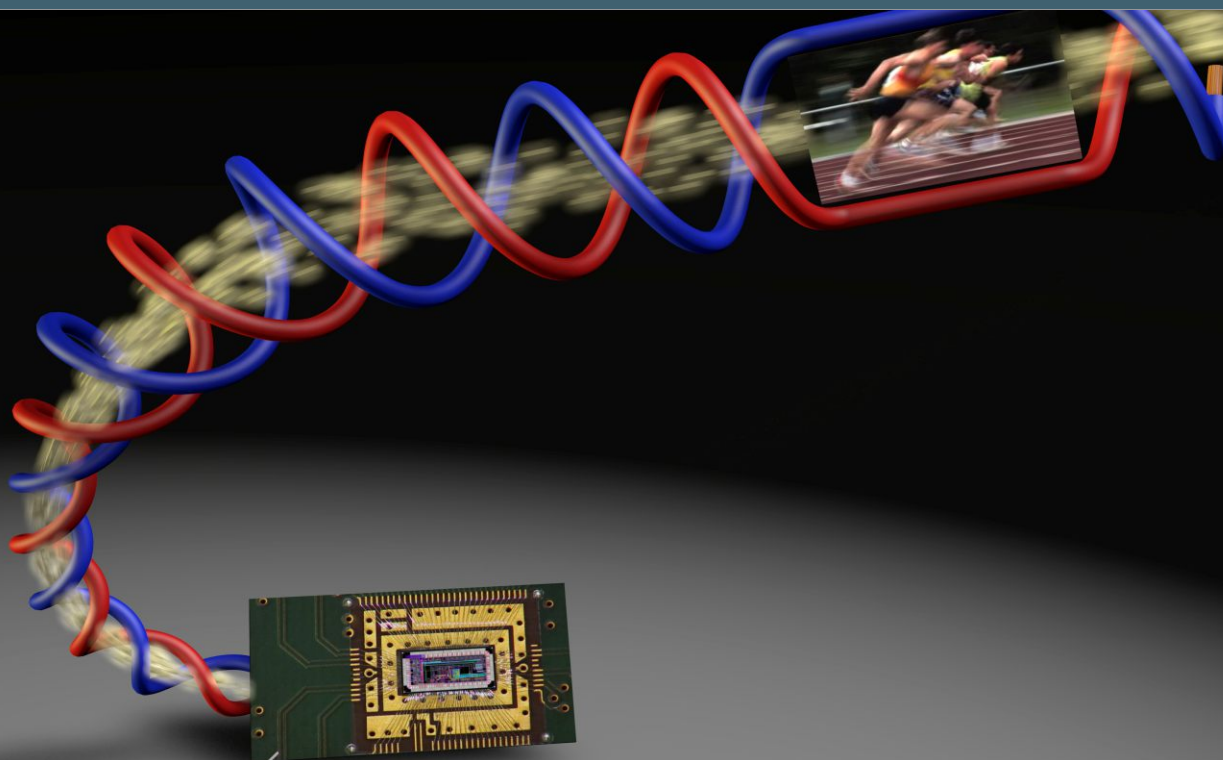


FRAUNHOFER IN INDIA NEWSLETTER - ISSUE 2/2015



FRAUNHOFER FEATURES IN THOMSON REUTERS TOP 100 GLOBAL INNOVATORS

Fraunhofer India showcase at Hannover Messe 2015

India participating in the world's largest industrial exhibition-Hannover Messe
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“The clarion call that has been resounding over the last few months, is to combine the ‘Make In India’ with ‘Innovate in India’. The ultimate goal should not only be to make India a ‘global assembly plant’ but also aim to be the innovation hub of the world.”

*Ms. Anandi Iyer,
Director,
Fraunhofer Office India*

Dear Friends,

Innovation is the engine of growth that leads research ideas to products in the shortest possible time, and thereby creates jobs, economic growth and prosperity for a Nation. Europe has made Innovation its success mantra and secured markets thereby creating huge brands and consequently employment and economic power.

In India, ‘The Make in India’ campaign by the Hon’ble Prime Minister has set the focus on augmenting our core sector, plugging the technology gaps and growth deficits, by invoking both national and international firms to look at India for their manufacturing base. As India faces monumental challenges including poor infrastructure, archaic labor laws, an excessive regulatory bureaucratic regime, and limited FDI—this Initiative can make a strong case to quell the downward spiral and boost our GDP. However, the clarion call that has been resounding over the last few months, is to combine the ‘Make In India’ with Innovate in India. The ultimate goal should not only be to make India a ‘global assembly plant’ but also aim to be the innovation hub of the world. In order to ensure that the Innovate in India campaign is an attractive proposition for global and Indian Industry some critical factors have to be addressed:

1. Focussed policies and encouraging environment for Product Innovation: India has witnessed a plethora of service Innovations, particularly in the health care, telecommunications and retail sector. But unfortunately we have a miserly few (if at all) success stories in the Product Innovation category.
2. Building and reinforcing the ecosystem for applied research: We need to compress the time-to-market of innovations through a sustained cooperation between Industