electronic radio labels – is one of the key technologies for connecting material and information flows. Using RFID technology is essentially a matter of the identification of objects and the distributed storage of information directly on an object. The advantage of radio labels is obvious. The systems operate without physical or visual contact and information can – as opposed to barcode for instance – be updated. Combinations with other technologies such as mobile radio, positioning and condition monitoring produce completely new concepts and solutions for logistics. Thus, for example, the shelf life and condition of valuable substances such as medicines can be constantly monitored. Their contactless transmission of information and the use of “accompanying observers” make this technology outstandingly suited for the monitoring and control of complex supply chains. The major benefits from connecting it to a company’s IT systems are more transparency and a better overview of all logistics processes.

Along with examples of successful use of RFID technology, in this issue, you will find other products and services developed by our institute in cooperation with companies for companies. This encompasses tools for digital factory planning just as much as the qualification of employees in logistics, methods of knowledge management and new concepts for better marketing and exporting services.

I would especially like to draw your attention to the interview with Peter Claussen, Plant Manager of the BMW Plant in Leipzig and Chairman of the newly formed Eastern German Automotive Cluster. Mr. Claussen talks about the ACOD’s goals and describes his vision of eastern Germany as an automotive center.

I invite you to get to know us better, to find out about people, current news and our institute’s products and services and I wish you a good time reading.

Sincerely

Prof. Michael Schenk

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## Minister of Transport Tiefensee Visits the VDTC



Federal Minister of Transport, Building and Urban Affairs Wolfgang Tiefensee paid a visit to Magdeburg's Port of Science on February 23, 2006. At the construction site of the Virtual Development and Training Centre VDTC, the minister was informed about the progress of building in Magdeburg's former commercial port. One of the main emphases of urban redevelopment in Magdeburg is the construction of a state-of-the-art service and research center on the premises of the commercial port.

Prof. Michael Schenk explained to the minister the topics on which Fraunhofer researchers will be working at the VDTC as well as the tools they will be using. Taking a virtual city model as an example, the director of the Fraunhofer IFF demonstrated the potential of virtual technologies for urban development and planning. Interactive visualizations and scenarios of city neighborhoods enable comparing and evaluating realistically represented planning variants. What is more, a virtual tour through a new neighborhood being

developed is an outstanding marketing tool for convincing investors and policy makers of a location. Apart from applications for urban architecture, VDTC researchers will primarily be working on product development and training. Virtual technologies can be used to develop products faster and test them at an early stage. Technical staff can be safely trained and qualified on virtual models.

Prof. Schenk took advantage of the opportunity to present other Fraunhofer IFF competencies to the minister, in particular in the field of logistics. Both for the region of Central Germany and for the country of Germany as a whole, logistics presents potential for tremendous development as economic and ecological challenges mount. Minister Tiefensee invited the director to collaborate on developing and elaborating an overall concept for transport and logistics in Germany.

## Intelligent Logistics Processes: Concepts, Solutions, Experiences

The most important topic at the 11th Magdeburg Logistics Symposium was the integration of intelligent information and communication technology in logistics processes. While individual subprocesses are often optimally organized to a large extent, the intelligent planning, coordination and control of these subprocesses constitute a central challenge for logistics management in which RFID technology plays a crucial role. In his impulse lecture, Richard Smyth from Airbus very sharply illustrated how the aircraft manufacturer organized the complex logistics surrounding the manufacture of the Airbus 380. Together with Jens Heitmann from Airbus, Prof. Michael Schenk from the Fraunhofer IFF presented jointly developed logistics solutions that have already been being effectively used at Airbus for ten years. Another lecture program highlight was the contribution from Prof. Dr. Achim Bachem from the German Aerospace Center, who spoke about new applications and services for the satellite navigation system Galileo.

The evening event on November 24 was held at the Fraunhofer IFF where the institute's LogMotionLab had organized an RFID user forum. Manufacturers of RFID technologies and providers of services based on RFID technology demonstrated their solutions to an interested and enthusiastic audience. In the LogMotionLab, symposium guests were able to experience RFID technology first hand, test newly developed solutions and convince themselves of their capabilities.

Thus, experts from companies and researchers from universities and research institutes had the opportunity to test the concepts and practical examples presented at the symposium in diverse scenarios and experimental setups.

The Magdeburg Logistics Symposium is organized by Prof. Karl Inderfurth, School of Management, Department of Production and Logistics, Prof. Michael Schenk, Chair for Logistic Systems, Prof. Gerhard Wäscher, School of Management, Department of Management Science and Prof. Dietrich Ziems, Chair for Logistics, all at Otto von Guericke University Magdeburg.



Symposium guests were able to experience RFID technology up close at the RFID user forum at the Fraunhofer IFF LogMotionLab.

## Logistics Prize Winner Kühne + Nagel Present Their Concept

Jens Wollesen, member of executive management at Kühne + Nagel, presented the award winning concept "Supply The Sky: Integrated Logistics Concept for the Airline Industry" at the Fraunhofer IFF. Kühne + Nagel won the 2005 German Logistics Prize for their concept. The logistics concept "Supply The Sky", developed over the last ten years by transferring proven methods from other areas of application, makes the aircraft the focus of activities in every phase of the life cycle. Thus, Kühne + Nagel provide logistics services of the highest quality standard worldwide, from development and manufacture to operation up through maintenance and inflight services.

The lecture was part of the 9th Guest Lecture Series "Logistics as a Field of Work of the Future" organized by the Fraunhofer IFF and Otto von Guericke University in Magdeburg. A total of nine speakers from industrial and service enterprises examined different thematic fields of logistics. Highlights beside Kühne + Nagel's concept were the presentation from Jürgen Hupe from Airbus on aircraft life cycle costing and the lecture "Logistics

Surrounding the FIFA World Cup Germany 2006™" given by Stefan Hans from the organizational committee of the FIFA World Cup and Christian Schultze from SCHENKER-globalsportsevents.

The lecture series is organized by Prof. Michael Schenk (Director of the Fraunhofer IFF and holder of the Chair for Logistic Systems at Otto von Guericke University) in collaboration with Prof. Dietrich Ziems (holder of the Chair for Logistics) and Prof. Karl Inderfurth (holder of the School of Management's Chair for Production and Logistics). It is under the patronage of Saxony-Anhalt Minister of Housing and Transportation Dr. Karl-Heinz Daehre.

For the latest information on the Guest Lecture Series "Logistics as a Field of Work of the Future" visit the website [www.gvr-log.de](http://www.gvr-log.de). The Guest Lecture Series is an annual event held during the summer semester. Attended by an average audience of 120 per lecture, it experiences a tremendous response.



Fraunhofer IFF, PhotoDisc®

## 9th IFF Science Days a Resounding Success



Dr. Valentin Gramlich, State Secretary in the Ministry of Education and Culture and Prof. Michael Schenk, Director of the Fraunhofer IFF.

With 400 participants from industry and the research and academic community, attendance at the IFF Science Days was higher than ever before. Trends, developments and examples of best practice from the fields of virtual reality and logistics were presented and discussed at an international conference and several additional workshops. The sizeable share of participants from commercial enterprises demonstrated that the IFF Science Days respond to the needs of enterprises. The Fraunhofer IFF thus forms a functioning interface between research and business and strengthens Magdeburg as a center of business and research.

“Our Science Days are right on target for our clients. The mixture of findings from scientific research and practical examples from industry forms the foundation for technical discussions and the initiation of new industry projects,” was how Prof. Michael Schenk Director Fraunhofer IFF summed up this year’s event. On June 21 and 22, researchers and experts from fifteen countries entered discussions at the 9th IFF Science Days

in Magdeburg. The Fraunhofer IFF involved partners from ongoing industry and research projects in this professional event.

The professional conference on “Virtual Reality and Augmented Reality for Planning, Testing and Operating Technical Systems” was opened with two scholarly presentations and a practical example from the automotive industry. The ViVERA Network of Competence and the European INTUITION Network of Excellence reported on the current state of research in the field of virtual reality. The automotive concern AUDI delivered a presentation on the challenges an international company with global production networks faces and the solutions already produced for virtual logistics and production planning. The aircraft and automotive industries in particular, but other sectors such as mechanical and plant engineering, shipbuilding and medical technology as well, are already employing virtual technologies. Now as before, there is still great need for research though.

Companies such as AIRBUS, AUDI, BMW, DaimlerChrysler, Lürssen Werft, MTU Friedrichshafen, Opel, Siemens and Volkswagen sent executives, heads of development and IT specialists to gather information about trends and hold discussions with researchers on other research developments.

### Logistics News: RFID and Satellite Navigation

The second substantive focus of the IFF Science Days was on technologies and solutions for making the increasingly international flow of goods more secure and more transparent. RFID and satellite navigation technology are particularly important here. The start of the Galileo satellite navigation system has provided the foundation for a multitude of new applications and services that allow engineering logistics more intelligently and processes more reliably. Both for the region of Central Germany and for the country of Germany as a whole, logistics presents potential for tremendous development as economic and ecological challenges mount. New technological solutions will be instrumental in further consolidating Germany’s leadership in the fields of logistics.



The ViVERA Network of Competence presented VR and AR solutions. Virtual technologies are used in medical technology, e.g. to support surgeons performing endoscopic operations.



### What Participants Are Saying...

Michael von Sparr, Senior Manager, AIRBUS Spares Support and Services: "It's quite exciting to be part of this interface between science and industry. The research community presents its findings; industry responds with feedback from first pilot applications or fully installed processes. The IFF Science Days are an extraordinarily valuable institution, which absolutely ought to be spread. The question is ultimately how long can one afford not to attend and be part of this?"

Peter Schickel, Managing Director, Bitmanagement Software GmbH: "We're holding highly professional technical discussions here. As an exhibitor, it is particularly interesting for us to speak with numerous attendees from industry and to be given a concentrated presentation of the requirements on VR and AR technology from a multitude of sectors as input for our developments. The concept of the IFF Science Days makes perfect sense. We'll be here again next year."

Frank Martin, Head of Public Contracts, Lürssen Logistics GmbH & Co KG: "The successful mix of lectures from research and industry deserves mention. For me, it was particularly interesting to see what applications are being developed and used in other sectors. The IFF Science Days give me important impulses for my own work."

## Eastern German Automotive Cluster Presents Itself to the Public

On the occasion of its general meeting at the BMW Plant Leipzig, the Eastern German Automotive Cluster (ACOD) presented itself to the media for the first time on June 19, 2006. On the evening before the opening of the supplier trade show "Z" in Leipzig, the members of the sponsoring organization ACOD presented their objectives and strategies for developing the eastern German automotive industry. The ACOD intends to promote the development of a balanced and sustainable structure for the entire automotive

bundle regional activities in one all-embracing organization and to create synergies in the sector for all of eastern Germany. To this end, it is imperative to better communicate at home and abroad eastern Germany's capabilities in general and its capabilities in the automotive sector in particular.

The ACOD is organized as a registered association. Chairman of the association is Peter Claussen, Manager of the BMW Plant Leipzig. Other members of the executive board are Prof. Michael



The ACOD board: from l. to r. Prof. Michael Schenk, Peter Claussen (Chairman), Jörg Peter Blecher.

industry in eastern Germany. The Eastern German Automotive Cluster (ACOD) is comprised of carmakers (OEM or original equipment manufacturers), suppliers and service providers as well as research institutes, associations and other institutions active in the five new German states. A "cluster" denotes the totality of all the networked parties involved in a branch of the economy in a region, irrespective of concrete activities or memberships.

The ACOD was initiated in 2004 by the OEM active in Saxony and eastern Germany as a platform for joint action. The goal of the ACOD is to

Schenk, Director of the Fraunhofer IFF and Jörg Peter Blecher, Manager of TWB Fahrzeugtechnik GmbH und Co. KG. Claussen is also spokesman for the "cluster board", the steering committee defining the basic principles for the cluster development process.

You can find out more about ACOD objectives in the interview with Peter Claussen starting on page 20.

[www.acod.de](http://www.acod.de)

## LogMotionLab Presents RFID Highlights



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The IFF SmartBox attracted a brisk crowd at the Fraunhofer IFF. With its expertise in testing and development, the LogMotionLab supports the customization of RFID solutions for a particular area of application and its concrete requirements.

More than 3,000 attendees, over 150 moderators and speakers and around 260 exhibitors met in Berlin for the first time from October 19 through 21, 2005 for the logistics event of the year. The 22nd German Logistics Congress further reinforced its position as the logistics sector's premiere event.

The Fraunhofer IFF has been successfully developing RFID solutions for more than ten years and its LogMotionLab is one best equipped RFID labs in Europe. The Fraunhofer IFF was represented at the 22nd German Logistics Congress with two stands and presented intelligent logistics solutions from Magdeburg. The LogMotionLab presented to an interested audience solutions for tool, spare part and container management, technical applications for the control of flows of pedestrians and goods and technical concepts for the secure chain of goods.



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On the DVZ red sofa, Björn Helmke, editor in chief of LOG.Punkt and the DVZ Deutsche Verkehrs-Zeitung discussed current logistics issues with Prof. Schenk. Their conversation particularly dealt with the tremendous potential of RF technologies to make international chains of goods more secure, more transparent and more efficient.

## Europe Week Opens at the Fraunhofer IFF

On May 6, 2006, Europe Minister Rainer Robra opened Europe Week at the Fraunhofer IFF. The minister emphasized the advantages of EU research funding. So far, fifty-nine projects from universities and colleges and non-academic research institutions in Saxony-Anhalt are involved in the current research program. "The opening of Europe Week is completely dominated by research and science," according to Robra. Thus, it fits well into the city of Magdeburg's concept, which is celebrating its "Year of Science" in 2006.



Prof. Michael Schenk warmly welcomed this guest to the Fraunhofer IFF. The Fraunhofer IFF not only profits from EU research funding but is also optimally networked with the European research community. The Magdeburg Fraunhofer Institute has already completed projects with partners from all 25 countries in the EU.

The motto of Europe Week was "Hands On Europe". The Fraunhofer IFF and the Experimental Factory extended an invitation to an open house. Both organizations are supported by the European Union and provided interested individuals an opportunity to find out about concrete projects and research work.

## Fraunhofer Representative Office Opens



At the opening of the Fraunhofer Representative Office and in the presence of prominent figures from science and politics, Prof. Michael Schenk gave a presentation on projects and cooperations between Russian research organizations and the Fraunhofer IFF.

The Fraunhofer-Gesellschaft opened an official foreign representative office in Moscow on October 31, 2005. Russian researchers and enterprises have already been collaborating closely with Fraunhofer researchers for years. In the future, the Fraunhofer Representative Office will support technology transfer and the development of strategic partnerships. The Fraunhofer IFF in Magdeburg will also profit from the newly opened office and the Fraunhofer-Gesellschaft's stepped up activities in Russia.

Together with the Russian Institute of Aviation Systems (GosNIIAS) and the Automobile and Road Technical University (MADI) in Moscow, the Fraunhofer IFF presented the "Joint-Lab", a joint research and development lab. In an initial phase, the joint lab will collaborate on spare parts identification for the aviation industry and on the development of optical measuring systems for manufacturing and quality inspection.

## Fraunhofer IFF and GosNIIAS Together at the ILA2006

The International Aerospace Exhibition ILA2006 was held in Berlin from May 16 through 21, 2006. Minister of Economics Michael Glos, Brandenburg



Minister President Matthias Platzeck and the Director of the Russian Federation's Federal Agency on Industry Boris Aljeshin opened the exhibition. More than 1,000 exhibitors from over 40 countries presented their products, systems and processes from all branches of this high-tech sector. The organizers registered a total of more than 250 000 visitors.

The Fraunhofer IFF and its Russian partner, the Russian Institute of Aviation Systems GosNIIAS, jointly presented new information technologies that safeguard the quality and reliability of manufacturing and logistics processes in the aviation industry. A demonstrator of the system "RFID for Aviation Components" developed as part of Interlogistica was presented at the stand. It is primarily for clear and tamper-proof labeling of components. Many representatives from Russian industrial companies and airlines displayed great interest in this identification technology.

## VDI/VDEh Maintenance Forum 2006

The 27th VDI/VDEh Maintenance Forum 2006 was held in Lahnstein on May 16 and 17. The Fraunhofer IFF was strongly represented in the program and presented RFID solutions for maintenance at the accompanying exhibition.

In his lecture, Dr. Klaus Richter presented potentials for RFID technology and best practice solutions in maintenance. Richter additionally moderated the workshop on "Maintenance and RFID: Where Are They Headed?". The Fraunhofer IFF has been working on research and development in this field for more than ten years and already had the know-how – long before the current RFID boom – to implement RFID based tool maintenance and management at AIRBUS in 1999.

The Fraunhofer IFF had a hand in organizing two other sequences of the maintenance forum. Deputy Director Dr. Gerhard Müller moderated the sequence on increasing productivity and Cathrin Plate guided speakers and attendees through the sequence on SAP applications.

With its clear concept, the VDI/VDEh Maintenance Forum has established itself in recent years as a marketplace of opinions for maintenance engineers and a reliable institution making current knowledge and trends accessible. Thus, it has evolved into a recognized center of maintenance competence.

## Fraunhofer IFF Goes East

The Fraunhofer IFF will be an exhibitor at "transport logistic China 2006". The institute is taking part in this international logistics trade fair in China to further expand its partner networks in Asia. The Fraunhofer IFF will be present at a joint stand with the Port of Hamburg and will be displaying intelligent logistics solutions from Magdeburg.

### Project Prospects in China

Fraunhofer IFF project activities in China are developing quite well. The institute will soon be starting two extensive projects in China. For international clients, the Fraunhofer IFF completed market and development studies of the Chinese software industry and of potential logistics solutions for Chinese agriculture. Both projects were internally managed by Kay Matzner and are contributing to further advancing research and development services for the Chinese market.

## Projects for SME in Thailand: Teams SME



TEAMS-SME project kick-off meeting: (l. to r.) Frank Müller, ASEP, Thailand; Ralf Opierzynski, Fraunhofer IFF, Germany; Pakka Pentita, EC Delegation, Thailand; Dr. Nilsuwan Leelarasamee, F.T.I., Thailand; Prof. Boonyong Lohwongwatana, ASEP, Thailand

The primary objective of the project TEAMS-SME is to boost the competitiveness of small and medium-sized enterprises (SME) in Thailand. To do

this, field-proven concepts of industrial controlling based on performance indicators as well as selected European management information systems (MIS) are being presented and their use trained, taking the basic conditions in the respective countries into account. MIS implementation projects are being piloted in selected Thai enterprises to evaluate their feasibility and to demonstrate how to develop concrete potentials for optimization.

The active involvement of local networks and dissemination structures (e.g. Industrial Estate Authority of Thailand, SME Promotion Office, Ministry of Industry, Thai-German Institute, SoftwarePark, etc.), the cooperation of which is assured by the many years of Fraunhofer IFF work in Thailand, will be instrumental in the successful completion of the project. The Fraunhofer IFF 's project partner is the Asian Society for Environmental Protection (ASEP) in Thailand. The Federation of Thai Industries (F.T.I) in Thailand is responsible for management.

## eLOGMAR-M: Chinese-European Forum on e-Logistics

The Fraunhofer IFF in Magdeburg is coordinating the project eLOGMAR-M intended to develop mobile communications solutions to support logistics processes in maritime applications. Eighteen partners from nine countries are members of the consortium. The eLOGMAR-M consortium held the first Chinese-European Forum on e-Logistics in Shenzhen, China, on March 30 and 31, 2006. The objective of the forum was to publicly present the results of the eLOGMAR-M project and further advance Chinese-European cooperation in e-Logistics.

Participants discussed the following main issues:

- Framework programs for research and technological development in Europe as well as e-Logistics projects in these framework programs
- Trends and case studies of information technology applications in logistics (e-Logistics)
- Training and education in e-Logistics and evaluation of the same



Dr. Eberhard Blümel in conversation with Zhou Mingtao, President of the Chinese partner HOPE Beijing Software Co.

Along with official representatives of the European Commission and the Chinese government, more than 100 experts from the logistics and IT industry as well as universities and the research community attended the conference. The conference could potentially be the prelude to an entire series of events on this highly topical subject.

## Plant Engineering Industry Meets in Magdeburg



At the accompanying exhibition, Torsten Böhme from Fraunhofer IFF presented a coupling of a real Siemens control system with the virtual model of a heavy machine tool.

On March 2 and 3, 2006, experts from business and industry, the academic and research community and government dealt in Magdeburg with the trends, opportunities and challenges in plant engineering. At the fourth conference on "Plant Engineering of the Future", these industry experts discussed how to gain competitive edges in plant engineering.

Virtual engineering and the potentials of virtual technologies were one of the primary emphases at the conference organized by the Fraunhofer IFF. Prof. Michael Schenk, Director of the Fraunhofer IFF, detected the following trend: "In order to be able to keep pace with the industry's increasing requirements in the industry, companies need the capability to integrate themselves in intercompany and international processes and quickly launch innovative products on the market. Virtual technologies are instrumental in doing this."

Shorter development and startup times for technical assets are being worked toward in order to remain competitive. The support of virtual technologies make it possible to realistically visualize complex plants and their functions and to experiment with them in a model. Not only can these models be used to create virtual prototypes but they also form the foundation for other services, e.g. early stage training of operators. The lectures presented examples of best practice, current trends and developments and the potentials of virtual technologies for the more efficient design, construction and operation of plants.

## Magdeburg Wants to Know: 2006 Is the Year of Science

The capital city of Magdeburg is changing, evolving from a city of heavy machinery manufacture into a city of applied science. Magdeburg has traditionally been a city of technological innovations and debates affecting the future. Its research potential is enormous. In order to highlight and publicize all its fascinating facets, the city declared 2006 Magdeburg's "Year of Science".

Magdeburg entered its Year of Science with a remarkable ceremony at St. John's Church. TV star Wigald

### Long Night of Science

The next highlight in Magdeburg's Year of Science was planned for May 20. In the "Long Night of Science", over forty cultural, academic and scientific organizations opened their doors and extended invitations to an interesting, nocturnal voyage of discovery. At this major event, residents of Magdeburg and their guests witnessed and experienced 150 experiments, actions and presentations concretely showing what research in Magdeburg is like. In its testing fac-

Plant Management. Service robots in action showed the public how automation can make life easier. In the CAVE, a special projection room, visitors immersed in virtual reality. In the LogMotionLab, researchers had equipped remote controlled jeeps with an RFID locating system. Big and little researchers stepped up to race. An analysis of who completed the course fastest and who deviated from the ideal route the least came at the end. The logistics specialists thus entertainingly showed how tomorrow's transponder supported logistics will function.

### MS Wissenschaft: Sports and Computer Science

On this weekend, "Science in Dialog's" science ship also started from the capital city on its annual tour of Germany. The 105 m long inland ship will call at thirty-five German cities along the Elbe, Rhine, Mosel, Main and Danube. In Informatics Year 2006, the "MS Wissenschaft: Sports and Computer Science" will use topics from sports to convey what computer science is, what it can do and where it can be found all over.



Prof. Michael Schenk explains the potentials of RFID supported logistics to Wigald Boning and the audience.

Boning (Clever: The Show that Creates Knowledge) presented a varied show program of interviews, scientific experiments and naturally his rousing "assistants ballet". The Fraunhofer IFF was involved in the stage program too. The LogMotionLab team installed a mobile RFID station onstage, which immediately identified all the prominent guests (provided with a transponder beforehand) and displayed information about them on a screen as soon as they came on stage.

lity, the Fraunhofer IFF presented highlights from four fields of research: Automation, Virtual Development and Training, Logistics and Production and



After the javelin has been thrown, data from the integrated chip is transmitted to a laptop.



The electronic javelin being used in training.

An exhibit from the Fraunhofer IFF Division of Automation is also on board: A javelin with integrated metrology. The measuring system was developed together with the olympic training center in Halle and is used to train athletes. It records acceleration and speed during a javelin throw. The measuring system is fully integrated in the javelin and allows analyzing the sequence of motions directly after a throw. The javelin and computer are connected with a specially developed magnetic adapter, making a cable connection unnecessary. A normal laptop taken directly to the training site is suitable for evaluation.

### Fraunhofer in Magdeburg: Selected Landmark in the Land of Ideas

Another significant moment is coming up on November 22: The opening of the Fraunhofer IFF Virtual Development and Training Centre VDTC will be celebrated in Magdeburg's Port of Science. The VDTC will be the selected "landmark in the land of ideas" on this day. "Germany: Land of Ideas" is the joint initiative of the Federal Government and German business represented by the Federation of German Industries. The initiative aims to present an image of Germany at home and abroad as a country that is innovative, open to the world and inspired. The Virtual Development and Training Centre VDTC was selected



Remote controlled jeeps equipped with RFID vividly convey the how transponder-supported logistics functions.

from more than 1200 applicants and is now part of the unique series of landmarks, which will outstandingly represent Germany as a Land of Ideas.

## Senate Meets at the Fraunhofer IFF

The highest Fraunhofer-Gesellschaft body, the Senate, met at the Fraunhofer IFF on October 18, 2005. Prof. Michael Schenk, Director of the Fraunhofer IFF, welcomed these guests to the Magdeburg Institute and took the opportunity to present the institute and selected research projects. Members of the Senate are high ranking individuals from business, research and the public sector. In his welcoming remarks, Senate Chairman Prof. Klaus Vöhringer emphasized the excellent reputation the Magdeburg institute enjoys in the Fraunhofer-Gesellschaft.



In the Magdeburg institute's testing facility, Prof. Michael Schenk (left), Director of the Fraunhofer IFF, explains current projects to Fraunhofer-Gesellschaft Senate Chairman Prof. Klaus Vöhringer (center) and Fraunhofer-Gesellschaft President Prof. Hans-Jörg Bullinger. Components and models of an inspection system for sewer systems can be seen in the picture.

## Virtual Worlds: New Dimensions



Outfitted with 3-D glasses, guests follow animated 3-D projections. An award winning software makes it possible to manage the gigantic quantities of data for the visualizations.

The Fraunhofer-Gesellschaft wowed its guests with multimedia projections and virtual 3-D worlds at its annual convention in Magdeburg. The high-point of the event was the awarding of a total of seven prizes to the best Fraunhofer researchers. In his speech, Fraunhofer President Hans-Jörg Bullinger emphasized the importance of applied research and rapid new product development in order to remain internationally competitive. Only this will make it possible to sustain the high standard of living in Germany.

The motto "Virtual Worlds: New Dimensions" was closely related to the year's venue. The Fraunhofer-Gesellschaft's decision to meet in Magdeburg was a clear endorsement of the location and honored the work being done in Magdeburg in the field of virtual technologies. Its leadership of the national network of competence ViVERA and the construction of the Virtual Development and Training Centre VDTC have established Magdeburg as a center of research in virtual engineering.

The Fraunhofer-Gesellschaft's annual convention is held in a different state every year. Following Dresden, Magdeburg is the second city in the new German states called upon to host this extraordinary event. This especially pleased the residents of Magdeburg, since many cities vie to bring home the annual convention. The Magdeburg Volksstimme even spoke of it as a "knighthood" for the Magdeburg institute.

## Construction Workers and IFF Employees Celebrate VDTC Topping Out Ceremony



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Traditional customs at the topping out ceremony: The last hammer blow delivered with remarkable precision by Deputy Director D. Gerhard Müller and a drink in honor of the occasion.



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On December 21, 2005, work at the VDTC construction site didn't progress as speedily as usual for a change. No surprise: Tables and benches had been brought in and heaters and spotlights set up. Numerous helpers gave their all to make it possible to celebrate a properly festive topping out ceremony at the wintry construction site. And so it came to happen as it should: Construction workers, architects and Fraunhofer IFF employees all made the night day.

The principal used the traditional topping out ceremony to express his deep thanks to everyone involved and wished a successful conclusion to construction. True to the saying "The moment this glass is broken on the

ground is the hour this building is dedicated", once the carpenter's nail had been successfully hammered in, toasts were drunk and the topping-out wreath was hoisted.

The next time a large number of guests gather in Magdeburg's Port of Science will be to open the new Virtual Development and Training Centre VDTC building. The date is already set. On November 22, 2006, the interested public will be able to find out how development, testing and training functions in virtual environments. On this day, Magdeburg Fraunhofer researchers will open the doors to their new institute building.

Thus, the VDTC will not only arouse interest in Saxony-Anhalt but also in all of Germany – and perhaps throughout the world. As one of the 365 landmarks in the "Land of Ideas" the VDTC is allowed to represent Germany in the world as part of this initiative in the year of the World Cup.

## Enigma and Fraunhofer IFF Sign Partnership Agreement

Enigma GmbH and the Fraunhofer IFF are jointly providing the after sales solution PMO Services for compiling, distributing, organizing and providing service information for the operation of machinery and plants. The two partners signed a partnership agreement to do this.

Fraunhofer researchers designed Plant Maintenance and Operation Services PMO, using the technology of the Enigma 3-C software platform to create it. PMO Services makes it possible to make diverse information and documents, previously stored in different systems and formats and sometimes on paper and other times in data files, available in a standard solution. One of the Fraunhofer IFF's contributions is providing virtual-interactive 3-D scenarios in PMO Services.

For more information, visit <http://www.pmo-services.de/>



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L. to r.: Asher Gabbay, ENIGMA GmbH, Rudolf Bohn, Saxony-Anhalt Ministry of Economics and Labor and Prof. Michael Schenk, Fraunhofer IFF at the signing of the agreement.

## ALFA Growth Core



A center for the development of novel products made of fiber reinforced composites is making a name for itself in Saxony-Anhalt. The starting technological basis is a production method from Polystal Composite GmbH in Haldensleben using a modified pultrusion method. On the basis of an “innovative regional growth core”, fourteen regional enterprises, the universities in Magdeburg and Stuttgart and the Fraunhofer Institutes IFF in Magdeburg, IAP in Golm and IZM in Teltow have joined forces in the Network for Fiber Composites ALFA. The network’s goal is to develop new methods for subsequently mass producing innovative products from composites for mechanical engineering, the construction industry and telecommunications. This demands solutions with widely varying requirements including, among others, high thermal stability, resistance to aggressive media, excellent deformation behavior, high flexibility at maximum force and shaping potentials as well as products being developed having force transmission adequate to load. The materials’ excellent potentials inspired the ambition to develop fiber composites into mass products. By systematically selecting matrix and fiber material and suitable manufacturing technologies, the profile of properties can be controlled well.

Up to now, the manufacture of fiber composite components, the most notable outstanding feature of which has been their weight to strength ratio, has been connected with a need for much manual labor. The goal of the ALFA growth core is to achieve a position of international leadership in industrial mass markets in the fields of fiber composite applications mentioned. With its expertise in automation, product and process management, data management and process and plant technology, the Fraunhofer IFF in Magdeburg is involved in the field of process development. In the coming three years, the Federal Ministry of Research will be supporting the growth core with up to seven million euros.

## Association Bundles Competencies in Regenerative Energies



Initiators and management of the newly established association (l. to r.): Prof. Zbigniew A. Styczynski, Otto von Guericke University Magdeburg, Dr. Horst Rehberger, formerly Saxony-Anhalt Minister of Economics and Labor, and Dr. Gerhard Müller, Fraunhofer IFF

The Center for Regenerative Energies Saxony-Anhalt was established in Magdeburg in early April. Former Minister of Economics Dr. Horst Rehberger, one of the initiators of the center, invited representatives from

research institutions and companies working in this field to the founding meeting. The associations’ goal is to bundle and further strengthen the state’s existing competencies in business and research in the field of renewable energies. The center will initially focus its work on fuel cells, wind energy, biomass and photovoltaics.

The founding members of the center come from Otto von Guericke University, Magdeburg’s Max Planck Institute, the Fraunhofer IFF, the Magdeburg-Stendal University of Applied Sciences, Cimbria SKET GmbH, Q-Cells AG, GETEC Energie AG, Bio-Ölwerk Magdeburg GmbH, AMB Vertriebs GmbH and BLZ GEOTECHNIK GmbH.

Prof. Zbigniew A. Styczynski, Dean at Otto von Guericke University Magdeburg, was elected chairman of the board. The other association board members are Dr. Hans-Jürgen Rasehorn, Managing Director of Cimbria SKET GmbH and Dr. Gerhard Müller, Deputy Director of the Fraunhofer IFF and Director of its Division of Production and Plant Management.

The installed generating capacity of all regenerative energy systems in Saxony-Anhalt accounts for around 45 percent of the state’s entire power plant capacity of 4500 MW. In 2004, the producers of regenerative electricity supplied 18.4 percent of the total power in Saxony-Anhalt.

## 2006 Innovation Prize in the Category Biotechnology



TELOMICS™ ex vivo robotics from KeyNeurotek AG, the first fully automatic system for tissue screening.

Two of the Fraunhofer IFF's development partners won the Initiative Mittelstand's 2006 Innovation Prize in the category biotechnology. First prize was awarded to KeyNeurotek AG for TELOMICS, a fully automatic system for tissue screening. Second prize went to AnagnosTec GmbH for MIROB, a robot that automatically prepares samples to determine microbe species.

TELOMICS™ ex vivo robotics is the first fully automatic system for tissue screening. Its particular advantage is its complete integration of tissue culturing and experiments, which is extremely labor and time intensive in a traditional lab.

In particular, pharmaceutical research in search of new active ingredients and medicines tests their activity on living tissue. Previous high throughput screening systems have usually been based on tests of single cells or molecules. Complex clinical pictures involving many cells in organs can only be detected by a tissue test however. TELOMICS enhances the quality of research by testing cell cultures and tissue instead of single cells.

This fully automatic system makes it possible to test larger quantities faster and more cost effectively. KeyNeurotek jointly developed it with the Fraunhofer IFF in Magdeburg.

The goal of the novel robot MIROB (MicroorganismenTransfer ROBot) is to automatically prepare samples for determining microbe species by means of mass spectrometry. Despite all the automation in the everyday lab routine, such analyses still require a great deal of manual labor. Samples usually have to be prepared under considerable safety precautions, particularly in the case of pathogens hazardous to human beings. MIROB is different. Supported by a camera and image analysis, the robot autonomously takes samples from petri dishes and feeds them to the mass spectrometer. Material flow control is all essential in

continuous operation. The camera registers the label of every petri dish and simultaneously identifies its barcode. A few minutes later, the computer combines this data with the result of analysis.

This was a collaborative project involving IMOS at Otto von Guericke University Magdeburg, the Fraunhofer IFF and the firms Symacon GmbH, Engelke Engineering Art, Proteomfactory AG and AnagnosTec GmbH funded by the BMBF support program "Production for Tomorrow".

Every year, the Initiative Mittelstand awards its Information Technology Innovation Prize at the CeBIT and its German Industry Innovation Prize at the Hannover Messe. In view of the numerous innovative ideas from medium-sized enterprises, the Industry Innovation Prize singles out additional winners in subcategories.



MIROB, the robot for AnagnosTec GmbH for automatic sample preparation of microorganisms.



Peter Claussen  
BMW Leipzig Plant Manager,  
Chairman of the association ACOD

# Eastern German Automotive Cluster Established

The Eastern German Automotive Cluster (*Automotive Cluster Ostdeutschland e.V. ACOD*) has been formed in eastern Germany. Carmakers with production facilities in the new German states played a leading role in advancing this initiative. BMW Plant Leipzig, Porsche Leipzig GmbH, Opel Eisenach GmbH, Volkswagen Sachsen GmbH and Daimler Chrysler Ludwigsfelde GmbH started the ACOD together with supplier companies, regional initiatives, associations and academic and research organizations to combine the forces of the enterprises involved. Peter Claussen, BMW Leipzig Plant Manager, was elected chairman of the association. Additional members of the board are Jörg P. Blecher, Managing Director of TWB Fahrzeugtechnik GmbH & Co. KG, and Prof. Michael Schenk, Director of the Fraunhofer IFF. An industry advisory committee made up of twenty-six prominent individuals is responsible for its strategic orientation.

In the new German states, 140 000 employees work in around 1000 companies in the automotive sector. According to figures from the Automotive Industry Association, the average size of companies in the new states is significantly smaller than in western Germany. If the automotive industry in eastern Germany is to continue to remain successful and be able to position itself nationally and internationally as an attractive and innovative location for carmaking, companies will have to network themselves better and combine forces.

In this Fraunhofer IFFOCUS interview, Peter Claussen talks about the objectives of the ACOD and his vision of eastern Germany as a center of carmaking.

Mr. Claussen, the ACOD has been officially founded as a registered association. Congratulations on your election as its chairman.

**What do you consider to be the most important tasks of the ACOD in the next twelve months?**

The ACOD must constitute itself this year so that it is fully capable of acting on its own account, can inwardly support the industry's process of development by providing targeted information and developing network platforms and events and is able to nationally and internationally communicate the region's potentials for the sector. A coordinated substantive strategy has been devised to do this. Now we want to make as many cluster members as possible aware of the work of the ACOD and its benefits so that we can operate on the broadest basis possible. Naturally we also need an appropriate working structure to do this.

**How will these tasks be dealt with?**

To operatively implement the tasks defined by the Cluster Board – the cluster initiative's advisory body – a company formed as a GmbH with a few employees will be founded, which will take over such things as processing information and preparing central events and will support the board's work and state initiatives. The actual substantive networking work and concrete projects will have to be undertaken by the cluster members themselves. State initiatives and microclusters will be the fundamental platforms for this. For the communication strategy to be effective, I consider it indispensable that we see and experience a broad involvement of carmakers, SME, universities, other research organizations and other partners.

**What future projects do you see for your vision of eastern Germany as a carmaking center?**

It is important to expand and develop competencies for systems development of larger modules. This is a long road, which presumably only a few firms will be able to travel alone in a reasonable time. That is why partnerships in concrete company projects with the collaboration of research organizations have to be an intrinsic element. I can only imagine stable economic success when there is constant innovation of products and processes. Without this backbone of product innovation, there will be too little demand for services such as logistics or plant engineering.

**Where do you see the field of activity for research institutions? Where will the greatest changes be in your opinion?**

The academic institutions and research organizations have to cover the automotive industry's entire value added chain with a practical orientation and the supporting processes such as logistics too. Particularly where issues of business management are concerned though – such as the methodology for evaluating business models and projects, controlling or marketing – knowledge transfer is important especially for small and medium-sized enterprises. Here and in research, research organizations can actively have a hand in eastern Germany being perceived as a center of production and development with a future.

Logistics research is also situated between conflicting priorities of international competition, e.g. in the 6th Research Framework Programme, and regional orientation for SME. What do you expect from research organizations in the field of logistics research?

Controlling the logistics process chain is a matter of survival for the automotive sector, which is based on an extreme division of labor and fundamentally has a national and international orientation. It's like this throughout the world and research organizations have to use their solutions to survive international competition. Thus, they can also generate substantial competitive edges for the region. Development in this field will remain at least as exciting as the innovations for the product the automobile.

# Transparency and Efficiency with RFID

Holger Seidel

The right things, at the right time - done right. Easy to say; hard to do. Short innovation cycles, volatile markets and investors' declining willingness to take risks make it difficult for companies to look ahead and thus impede identifying and taking advantage of market opportunities in the long term. Technologies, for which there is no recognizable, developable market in the short-term, are frequently recognized too late to generate any real competitive edge. On the other hand, potential users often only become aware of new technological methods and products when their competitors start using them.

The strategic and economic significance of logistics for the development of locations and regions is indisputable. Logistics is a sensitive, time-critical and disruption-prone business. Security concepts for goods and their transport process with the requisite technologies are just as important. In the future, infrastructure security in transportation and information technology will play a greater and greater role in competition between international locations and be a decision criterion for investors.

Often, only insiders are aware of the possibilities innovative telematics and RF technologies open to develop new logistics products and service processes however. A multitude of events – organized by private and public providers – are intended to make the significance of these technologies accessible to the general public and to recruit companies to develop and use new products. Technology rather than customer benefit, i.e. the generation and optimization of logistics processes, is often uppermost. The development of products is only one aspect though: Most innovations never make it out of the prototype stage for lack

of sufficient testing and thus sufficient customers in the field of application. Another aspect reveals that only products, which can be smoothly integrated in an industry's existing solutions immediately and create clear competitive advantages quickly, are experiencing success on the market. Moreover, innovative products normally connect innovation in IT, hardware and service processes and – particularly in logistics – are correspondingly complex.

## Logistics as an Innovation Driver

International, intermodal chains of goods require controls for product tracking, product identity, product accountability, product return, minimization of packaging and security in the chain of goods. Logistics will only be able to control the continually increasing flows of goods if new intelligent and cost effective techniques and technologies are used, which track, control and monitor the entire logistics process. Only the use of new techniques and technologies can permanently achieve the goal of acting in near real-time and flexibly as well as simultaneously increasing utilization of the means of transport.

Only then can intelligent, secure logistics solutions and a secure transportation infrastructure interact.

Thus, it will be more and more important in the future for suppliers, logistics service providers and customers to be able to monitor the location and status of logistics assets along the entire transport chain all the time.

The globally usable European satellite navigation system Galileo will make it possible to provide precise locational information and other additional services.

The incipient use of new techniques and technologies such as RFID and sensor systems in logistics is enhancing the potentials for constant identification and status monitoring. Combining both directions of technical development is creating the prerequisites to develop urgently needed new solutions.

Information on the current position and status of goods, means of transport, containers or vehicles as well as the availability of this data in expediting systems, is assuming a central role in transport logistics for instance. For reasons of logistics and security, logistics companies are making great efforts to obtain information about the location and status of selected goods in real-time with the goal of defining intelligent mobility. The market of such telematic service providers is growing dynamically.

Product vendors and communities of interest are emerging that want to engineer logistics processes or telematic products to be testable so they are actuarially accepted by property insurers for example.

- Logistics is an important basis for Germany's competitiveness as a center of industry and value added. It is the foundation for industrial manufacturing, the circulation of goods and collaboration among companies.
- Following retail and the automotive industry, logistics is the third largest sector in Germany and employs approximately 2.6 million people, of which 160,000 in Central Germany work in the transport and logistics sector at this time.
- As a cross-sectional function of business sectors, logistics provides for previously unconnected technologies to converge in ready-to-use and tested products. It demands newer and newer technologies and IT solutions for its specific applications and thus acts as a driver of innovation.

The extensive expansion of the communications infrastructure, the progressive digitization of information based on spatial data and the availability of highly mechanized, inexpensive equipment are responses to the demand for intelligent mobility.

As the concept of the logistics service provider Red Parcel Post set to start in 2007 promises, intelligent logistics can cut inner city commercial transports by up to fifty percent. Savings in the range of ten percent are realistic for intermodal transports. The vision of a material Internet in which a logistic asset corresponds directly with its environment promises completely new potentials for rationalization. On the other hand, the dynamic development of maritime transport and increasing cargo pressure will assign inland harbors a new role and importance as logistics nodes. Once the deep sea harbor of Jade Weser Port has been constructed, flows of goods and traffic will shift and new relations will develop, e.g. between Hamburg, Bremen and Wilhelmshaven.

Telematics and navigation technologies based on GPS are already being broadly applied in logistics in fleet management and are increasingly being extended with innovations from automotive engineering, e.g. to monitor loading status. The growing logistics market and logistics' role as a link between Europe's markets provide an up-and-coming field of application for products and services based on Galileo.

#### **Best Practice from the LogMotionLab**

The Fraunhofer IFF LogMotionLab has specialized in developing applications in various industries and in integrating typical industry solutions. The articles on the following pages present several examples of successfully completed industry projects.

Industrial asset maintenance and shut-downs make enormous demands on logistics operations. Company staff and subcontractors must be just as coordinated as buying operations, spare parts and tool management, disposal and the execution of all work on schedule and according to plan. One article demonstrates how the use of telematics and RFID facilitates the organization and execution of maintenance measures and contributes to cost cutting.

The successful conception and implementation of a container management system for the manufacture of gas turbines at Siemens Power Generation delivers a vivid example of the potentials of RFID to rationalize production logistics. In contrast to requirements for specific industries in maintenance logistics, the container management model can be transferred to other industries without any problems.

The Fraunhofer IFF is systematically researching the requirements that technological solutions using RFID and telematics have to satisfy in order to be used for certain processes and in particular industries. Standards for typical industry solutions are being jointly developed in cooperation with future users of the technology who come from various sectors of the service and manufacturing industry. The LogMotionLab experts' standardization and certification make any company's introduction to these new techniques and technologies easier.

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# Smart Objects in Maintenance: How RFID Helps Maintenance Personnel

Dr. Klaus Richter and Cathrin Plate

More and more companies are discovering the advantages of RFID technology for their maintenance. Using RFID chips for various maintenance processes such as receiving spare parts, managing reconditioned components, documenting servicing and maintenance and automatically compiling maintenance history files gives companies a competitive edge.

RFID technology provides great potential for improving productivity throughout every phase in the life cycle of manufacturing equipment. Both from the perspective of logistics and maintenance, benefits of and opportunities for RFID are opening in maintenance. Fields of application and scenarios of use are extremely diversified and a wide range of influencing factors leads to different requirements for the use of RFID transponders in maintenance. Operating conditions such as dirt and dust, extreme temperatures, aggressive substances and metallic environments play as much a role as logistics conditions. These include a large proportion of subcontractors, the type and duration of reconditioned component processes, the size of spare parts inventories, the delivery of spare parts or the construction site character of larger maintenance measures. The use of transponder technology must also be coordinated with the type of maintenance assets and their related processes, depending on whether plants are mobile or stationary, equipment is highly complex or simply structured, processes have many degrees of freedom or information is standardizable. Ultimately, the analysis of the internal operations and information flows being supported and, if necessary, their reorganization in the course of RFID implementation are critical to engineering the right RFID system. So far, maintenance hardly has any RFID reference processes and related standardized systems. This is why RFID systems have to be individually designed and implemented. In the run up to system implementation, the Fraunhofer IFF LogMotionLab makes its superbly equipped test lab and ten years of RFID know-how available to test RFID components under industrial conditions.

### Smarter Maintenance

Passive RFID systems have undergone rapid development and product diversification in recent years. In the maintenance environment, they are used:

- As digital nameplates for the unique identification of parts and components,
- For documentation of maintenance activities directly on a maintenance asset,
- As smart labels for case and item identification in the supply chain of plant engineering processes,
- As auxiliary equipment for bin location identification in spare parts storage,
- For tool and equipment management,
- As certificates for the status of load carrying devices or wind energy converters,
- To verify the origin of goods intended for disposal and
- As aids for access control of personnel in security areas.

RFID systems with mobile handheld readers in the 13.56 MHz range (HF range) have become established in maintenance. The first UHF handhelds (868 MHz), which attain significantly larger read ranges and speeds than in the HF range, have also become available in the meantime. Here too, environment (metallic environment, aggressive media and dust) can also impose constraints though. A mix of barcode and RFID technology or sensors and RFID is quite common in applications where the technologies' features augment each other practically.

Maintenance planning and control systems (MPC) have in the meantime become widespread in large and medium-sized enterprises. The implementation of distributed RFID data carriers in maintenance processes automates information flows and improves their quality and transparency. Priorities include making data available up to the minute, eliminating errors that occur by recording data manually, preventing inconsistencies in data and making information available directly on an asset. Thus, the methods and times needed to search for information can be drastically reduced in large-area plants when the current configuration of an assembly or a reconditioned part's history can be read out immediately with a handheld device whenever unplanned maintenance work has to be done. Decisions can be made more quickly and downtimes thus reduced.

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# RFID Makes Container Management Transparent

Helmut Röben and Manuela Wahl

The international exchange of goods and products is ever growing. As a result, the number of reusable transport containers is also rising. New information and communication technologies are helping keep an eye on everything. The Fraunhofer IFF provides high performance RFID based container management systems that are just as suited for internal material flows as for international supply chains.



Reusable transport containers are a good idea for closed logistics cycles. Controlling the flows of accompanying and preceding information is a basic prerequisite to smoothly organizing the flow of goods and commodities as supply and logistics networks become more and more complex. Losses from misdirected containers, pallets or luggage each run in the double or triple digit millions. State-of-the-art solutions must not only be able to positively identify mobile assets of different types and in varying environmental conditions but also to localize them, communicate with them, navigate them and control them.

Information is evolving into one of the most important factors of logistics. New potentials in the field of information and communication technologies are allowing better and better solutions to support logistics processes. The Fraunhofer IFF provides RFID based container management systems that do this.

The crucial advantages of these RFID based systems are the rewritability of the data media and the distributed provision of information directly on an object. Rewritability of the data medium, integrated in each container, enables storing and retrieving needed information directly on the container

anytime. The RFID chip makes every container clearly identifiable all the time. Thus definite statements can be made about owner and content. Linking decentralized and centralized information creates the prerequisite to an organizational solution that transparently maps logistics processes and evaluates them. This can be built upon to establish process-oriented control loops in supply chains. Defining the data model that stipulates what data shall be mobilely recorded and managed is critical for the success of such systems. The interface to company software and, in particular, the connection to master and job data are critically important here.

The advantage is obvious: If, for example, goods are transported in time-critical orders, localizing and communication technologies provide clear information all the time about whether the transport is moving within the specified timeframe. When there is a delay, an alarm can be activated and a change can be made to a faster means of transportation. If the transported items are particularly sensitive goods, e.g. medicines or frozen foods, their condition in the container can be checked. If their condition becomes critical, for instance because a specified temperature limit has been exceeded, the system activates an alarm, making it possible to actively intervene at an early stage and thus protect the goods from being ruined. RFID based container management enables continuously tracking shipments – while accordingly organizing the processes along the entire value added chain – and results in more transparency in the material flows.

In conjunction with other technologies such as sensor systems for registering condition and other communication technologies such as mobile radio and GPS, transport containers become intelligent objects that ensure logistics processes are of high quality and reliable.

Apart from improving the actual logistics processes, equipping containers with RFID chips generates other benefits in container system organization and maintenance. Applying smart labels not only makes the actual transport process more transparent but also provides clear information on the number of containers used, on possibly unused potentials or overcapacities. Along with information on content, e.g. owner, type, quantity, condition or destination, information on the container can also be stored on the data medium. In turn, this information supports the systematic planning and control of service

processes as well as maintenance management. Transponders have significant advantages over conventional visual container labeling. They are quite suited for use in a harsh production environments and, most especially, in that their operational readiness is not impaired by dirt.

The availability of distributed information opens potentials for success in terms of cycle times, costs and quality. Integrating information and material flows produces process transparency that makes it possible to identify and optimize logistics performance variables such as cycle time and logistics quality. The Fraunhofer IFF LogMotionLab is one of Europe's best equipped RFID test and development labs. Fraunhofer IFF researchers use their know-how to adapt customized solutions to internal and external logistics processes.

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### A Successful Project with Siemens Power Generation

The Fraunhofer IFF has successfully implemented RFID based container management (TIP4BOXES) at Siemens' Gasturbinenwerk Berlin.

In Berlin, Siemens manufactures gas turbines and uses turbine blades that they in part manufacture themselves but in part also receive from suppliers in England and the USA. Depending on its size and design, the value of a single turbine blade can equal that of a well equipped mid-size car. The varied and diverse transport movements and the costliness of the components induced the Gasturbinenwerk to implement container management using RFID chips.

In brief, the most important advantages of container management are:

- Previously considerable effort needed for searches is almost completely eliminated
- Any Siemens Intranet PC allows easy access to the system
- Container management can provide information on the content of every container
- The location of every container can be determined with the push of a button
- Errors caused by manual data input are eliminated
- Suppliers can be integrated in the system
- Operational organization of internal and external container logistics is improved



# Standardizing and Certifying Typical Industry Applications

Dr. Klaus Richter and Cathrin Plate

RFID is booming. The radio labels promise to make processes more transparent and more secure in many industries. Functioning solutions have become available for the large number of uses and the wide variety of requirements of various sectors and applications. Standards and certifications for RFID solutions are still needed though.

RFID technologies combining identification, positioning, status logging and communication are still on the threshold to mass market launch. Various sectors such as retail, courier express shipping service or industrial plant engineering are making great efforts to create stable and standardized processes to implement RFID technologies in the entire value added

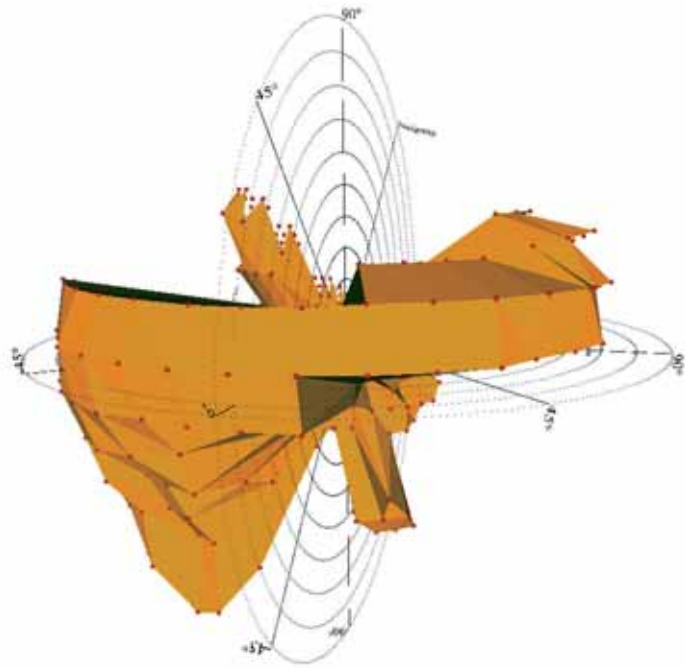
chain. To this end, future users are forming strategic partnerships to forge a close bond between hardware and software developers and users. Common to industry applications are efforts to standardize and certify both RFID based processes and their requisite technologies and equipment in order to make it easier for companies to start using this new technology and to clearly communicate its advantages.

As an example from industrial plant engineering demonstrates, a classification based on the field of application, the logistics asset being analyzed and the packaging unit is the foundation for making RF based processes standardizable and certifiable in the future.

LICON's ([www.licon-logistics.com](http://www.licon-logistics.com)) goal of establishing industry guidelines also meshes with standardization efforts. Companies and research organizations in the LICON Group are defining and specifying the requirements of RFID aided logistics processes from real projects. Industry representatives and RFID experts are testing specifications based on these requirements. These test specifications ensure that processes meet LICON requirements. A LICON certification process accordingly describes all the necessary process steps that safeguard the security and transparency of an industry-specific supply chain as a network of transport, storage and handling operations. In the process, two aspects are fundamentally important:

- The solution being certified is comprised of RFID and other technologies for identification, authentication, condition monitoring, communication and control.
- Industry-specific test routines for anti-tampering protection, system stability, usability, e.g. minimum service life, or resistance to materials in contact are included.

The construction site logistics project cluster involves one of the first thematic fields members of the association are working on. It was determined that the technology drivers RFID and telematics offer many new potentials for construction site products, software tools and services for industrial plant engineering. Not only the automation of identification and inventory management but also RFID and telematic functionalities will increasingly affect the continuous determination of components' location and condition.



An RFID transponder's read quality as a function of reading distance and transponder location.

These solutions are being tested jointly with medium-sized enterprises for their practicability at the LogMotionLab, the Fraunhofer IFF RFID lab in Magdeburg. A research theme from the Stiftung Industrieforschung initiated this work with several industry partners from different sectors.

The results demonstrate that there continues to be need for intensive further development of transponders in metallic environments, transponders coupled with sensors, universal readers and adapted positioning systems, which, from a cost and handling perspective, are suited for use at harsh construction sites.

Standardization may not impede the agility and flexibility of process changes. Standardization focuses on the process and architecture so that a specific functionality can already be produced with little individual software. Standardized solutions are

needed in international construction site logistics, yet no longer generate any competitive advantage after a run-in phase. Strategies for flexibly defining RFID equipment and services are in demand to gain competitive advantages. Construction site logistics in industrial plant engineering provides room for highly scalable RFID based solutions that can be used to competitive advantage.

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# Quality Control for Car Wheels

Dirk Berndt and Herbert Siegert

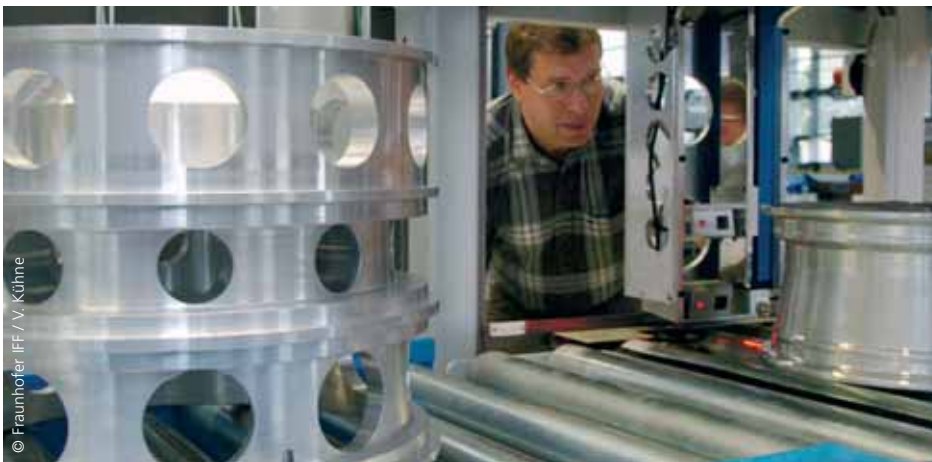
Time pressure and requirements are mounting: Quality control in manufacturing is becoming ever more important. New optical measurement technologies are making one hundred percent control possible. Researchers at the Fraunhofer IFF have specialized in contactless optical 3-D measurement technology. Using lasers and cameras, they measure car wheels and analyze the data fully automatically within a few seconds.

A conveyor automatically transports a car wheel to the measuring unit. A clamping and centering device in the measuring system makes sure it is locked in the correct position. The measuring arm, on which several sensors are mounted, descends automatically. The complete measuring unit circles the car wheel one time within a few seconds. Synchronous with the measuring arm, a fine red line runs over the surface of the wheel. The cameras film this line projected by lasers and use it to calculate the wheel's complete 3-D geometry. Once the acquired measured values have been compared with the specified target values, the wheel advances further in the fully automatic measuring unit to the next work station or to reworking, depending on the result of measurement.

perform its work, automatically and extremely precisely. The measuring system tests itself at regular intervals to maintain the high precision of the measuring process. It automatically conveys a so-called adjustment master to the measuring unit. This adjustment master acts as a reference object and makes it possible to check whether the results of measurement currently being obtained correspond with the known parameters.

The exact geometry of the complete wheel is critically important for driving comfort and safety. Metal parts must be manufactured precisely so that the tire fits perfectly and runs roundly. Any deviation from the ideal shape is noticed later by a driver as an unpleasant vibration or humming. Apart from the wheel's fit, the hub bore and

Mr. Schmidt explains the crucial advantages of the method employed: "We rely on a contactless optical method. Our system consists of lasers and cameras, which capture the wheel three-dimensionally. The laser line hits the wheel surface. The light section produced is filmed by a camera. Seen from the camera's perspective, the wheel's shape distorts the laser line in a characteristic manner from which a three-dimensional surface is calculated. So far, this laser light-sectioning method is unique in wheel production." Schmidt and his colleagues developed the system in cooperation with JBL Consulting, Manfred Kratzmeier GmbH, a specialist for wheel manufacture, and Feinmess Dresden, a supplier of fine positioning systems. Several sensors capture all the relevant areas of a wheel. The analysis of the wheel is available after a few seconds. The measuring system assembles several hundred thousand points into an overall 3-D image of the wheel topography from which the relevant geometry parameters are automatically calculated. Thus, the measuring system detects the smallest shape and position tolerances. The method, presented here taking wheels as an example, can be transferred to many products that have three-dimensional geometry requiring accurate measurement and inspection.



"Our system works so quickly that it makes one hundred percent quality control possible," says project manager Nico Schmidt. "In addition, it recognizes a large number of different wheel types, can measure them automatically and determine whether a wheel meets quality specifications." The speed of the procedure and the flexibility of the system allow integrating the measuring machine in the production line. The machine does not have to be reset when wheel types are changed. Only when a new type of wheel goes to production do its parameters have to be registered and the effective target values specified once. From this time on, the machine can

bolt holes are particularly important. These are used to align and mount the wheel on the axle. Up to now, manufacturers have usually used mechanical sensors, which glide over a rotating wheel on a test bench, to inspect its quality. Bumps or deformations can be sensed, which briefly lift or lower the sensor and indicate how greatly a wheel deviates from the ideal. This method has disadvantages: The sensor wears and does not measure all the desired parameters. In addition, the measurement of other geometry parameters requires digitizing the surface using time consuming point-by-point scanning.

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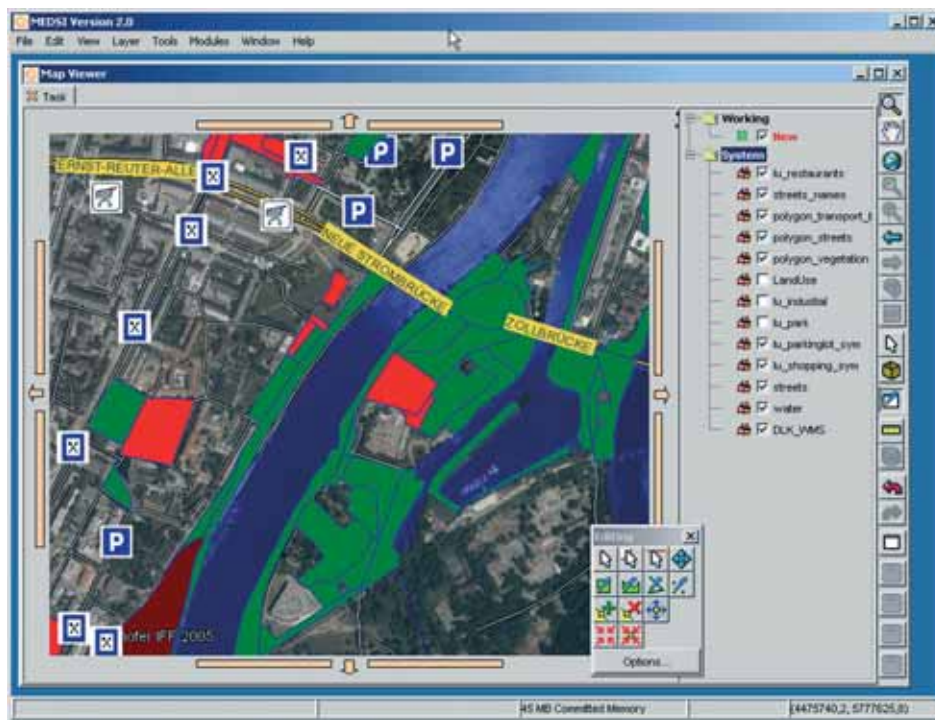
Magdeburg

# Transparently Managing Emergencies

State-of-the-Art Approaches to Emergency Management

Dr. Martin Endig and Helge Langenhan\*

Flooding in Saxony-Anhalt. Snowmelt and new precipitation cause waters to rise. If, however, the normal rate is exceeded and a flood disaster threatens as in 2002, up-to-date emergency plans have to already be available. How can up-to-date information, texts, picture, plans and lists of everyone involved be reconciled though?



Screenshots of MEDSI application scenarios for Magdeburg: Planning tool for state-of-the-art emergency management. © Fraunhofer IFF

Whether flood or conflagration, once an emergency occurs, the biggest problem is the constant lack of time. That is why plans for coping with damage situations must always be prepared and retrievable up-to-date. An emergency management team must meet immediately and make the right decisions quickly: Should a region have to be evacuated, which and how many immediate reaction forces are needed and what equipment has to be requested? Where are the resources located? Making the right decisions early enough can save the lives of many people.

An emergency management team consists of many different actors. Members not only include public authorities and agencies but also the fire department or the Federal Technical Emergency Agency. Every institution brings different information to the group, which exists in the widest variety of forms: Lists, pictures or plans – predominantly in electronic form but sometimes still on paper. The challenge is to make an optimal

exchange of information possible for emergency planners. In the project Management Decision Support for Critical Infrastructure (MEDSI), researchers at Magdeburg's Fraunhofer IFF and their ten European partners jointly developed a concept for a software that quickly and manageably provides all the information needed in an emergency. The starting point for the proposed concept is existing information in the form it is presently available. A flexible catalog system integrates the relevant sources of data in the new software at runtime. This facilitates, for example, the integration of new sources of data such as weather information or water level reports in decision making without having to modify the software used. This concept enables flexibly adapting the envisioned software to future users' local needs.

In an initial step, the Fraunhofer researchers already created a software that integrates all geographic information from various sources in the widest variety of file formats and visualizes it in a unified view. The technical basis of implementation is

generally available IT standards such as WMS, WFS for exchanging geographic information or even the Common Alerting Protocol for exchanging messages.

Masses of paper accumulating in binders are thus a thing of the past. An emergency management team would be better able to assess the situation and react quickly. Only when sufficient up-to-date information about the damage situation is available, can appropriate decisions be made to "optimally" deal with a particular situation. The Fraunhofer researchers were supported by experts from the City of Magdeburg's Fire Prevention and Emergency Management Agency. This collaboration produced a concrete scenario based on the flood disaster of 2002. In order to be optimally prepared in an emergency, building upon the results and experiences from MEDSI, a solution was devised for the individual districts in Saxony-Anhalt and which also meets their needs and requirements. It is an optimal instrument for preparing for an emergency. If the software is regularly furnished with current information, it will support a statewide, rapid overview of resources, infrastructure plans or personnel for example. Thus, much time will have been gained in an emergency, which can then be used to take initial actions.

\* Helge Langenhan is Head of the City of Magdeburg's Fire Prevention and Emergency Management Agency

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# Formula for Success: Product plus Service

Frank Ryll and Rico Schady

Experts know them as hybrid products: Service bundles and one stop services consisting of a combination of product and services. Particularly for complex products like those in mechanical and plant engineering, customers are increasingly relying on solutions, which in addition to the product also include development, operator or maintenance services. An orientation toward this strategy also promises SME success in international competition.

Exclusively focusing on the further technical development of mechanical and plant engineering products is no longer enough for companies in the capital goods industry to consolidate and expand their market position. The international harmonization of standards, manufacturing and logistics processes as well as the rapid spread of technical knowledge are making it difficult to use technical equipment and parameters to distinguish oneself

from competitors. In many industries, this is reflected in heightened cost competition. One strategy to improve competitive position can be derived from the results of the VDMA trend survey from 2004: Enhance the value of products by offering excellent services and integrated solutions for customers as hybrid products. A customer receives a combination of individual goods and services. Many manufacturers still see offering a range of services as a necessity demanded by the market, an annoying job that does not fit into the company's core business. Consequently, the elements of the bundle of services are normally developed independently of one another.

One strategy that seems to promise long-term success relies on systems solutions in the form of hybrid products. Services and goods complement one another symbiotically. What such solutions look like concretely and under what conditions – also in the context of mechanical and plant engineering networks and cooperations – they can become successful are the subject of this article. Central themes are the networked development of product and service and the organization of relational and cooperation networks in the industry. While well functioning business processes have, as a rule, been established for product development for machinery and plants, the development of services frequently suffers from deficits.

In order to be able to provide customers a customized solution in the form of a hybrid product, the product development process for goods has to be expanded into a product development process for hybrid products. This means closely networking the development of services and goods.

### Development Concepts for Hybrid Products

Work on the development of services is closely connected with the concept of service engineering. In service engineering, the foundations for service research that originate from marketing are augmented by methods and approaches for systematically engineering and developing services based on the development of goods. An analysis of previous research studies revealed that research is still needed in the following areas:

- Requirements of a business process to develop hybrid products have only been inadequately analyzed and specified so far. This especially pertains to practicable approaches to networking the subprocesses and activities in the development of hybrid products.

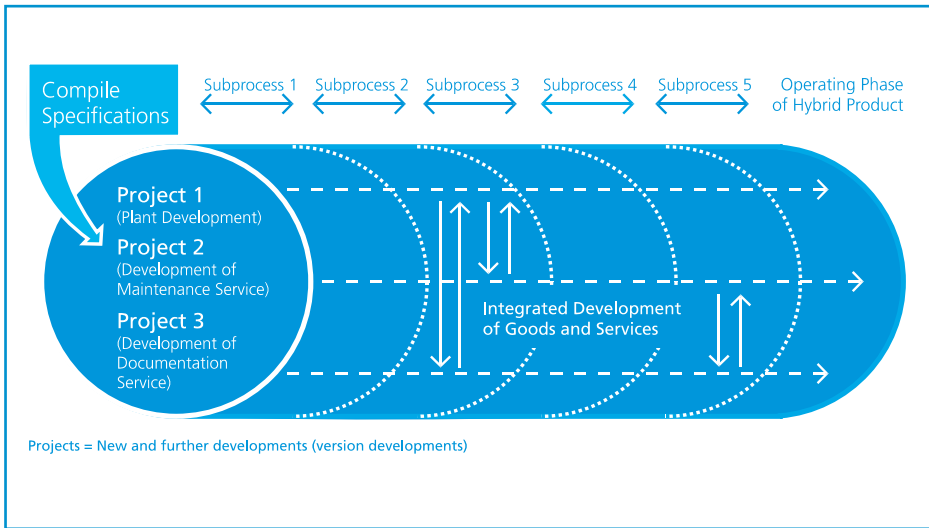
- A model for the integrated development of hybrid products does not yet exist.
- The implementation and engineering of a stable business process for the development of hybrid products has been insufficiently taken up as a subject. In particular, applied methods and tools are lacking, which support the individual phases of the development of hybrid products.

A whole series of issues arises for companies that want to position themselves on the market with hybrid products. First of all, they must identify what hybrid products their potential customers demand and expect. This is followed by an analysis of whether they can profitably develop and produce such products and who may be considered a potential cooperation partner. If the company works in the processing industry, then the thing to do, for example, is not to provide the service oneself but rather to entrust it to a specialized service company. Companies are facing the situation of internally engineering the process for the development of such hybrid products and documenting and managing the customized products developed. An example from plant engineering illustrates approaches to engineering and implementing a business process for the development of hybrid products.

### Business Process for Developing Hybrid Products in Plant Engineering (HyPEP)

In the the product development process for hybrid products, the processes for developing goods and services must be interconnected. Requirement specifications based on concrete customer demands or generated by idea finding and evaluation as well as a requirements analysis serve as the initial basis for product development. In contrast to conventional approaches, the requirement specifications must also record descriptions of the components of the services to be provided. The business process for developing hybrid products (HyPEP) is additionally intended to facilitate the development of products that are as customizable as possible. The modularization of goods and services is a suitable method for doing this.

In mechanical and plant engineering companies, HyPEP is run through when new single unit and serial products are being developed as well as when they are being adapted or developed further. In every case, this produces changing requirements, which have to be incorporated when the business process is planned. The diagrams on pages 36/37 break down the development work for a hybrid product into three subprojects as an example. The goal is to network the activities in the subprojects throughout the individual phases of HyPEP to ensure product development is synergetic.



Hybrid product development process (HyPEP)

Cooper's Stage-Gate concept or similar concepts which divide product development processes into a defined number of stages can be applied to HyPEP. The stages consist of pre-defined parallel and cross-functional activities and are entered through so-called gates. These serve to monitor and control process quality as well as the results of development and also support decisions about continuing or terminating a project.

In addition, a company must ensure that its existing range of products meets customers demands. This is done best with surveys of customer satisfaction with existing products and of improvements desired in the future. The attractiveness of the product portfolio should be reviewed at regular intervals and, whenever necessary, this should lead to new integrated development projects.

### Incorporating the Relation Network

When developing hybrid products, a plant manufacturer should not be viewed in isolation but rather in the setting of its cooperation partners. A plant manufacturer's range of hybrid products ensues from its suppliers products and services supplemented by its own offerings. As Figure 3 illustrates, a complex relation network of cooperation partners exists.

A company wanting to enter the market as a systems provider must decide:

- What services from suppliers it wants to incorporate in its products,
- What requirements services have to meet so that they can be cost effectively integrated in one's own hybrid product and
- Under what circumstances services should be provided internally or purchased.

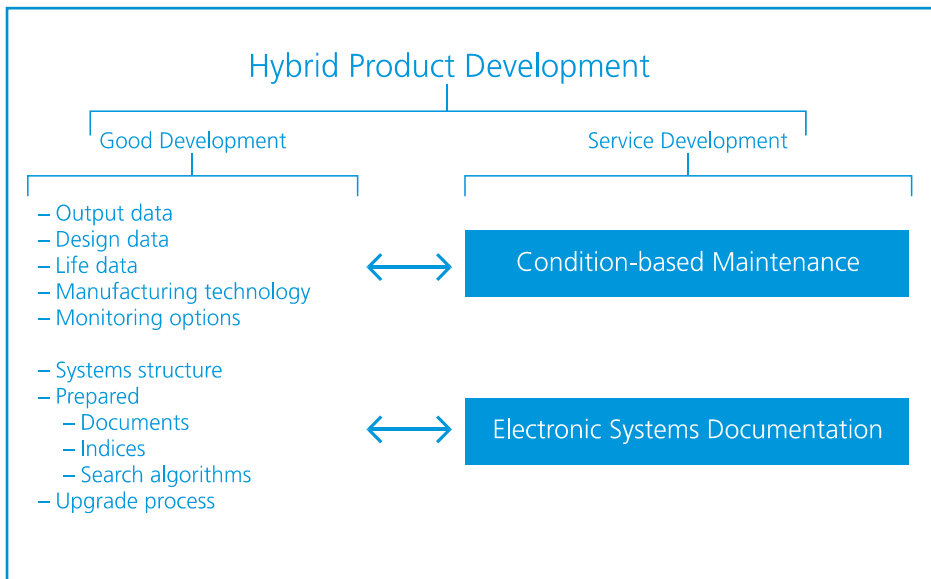
To answer these questions, methods and tools will have to be developed in the future, which make it possible to configure hybrid products incorporating the relation network presented. These must use the existing relation network both to uncover strengths and weaknesses and potentials and risks for hybrid product development in order to be able to derive needs for action to make changes in the network. Initial studies addressing the service supply chain (SSC) can be built upon here.

### Alternative Qualification Service

One innovative approach is the qualification service conceived by the Fraunhofer IFF as a service for a plant manufacturer's customers. This qualification enables purchasers of a system to themselves perform a service connected with the delivered system. This can, for example, be the operation or maintenance of the system purchased. A transfer of special process know-how and of tools for providing services is conceivable. The basic idea behind this qualification can be summed up in the sentence: "Help me do it myself."

To develop and customize the qualification service, HyPEP is run through at the plant manufacturer's. The prerequisite is the capability to develop the service cost effectively.

In cooperation with Otto von Guericke University, the Fraunhofer IFF is developing methods and tools for generating and implementing development processes for hybrid products specifically for small and medium-sized plant manufacturers in the capital goods industry.



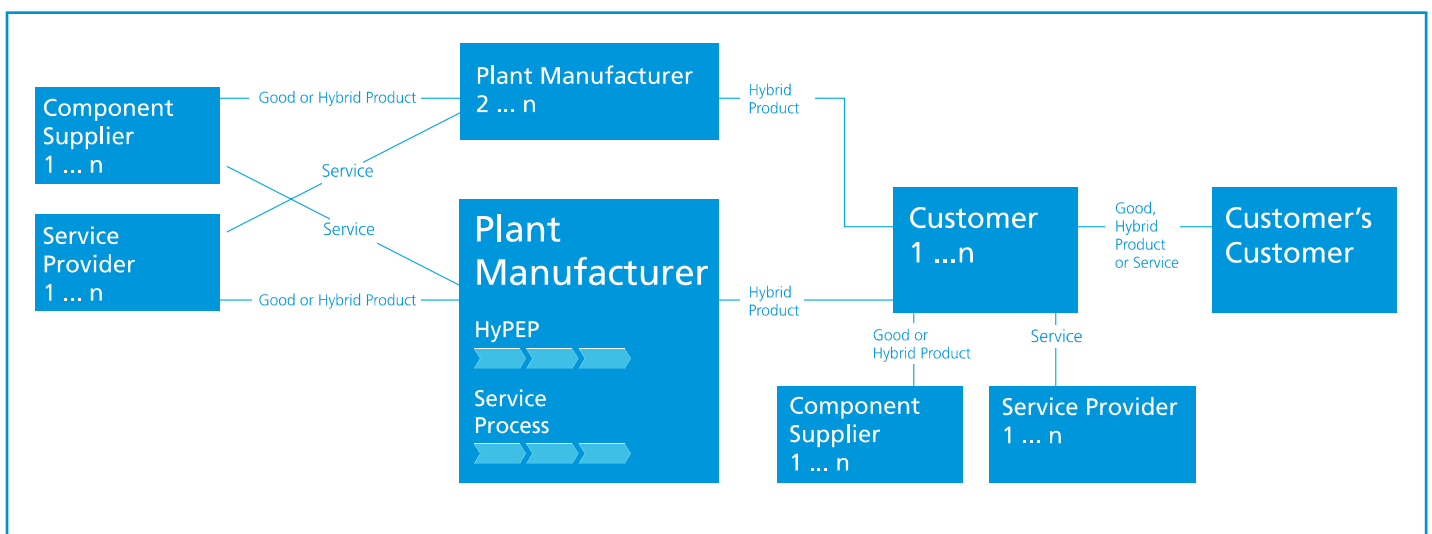
Interfaces between the development of goods and services exemplified by two model hybrids

### Outlook

Engineering and structuring a development process, in which the integration of the development of goods and services is rigorously pursued, is a necessity. A fundamental requirement is analyzing the relational network in the hybrid product development process in order to scrutinize and evaluate information about partners' interests, capabilities and requirements as well as potentials for integrating partial services into complex ranges of services. The development of a service for a plant manufacturer's customers

is one innovative approach. This qualification enables customers to themselves perform a service connected with the system delivered and taken advantage of so far.

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Basic model for configuring hybrid products at a plant manufacturer



# One Stop Services: Your Contact for Complex Services

Jörg von Garrel

The service industry has evolved into one of the most important economic sectors in Germany. From 1991 to 2002, the number of people working in the service sector rose by 3.5 million so that it currently accounts for 70 percent of the jobs as well as 70 percent of the gross domestic product. However, this sector has an export deficit.

Not only the slight growth of exports of services compared to exports of goods but also an examination of the balance sheet of services, which has always been in minus in past years, illustrates this sector's weaknesses.

An examination of the balance sheet of services with regard to engineering services and other technical services reveals a positive trend. On the one hand, these services nearly doubled in the last ten years, yet, on the other hand, 2003 was the first time an export surplus could be attained.

This development allows the conclusion that a good starting basis for further internationalization exists for the services mentioned. Already in 1995, the then Federal Ministry of Education, Science, Research and Technology (BMBWF) recognized German service providers' deficit when compared internationally and reacted with the initiative "Services for the 21st Century".

In this support program, the joint project "One-Stop Services for Global Industrial Production (OSS) is boosting the internationalizability of German service exports.

The concept of one stop services is young and is particularly much used in relation with public authorities. One-stop government is frequently spoken about in this context. The starting point for this development is greater customer orientation in public administration to counteract the negative associations (complicated forms, long waiting times, widely varying contacts) connected with a visit to public authorities.

With regard to the project, the concept of one stop services means the development of a range of services from legally and economically independent (national) small and medium-sized enterprises. These provide foreign factories both project-based and ongoing services from one source for the entire factory life cycle to generate the largest possible share of value added in Germany in the future. This is implemented in a holistic network of professional partners confined to one concrete task.

The analysis of services concentrates on production services that can be assigned to the phases of the factory life cycle. All phases are subject to change and are viewed as a holistically closed loop that has to be planned and controlled throughout the entire life cycle. By allowing for changes and interactions in and between the particular phases in the overall cycle, this approach makes great allowances for the aspect of adaptability. This holistic organization of the factory life cycle is viewed as a cooperative task of factory planning and factory operation and, as opposed to previous selective approaches, represents an expanded approach to planning for factories.

Employee-oriented work structuring and legal protection of services offered abroad are viewed as other fundamental factors of success for a one stop service.

To put this interdisciplinary research

approach into practice, company projects will be used to transfer research institutes' findings to applications and evaluate them on an on-going basis. Industry partners will supply a domain of concrete subjects to support the research activities in terms of content and to verify the validity and practicability of research findings. As a result, the competencies of the Fraunhofer IFF will be augmented by industry partners and existing deficits eliminated.

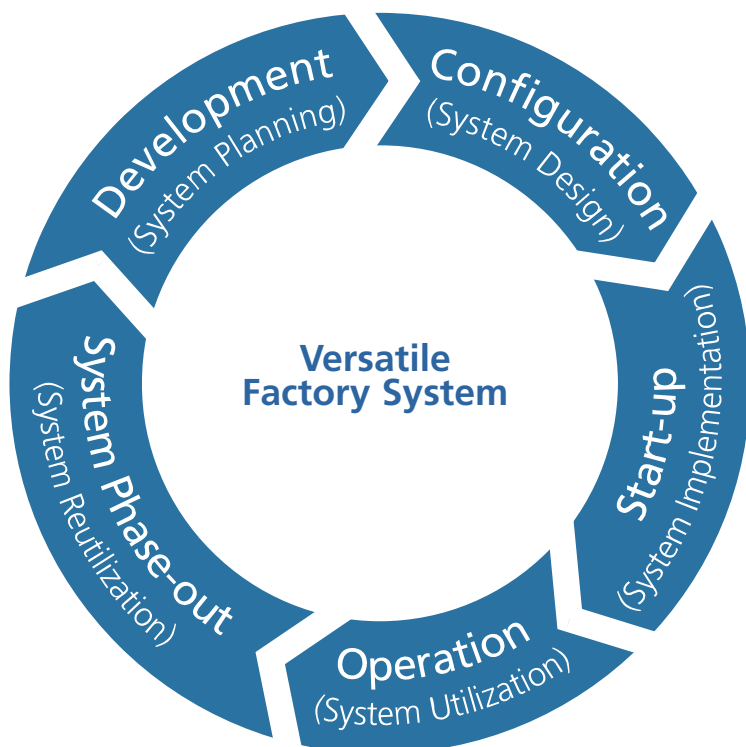
The consortium for industry projects is composed in such a way that the industry partners cover all services relevant to the domain of research with their own services. Examples are Kohlbecker Architekten & Ingenieure, T&O - Unternehmensberatung GmbH and precis Maschinen und Anlagen Service GmbH. The firms complement one another to the effect that they concentrate on their core competencies and each provides a certain part of the requisite services. OSS pools all the services offered and thoroughly

acts towards customers as one company. A broker company or office is needed as a service consultant and contact.

Thus, in the industry projects, a one stop service will be conceived incorporating the research findings. Along with this direct mode of implementing a one stop service, the end of the industry projects altogether will see the development of a guideline for action for one stop services, which can be used as a support for services offered on the international market.

A web-based platform exists to ensure continuous transfer between research and practice and for purposes of presentation to and communication with the general public. (<http://www.one-stop-services.de/>)

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Phases of the factory life cycle

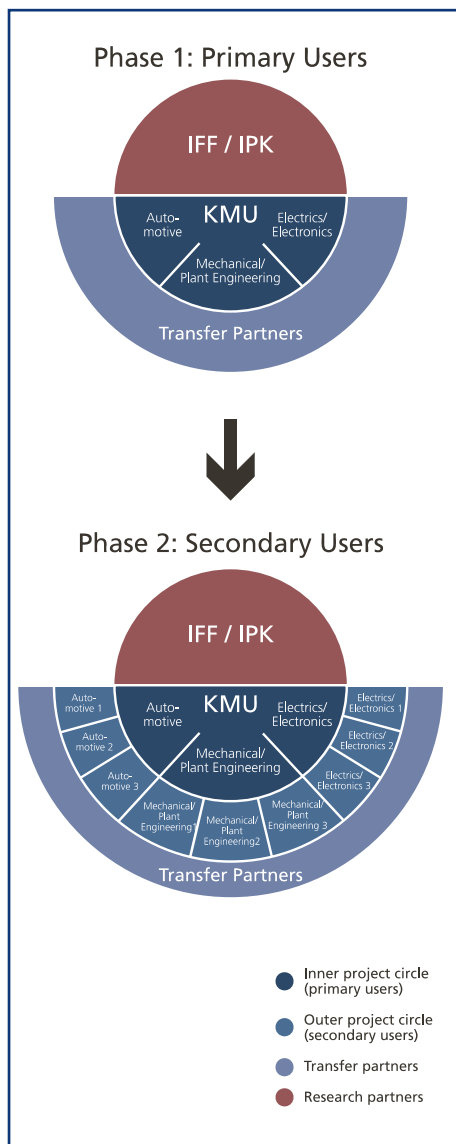
# ProWis: Knowledge Management Solutions for SME

Mark Staiger and Stefan Voigt

In the midst of globally and rapidly transforming markets, small and medium-sized enterprises (SME) are increasingly having to provide innovative products ever more quickly, flexibly and cost effectively. In order to be able to withstand this enormous innovation and cost pressure, all available resources must be used effectively and efficiently. Knowledge management is used to meet these challenges and to tap the resource knowledge for corporate success.

Small and medium-sized enterprises have hardly been using methods and processes to manage the resource knowledge. That is why the Federal Ministry of the Economy and Technology (BMW) started its initiative "Fit for Knowledge Competition" with which it intends to systematically support SME as they develop their knowledge potentials by initializing knowledge management activities.

As part of this initiative, the Fraunhofer IFF and Fraunhofer IPK initiated the project "ProWis: Process Oriented and Integrated Knowledge Management in SME" supported by the BMW. In collaboration with twelve SME from the mechanical engineering, electronics and automotive industries, knowledge management methods are being tested and practically prepared for further use in other companies.



One example of an easy to use method is planning coaching to improve project planning. This method provides for a structured workshop attended by the designated project manager, manufacturing and sales staff as well as experienced project managers. During the workshop, participants discuss and improve the distributed planning materials prepared by the project manager in advance. As a result, workshop participants' suggestions and experiences already enter into the project at an early stage and support a trans-project learning process.

Another possibility for knowledge management is to hold debriefing workshops after a project concludes. The objective of such workshops is to identify successful solutions as well as deficits of past projects. These workshops teach participants to recognize effective methods and solutions and empower them to develop alternative approaches if and when the need arises. The knowledge gathered in debriefing workshop helps one avoid duplicating errors and take advantage of potentials for improvement.

The Fraunhofer IFF already offers such workshops for clients and has been conducting them at companies with great success.

ProWis is pursuing the goal of working up these tried and tested management instruments into a toolkit of easy-to-handle solutions for specific industries. In principle, the idea is not to reinvent the "knowledge management wheel" but rather to revert to existing methods and solutions that have proven themselves in the field.

### The ProWis Transfer Approach: "Learn from the Experience of Others"

In order to achieve optimum applicability and maximum practicability, ProWis is divided into two phases. In the first phase, together with one company from each of the three sectors, existing knowledge management methods are adapted to the specific needs and requirements of SME. This is the basis for the companies to implement the customized knowledge management solutions. In the second phase, other companies make the ProWis implementation model "ready for production". In this phase, a total of nine SME (three companies per sector) are participating in the ProWis project as secondary users (cf. Figure 1). The Fraunhofer researchers support companies when they are implementing the knowledge management solutions.

This approach is intended to optimize the knowledge management solution modules for the needs of the SME and work up successful implementations of knowledge management as reference models for other companies. Hence, the primary and secondary users' experiences as they designed and implemented their solutions for their specific company enter into the development of the "ProWis Shop". This is a portal-based Internet platform being developed successively during the runtime of the project and to be activated later for all SME in Germany. All the solutions developed as well as experiences made will be made available to potential users here. The overriding idea is of do-it-yourselfers who select "their" knowledge management products themselves (methods, models, approaches) and apply them themselves to the greatest extent possible.

We are extremely interested in actively involving other SME in the ProWis project. You profit from the exchange of experience with primary and secondary users and the team of Fraunhofer experts.

For more information on the project ProWis visit <http://www.prowis.net>

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# Digital Factory Planning Tools and Trends

Dr. Steffen Strassburger, Holger Seidel,  
Rico Schady and Steffen Masik

The growing market dynamic demands flexibility and rapid reaction times from enterprises. Companies' versatility and adaptability are basic prerequisites to surviving global competition.

This development is making new demands on factory planning. The layout of inputs, i.e. the manufacturing processes as well as human and technical capacities, establishes the operating and unit costs of production facilities for a long time. Consequently, the factory planning process in its totality has a lasting impact on future organizational potentials and basic conditions for products, processes, employees, cost effectiveness, flexibility, ecology and corporate attractiveness.

Future demand will be for more and more flexible and adaptable factory systems. In this context, factory planners often face the problem of having to deal with the constantly increasing complexity of planning tasks in less and less time. Meeting these requirements necessitates highly developed and user friendly IT tools providing integrated support of the factory planning process.

The field of production system and plant layout in particular has been developing rapidly for several years. The concepts "digital factory" and "digital factory planning" embody this. The digital factory can usually be considered a reproduction of every element of a factory and consists of digitized information and data stored in databases, which result from real product, process and problem solutions. State-of-the-art methods and software tools are used to test equipment and manufacturing processes for the digital factory in elaborate simulations. Innovative IT infrastructures for plant layout and modeling based on digitally networked models, as they are currently produced using the digital factory, are intended to support the specification and simulation of all essential factory processes and the testing of their feasibility, before they physically exist at all. These tools also aim at providing integrated support for the planning process, yet often fail to provide factory planners optimal support.

### The Survey

The trends presented here are the findings of a study entitled "IT Tools in Factory Planning" conducted by the Fraunhofer Institute for Factory Planning and Automation IFF. The study was designed as an online survey and explicitly directed toward practitioners from the field of factory planning.

According to a 2002 market study on generative automatic factory planning, no software solution existed at that time, which was able to fully meet the extensive and complex demands of factory planning. A widespread survey of the state of factory planning in small and medium-sized enterprises conducted by the Fraunhofer IPA in 2004 largely confirmed this. The current survey focused on the aforementioned problems and was initiated with the objective of evaluating the need for the development of functionalities in factory planning tools to enable organizing the factory planning process more effectively and efficiently in the future.

Specifically, thematic foci were:

- Current use of factory planning tools with regard to process, layout and material flow planning, operations simulation, workplace design and CAD applications
- Simulation to soundly support risk-laden decision processes in factory planning
- Visualization and 3-D modeling in the factory planning process
- Evaluation of innovative ideas intended to support factory planning

### Simulation

Simulations are established tools for planning, designing and testing dynamic systems. They are accepted tools both in manufacturing (e.g. for dimensioning plants and logistics systems) and product development (e.g. for designing and evaluating technical devices, vehicles, etc.). A simulation run alone does not guarantee optimization. Rather, several simulation runs produce an abundance of potential alternative solutions. Factory and material flow simulation identifies potentials and reveals weak points, long before sizeable investments and expensive modifications have to be made during production. Thus, the technique of simulation is a tool useful for considerably better managing the factor of uncertainty.

The current survey helped identify some clear distinctions from the preceding survey. The target group addressed uses simulations far more frequently and almost exclusively uses professional software tools to do this. Frequently, these simulation tools have not yet been integrated in common factory planning tools, yet they have interfaces that were also evaluated in the survey as inadequate, particularly with respect to bidirectionality and user friendliness. This demonstrates how only few simulation tools have until now had the capability to fit smoothly into the workflow of factory planning. Thus, even if already simplified by tools, the generation of simulation models is still quite involved. However, simulation models now have to be even more flexible and more dynamic. The potential to interact interactively with the simulation model through its 3-D visualization, to modify parameters and directly observe the effects will take on even greater importance in the future.

The simulation models created during the factory planning process are frequently reused in later phases of the factory life cycle too, e.g. for production planning and control. Other values added and potentials for reusing the simulation and VR models produced can also be expected in other domains (worker training and education, change planning, etc.).

### **3-D Visualization and Virtual and Augmented Reality**

Another focus of the study was an examination of tools for visualization and 3-D modeling. Findings revealed that more than half of the respondents are not only already creating presentations and demonstrations in 3-D but are also already directly using 3-D representations for planning.

Since they are usually considered sufficiently informative, 2-D visualizations alone are still frequently used to present simulated systems even now. The overwhelming majority of target groups addressed additionally already uses 3-D animation to visualize representations of simulated facts though. Some also resort to interactive 3-D visualizations, i.e. those able to dynamically react to a user's actions. This is then called virtual reality (VR). The future trend is very clearly moving toward 3-D and VR. Along with simple 3-D visualizations, the survey respondents also intend to use photorealistic visualizations.

Respondents additionally see values added from planning aided by 3-D models in collision tests and space utilization planning. Collisions can occur, for example, between machinery and the piping laid in a factory building, other machinery, workpieces, transport systems, etc., and frequently can only be detected with certainty in a detailed 3-D model. Space utilization planning also plays an important role, because the available floorspace in a factory building is a valuable resource and three-dimensional models can even be used to protect it from collisions and ensure transport routes are optimal. Other potential uses open up for the planning of complex, multi-story systems and for ergonomic tests.

Along with virtual reality, augmented reality is also increasingly playing a role in industry. Augmented reality (AR) means visually superimposing (augmenting) virtual information on reality in real-time. As far as possible, information needs to be represented in the correct geometric position. For example, the placement of equipment could be planned directly on site in a factory building by inserting the virtual machinery into the image of the real factory building. Special glasses make this technically possible. Technologies such as augmented reality open fascinating possibilities for creating human-computer interfaces.

### **Outlook**

The Fraunhofer IFF study makes it possible to assess the present and future relevance of various innovative technologies from the fields of planning, simulation and visualization for factory planning. These include, for example, knowledge-based factory models, assistant systems for the control of the planning workflow and documentation systems for decision processes as well as photorealistic, interactive visualization of simulation data and on site planning aided by augmented reality. Consequently, these trends can be used to infer future needs for tools and operations, not only for the sector addressed. We would be pleased to send you a detailed summary of the results of the survey upon request. We would also be glad to answer your questions about digital factory planning.

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# ULF Business Management Game at the Ufa Instrument-Making Production Association in Ufa, Russia

Tobias Reggelin

In December 2005, Stanislav Morozov (Fraunhofer IFF) and Tobias Reggelin (Chair for Logistic Systems, Otto von Guericke University) ran an intensive two-day seminar using the management game ULF (*Unternehmen Logistikgerecht Führen - Managing a Company Based on Logistics*) at the Ufa Instrument-Making Production Association in Ufa, Russia. Every upper level executive attended the seminar. The company's products include aircraft instruments and gauges.

The players of the management game had the task of managing a very functionally oriented company, which was on the brink of bankruptcy and had large inventories and long cycle times, back to the road to success. During the two-day seminar, the players managed to do this by applying methods based on processes and production logistics, e.g. Kanban and segmenting, to the management game company. Theoretical and practical sequences were alternated during the seminar so that the players could immediately apply their acquired theoretical knowledge to the management game company.

One advantage of such haptic business management games is that players are no longer merely consumers but also producers of knowledge. While the management game was being played, they developed part of the logistics methods and concepts on their own with the moderator's support. Players learn such knowledge faster, accept it more readily and judge it to be more credible than frontally taught knowledge.

At the end of the two-day seminar, General director Dr. Alexander Gerasin spoke of a complete success. He is planning to implement the acquired knowledge in his company soon and bring about positive changes.

The business management game played at Ufa Instrument-Making Production Association in cooperation with the Chair for Logistic Systems and the Fraunhofer IFF was an Interlogistica activity. Founded during the Petersburg Dialog in 2003, Interlogistica is a German-Russian logistics center intended to develop joint competence in research, development and qualification.

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# Logistics in India: A Project Report

Kay Matzner

**Economically speaking, India is the second most important country in Asia after China. Its national economy grew at rates between six and seven percent in recent years and by double digits last year. This growth starkly contrasts with the country's infrastructure.**

The Indian economy is especially growing in sectors related to IT. The reason is the excellent English language skills and excellent education of segments of the Indian populace. In other sectors, manufacturing and agriculture in particular, development has however, progressed less dynamically in recent years. One reason is the country's basic logistics conditions, which appear catastrophic at first glance. Roads with numerous potholes, an extremely overloaded and antiquated rail system and frequent power outages are only a few characteristic examples of the country's infrastructure.

In order to help improve the existing situation and profit from the country's potentials in the long-term, the European Commission contracted the Fraunhofer IFF to carry out the project Logindia. The objective of the Logindia project was to analyze the logistics situation in India, to provide logistics training and to initiate business cooperations in logistics between India and Europe. In particular, the Indian-German Chamber of Commerce and the Indian Institute of Science provided the Fraunhofer IFF support to conduct training.

In an initial stage, the project partners employed questionnaires and interviews to analyze current and planned use of methods of logistics planning, control and optimization. As part of this study, under the guidance of the Fraunhofer IFF, the Indian Institute of Science surveyed ninety Indian enterprises. The focus was on the Indian automotive and pharmaceutical industry. It turned out that Indian enterprises' corporate logistics especially needs to catch up in the use of IT and performance indicators, India's automotive industry being significantly better positioned than the pharmaceutical industry.

Building upon the findings of the study, Kay Matzner from the Fraunhofer IFF and Tobias Reggelin from Otto von Guericke University Magdeburg developed a logistics training program for the enterprises involved in the survey. The two researchers imparted European theory and practice in a training program in November 2005. They adapted Fraunhofer IFF management games to the Indian market and used them effectively during training. In addition, European companies' best practice solutions were presented.



**YEAR OF SCIENCE**  
Magdeburg 2006

The Logindia project ended with a concluding networking conference held in conjunction with the largest Indian automotive exhibition in New Delhi in January 2006. At the conference, project partners presented the results of the Logindia project as well as numerous practical and theoretical experiences from Europe and India. The largest Indian carmakers and German firms such as Bosch took advantage of the conference to discuss their experiences in India and establish valuable new contacts.

Logindia brought the Fraunhofer IFF contacts and experiences in India that will also be valuable for future activity in India as a research service provider and consultant.

The complete results of the Logindia project are documented on the website [www.logindia.org](http://www.logindia.org).

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# SCIENCE 06

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## Holger Seidel Elected BVL Regional Chapter Spokesman

Holger Seidel, Director of the Division of Logistics Systems and Networks at the Fraunhofer IFF, is the new spokesman of the BVL Saxony-Anhalt Regional Chapter. During his studies, Seidel specialized in factory planning and logistics. As an engineer for production organization, he acquired his first professional experience at a heavy machinery manufacturing company in Magdeburg. As an assistant in the Department of Factory Planning and Logistics, he helped prepare the founding of the Fraunhofer IFF in 1991. Since then, he has managed research and industry projects, primarily in the fields of factory planning, logistics, SCM and reorganization.



## BVL Honors Former Chairman Prof. Gottschalk



Leading researchers of production logistics met at the Fraunhofer Institute for Factory Operation and Automation in Magdeburg on January 13, 2006. The reason behind their colloquium was the seventieth birthday of Prof. Eberhard Gottschalk, founder and former director of the Fraunhofer IFF. Former BVL chairman Dr. Hanspeter Stabenau congratulated the birthday boy and delivered congratulations and the present from the BVL board.

As professor of production process control and head of the Fraunhofer IFF, Prof. Gottschalk significantly shaped the research field of production logistics. As a member of the BVL board, he was instrumental in expanding and developing the BVL in the new German states. For his accomplishments, commitment and exceptional personal involvement, the BVL honored Prof. Gottschalk with a sculpture by the Worpswede artist Waldemar Otto.

In his laudation, Fraunhofer IFF Director Michael Schenk, emphasized his predecessor's unflagging commitment when the institute was founded and growing. Employees and fellow-travellers wished their former boss happy birthday. In addition, more than 100 guests from all over Germany had traveled here to personally congratulate the birthday boy. They included Prof. Helmut Baumgarten from Berlin, Prof. Hans-Peter Wiendahl from Hannover, Prof. Siegfried Wirth from Chemnitz, Detthold Aden from BLG Logistics Group and Dr. Erich Hautz, formerly at Siemens AG.

## Magdeburg University Places Second



Students from Otto von Guericke University Magdeburg took second place in the Logistics Masters Competition 2006 sponsored by the professional journal LOGISTIK-inside. The journal held its competition from February through September 2005. Each of these eight issues included a questionnaire with questions from all realms of logistics to be answered. Among the students from eighty-six participating universities in Germany, Austria and Switzerland, Prof. Dietrich Ziem's students from the industrial engineering and management logistics program placed second in the overall standings.

Mona Keinert, who studied under Prof. Ziem and worked as a student assistant at the Fraunhofer IFF, was the top student from Magdeburg, scoring 89 % of the points. As a successful graduate, Ms. Keinert had no problem finding a qualified job. She has been working at ACCENTURE as a Global Service Line SCM Analyst since February 2006.

IFFocus editor Herbert Siegert spoke with Prof. Dietrich Ziem who was instrumental in developing the industrial engineering and management logistics program.

**Prof. Ziem, students in the industrial engineering and management logistics program placed second in the Logistics Masters Competition 2006. Congratulations. You developed this program as we know it today. What's your recipe for success?**

Logistics is an extremely varied job description. Technical aspects of material and information flows play just as much a role as economic issues. Anyone transporting commodities or goods must ensure that not only the flows of goods but also information flow purposefully and are provided in a timely manner.

It is in the nature of logistics that it connects partners and per definition has to use very many different interfaces. We respond to this broad requirements profile for future logisticians by offering an interdisciplinary major.

### **What disciplines are emphasized?**

The most important subjects are engineering and economic sciences and computer science. We supplement these by teaching mathematics, law, ergonomics and social science and systematically training soft skills in a series of semester projects.

### **How do you ensure that students not only receive an academic education but also the requisite practical know-how for their later work in the business world?**

In the context of professional internships, research projects and Diplom theses, our students accumulate valuable experiences in the automotive, mechanical engineering and electrical industry, in wholesale and retail as well as at large international logistics providers. Not a few students use this opportunity to organize foreign internships for themselves all over the world. What is more, we

cultivate very intensive cooperation with the Fraunhofer IFF. The Magdeburg Fraunhofer Institute performs applied research in the field of logistics for global players in industry and the service sector as well as for SME and public contracting authorities. This cooperation with the Fraunhofer IFF allows our students to profit from their research contracts and jobs. They gain insight into current problems and become familiarized with methods, tools and strategies to solve them.

### **How have you positioned yourself for the future so that Otto von Guericke University Magdeburg remains one of the top logistics schools?**

If we look at the trends in logistics it's clear that logistics as a service will become more and more complex and more and more closely interlinked with individual clients' manufacturing and business processes. When we speak of clients here, this encompasses both internal and external logistics services. Logistics tasks are growing more and more complex because of global distribution and procurement networks, greater diversity of variants and faster and faster innovation cycles. They can only be coped with successfully if students are prepared for these challenges. To do this, we have both a demanding interdisciplinary academic education and the important practical orientation in Magdeburg. Business management games, interdisciplinary projects, case studies, excursions, lab internships and field analyses guarantee this.

To this end, we've created a Logistics Workshop in Magdeburg, which is the center of our novel problem-oriented academic concept.

## Outstanding Doctorate



Dr. Tamara Nestorovic was awarded a VDI Promotion Prize for her doctoral dissertation “Controller Design for the Vibration Suppression of Smart Structures”.

The Magdeburg Regional Chapter of the VDI annually awards prizes for outstanding internship papers, Diplom theses and doctoral dissertations. With her doctoral dissertation, Dr. Nestorovic produced groundbreaking research findings that go far beyond the current state-of-the-art. Her mathematically and experimentally sophisticated work deals with the adaptive reduction of vibrations and noises.

At the Fraunhofer IFF, Dr. Nestorovic developed a VR based configuration tool for the VDTC. It serves as a platform to test virtual engineering methods for developing and consolidating customized products. In cooperation with Otto von Guericke University, she is involved in establishing a Computational Mechanics Lab (CML). In the VDTC, this lab will support product optimization, above all, to resolve mechanical-structural problems. As part of a DFG project, Dr. Nestorovic is researching the development and experimental verification of adaptive control algorithms for adaptive mechanical systems.

Dr. Nestorovic was born in Serbia on May 3, 1970. She attended school there until 1989 and studied at the University in Nis from 1989 to 2000, where she first received her Diplom degree and then her M.Sc. in mechanical engineering. Dr. Nestorovic completed both degrees with highest marks. Since 2001 she has been a doctoral candidate and employee of the Department of Mechanics of the School of Engineering at Otto von Guericke University Magdeburg. In 2005 she received her doctorate summa cum laude under Prof. Ulrich Gabbert. Dr. Nestorovic is married and lives in Magdeburg. She is interested in painting and enjoys biking in nature in her free time.

## VDI Promotion Prize for Virtual Steam Locomotive

André Winge was awarded the promotion prize in the category “Diplom Theses” from the Magdeburg Regional Chapter of the VDI. Winge was recognized for his virtual model of a new model steam locomotive for the Harzer Schmalspurbahnen HSB.



Since the technical documentation for the steam locomotive from 1955 was only fragmentary, Winge had to procure his data elsewhere. The computer scientist interdisciplinarily combined engineering and computer science. Measurements, digital photography and 3-D modeling based on available drawings were the basis on which Winge created an interactive

model of the steam locomotive. What is more, he reproduced individual functions of the steam locomotive in the VR model so that the virtual steam locomotive can be operated interactively. The Harzer Schmalspurbahnen is now using these models to train honorary engineers.

Winge was already working with the virtual locomotive cab in his first practical semester and continued developing his idea until he graduated and finished his prize-winning Diplom thesis. He is now developing virtual training scenarios at the Fraunhofer IFF.

## 2006 VDI Academic Prize for Logistics



The VDI Society for Materials Handling, Materials Flow and Logistics Engineering’s annual awarding and presentation of a VDI Academic Prize at the German Material Flow Congress has already become a fine tradition. This year’s lucky prize winner was Stefan Galka, a graduate of the industrial engineering and management logistics program at Otto von Guericke University Magdeburg. He received his prize at the 15th German Material Flow Congress in Munich on March 2, 2006 for his outstanding Diplom thesis on a “Holistic Control Concept for Supplying Assembly Lines Small Parts from an Automated Small Parts Warehouse: Dimensioning the Supply Cycle”, which he had completed at the DaimlerCrysler AG plant in Bremen. Significant portions of his

approach were introduced and implemented in practice there while he was still working on his Diplom thesis.

Since his graduation, Stefan Galka has been working on the staff of the Department of Materials Handling, Material Flow, Logistics at the TU Munich.

## First Marie Curie Researcher in Magdeburg



Bartłomiej Arendarski has been researching in Magdeburg for a month. The 25 year old Pole is one of the first young researchers at the local Virtual Development and Training Centre VDTc in its Marie Curie Program, a training program supported by the EU. A total of 1.1 million euros has been earmarked for young guest researchers to reside in Magdeburg.

The objective of the program ResearchTraining@vdtc is to give twelve up-and-coming researchers from inside and outside Europe an opportunity at the Fraunhofer IFF to collaborate on international research projects and to gather practical experience in industry projects over four years. The thematic focus of the program covers the field of applied virtual engineering. Three thematic fields can be selected: Virtual product development, virtual process control and virtual-interactive training. The

training program is conducted in cooperation with Otto von Guericke University Magdeburg and regional industry partners.

The affable young man from Poland comes to the program with an outstanding background rooted in his degree in electrical engineering and telecommunications from Poland's second largest technical university in Wroclaw. Last year, Bartłomiej Arendarski earned his Master's, specializing in digital transmission. At the Fraunhofer IFF, Arendarski is working on research in the field of virtual process control and actively collaborating on an industry project dealing with maintenance work on a transformer weighing several tons, which researchers from the Fraunhofer IFF are first testing in a virtual environment rather than reality.

## Fraunhofer Researchers Model

2006 is Magdeburg's "Year of Science". The eye-catching posters all over town have made everyone living in the city on the Elbe well aware of that. Two "Science Buses" in characteristic Year of Science design are driving around the city. The "Year of Science" project organized its own photo shoot for the flyers and programs available in bars and cafés. Well-known press photographer Viktoria Kühne photographed a number of Magdeburg residents, most of them researchers, for the photo series. The faces of the "Year of Science" were selected from the countless pictures taken.

They include portraits of four researchers from the Fraunhofer IFF. Dr. Lutz Hoyer, whose picture (on page 52 in the Gallery) is encountered more frequently than any other, jokes: "During the elections for the state parliament in March, I was repeatedly asked where my name would be on the ballot." As a matter of fact, the first posters with the portrait of this longtime Fraunhofer researcher went up on his sixtieth birthday. "That was a fantastic present!" Happy birthday!



Heike Kissner




Anna-Kristina Wassilew




Dr. Sascha Thomas

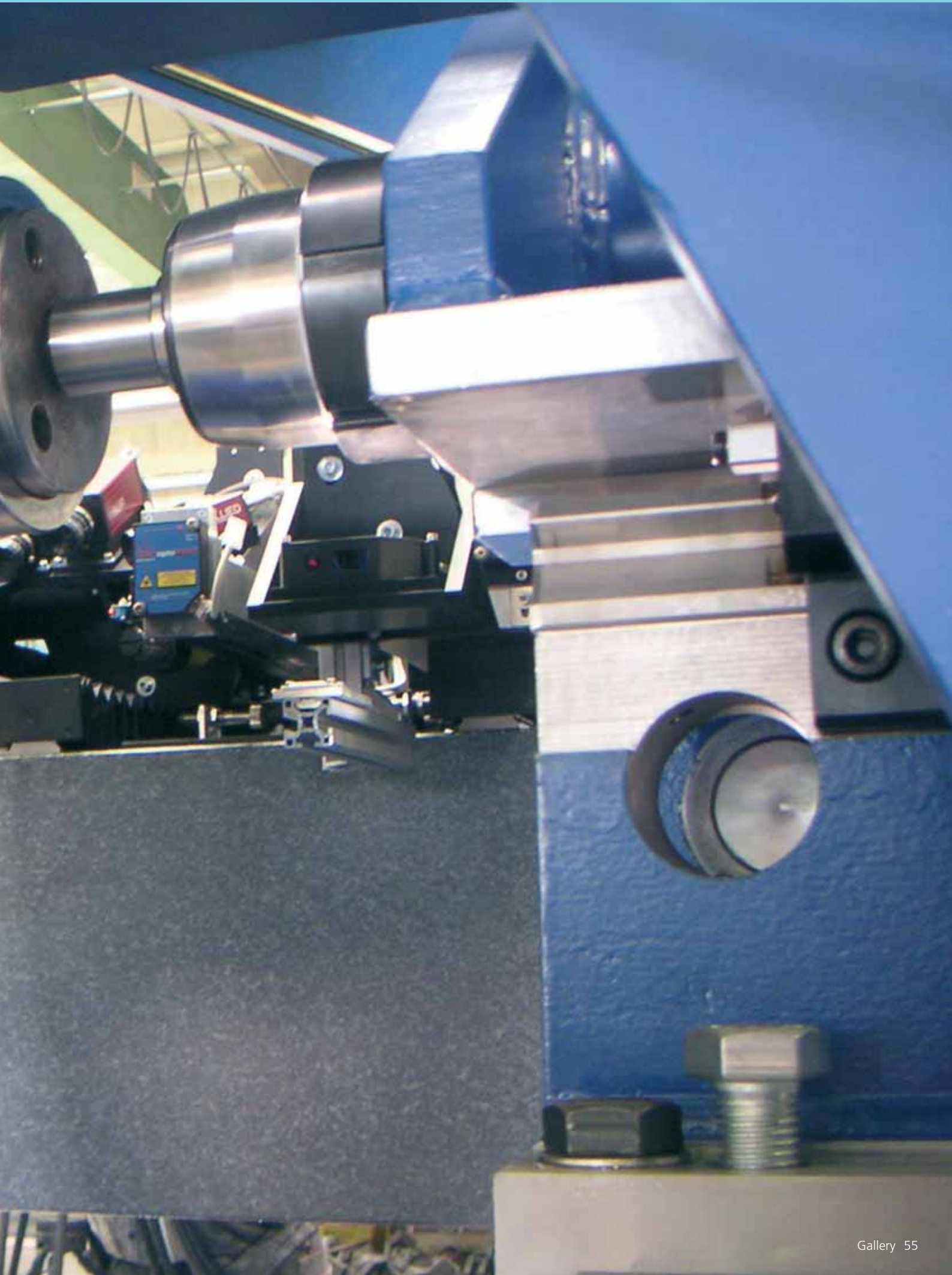




Dr. Lutz Hoyer shows a union for the firm MTU made at the Fraunhofer IFF using rapid prototyping. The photo comes from the shooting for the promotional campaign for the "Year of Science 2006".

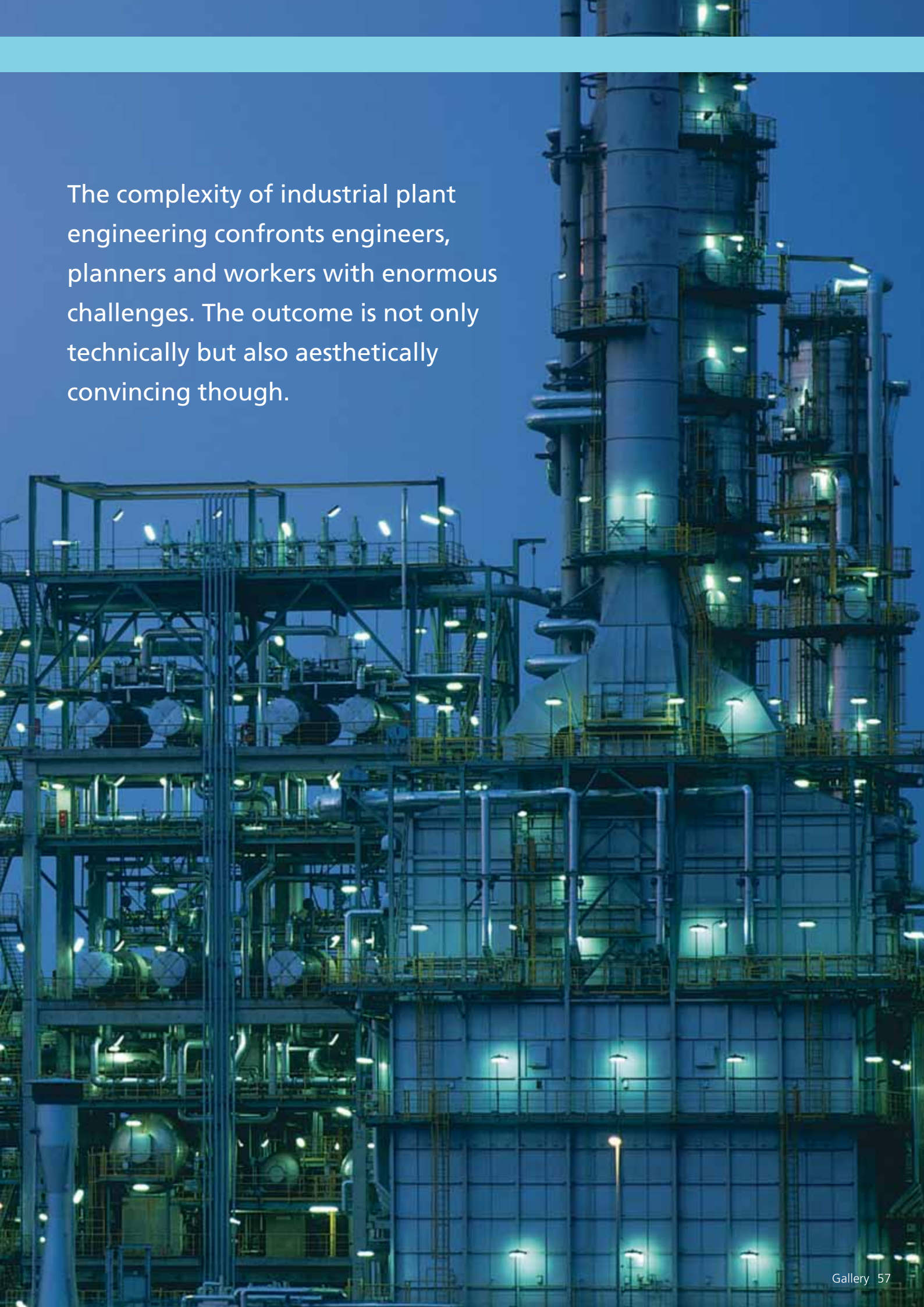


Train wheelsets are subject to tremendous stresses. Optical 3-D metrology is used for quality inspection to ensure safety and comfort.






The complexity of industrial plant engineering confronts engineers, planners and workers with enormous challenges. The outcome is not only technically but also aesthetically convincing though.







Wind energy converter maintenance not only opens excellent prospects for the asset but also for maintenance technicians.

## IFFOCUS 1/2006

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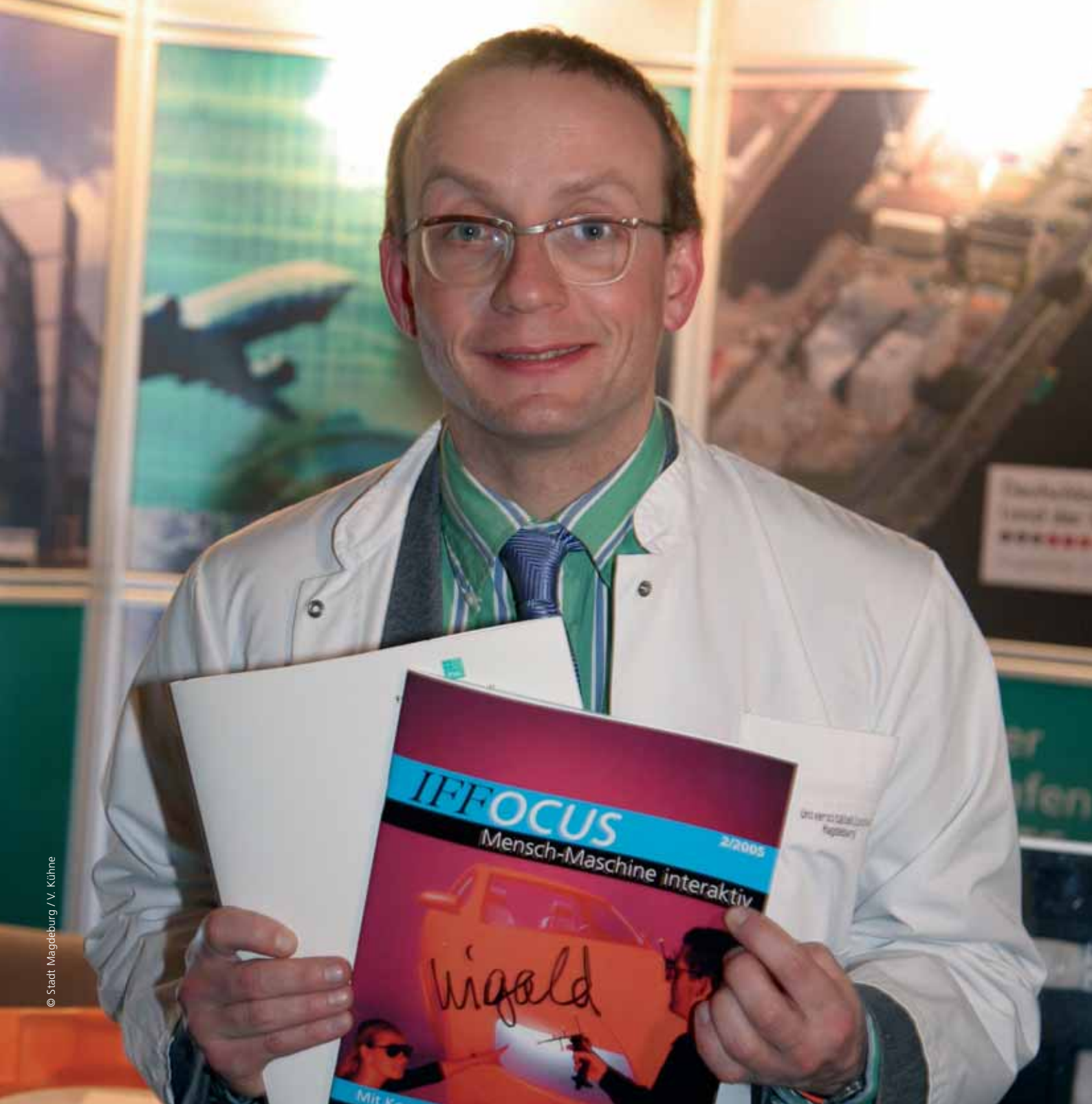


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Viele Grüsse an die Leser des  
IFFOCUS!  
Wigald Borinny

## Events in 2006

July 12-16, 2006

Interforst: 10th International  
Trade Fair for Forestry and  
Forest Technology  
Munich, Germany

September 19-22, 2006

InnoTrans  
Berlin, Germany

September 19-22, 2006

transport logistic China 2006  
Shanghai, China

September 22-23, 2006

Festival of Science  
Magdeburg, Germany

September 26-27, 2006

12th ASIM Conference "Simulation  
in Production and Logistics"  
Kassel, Germany

October 2, 2006

Ceremony Marking 50 Years of the  
IFSL at Otto von Guericke University  
Magdeburg, Germany

October 4-5, 2006

Conference "Quality Assurance and  
Reliability of Logistics Processes  
in the Aviation and Automotive  
Industry"  
Moscow, Russia

October 12, 2006

Open Days: European Week of  
Regions and Cities  
Brussels, Belgium and  
Magdeburg, Germany

October 12-13, 2006

Power Quality Seminars, Module 3  
"Harmonic and Subharmonic"  
Magdeburg, Germany

October 17-19, 2006

Maintain 2006: International Trade  
Fair for Industrial Maintenance  
Munich, Germany

October 18-20, 2006

23rd German Logistics Congress  
Berlin, Germany

October 25 - December 6, 2006

3rd Virtual Reality Guest Lecture  
Series  
Magdeburg, Germany

November 13-15, 2006

International Conference "Rapid  
Product Development: Building the  
Future by Innovation"  
Marinha Grande, Portugal

November 14-16, 2006

11th IIR Production Symposium  
SYM)PRO 2006  
Nürtingen, Germany

November 16-17, 2006

Power Quality Seminars, Module 4  
"Voltage Fluctuations and Flickers"  
Magdeburg, Germany

November 16-17, 2006

Magdeburg Logistics Symposium  
Magdeburg, Germany

November 22, 2006

VDTC Opening in the Port of  
Science  
Magdeburg, Germany

December 3-6, 2006

Winter Simulation Conference  
Monterey, California, USA



# Deutschland Land der Ideen



Ausgewählter Ort 2006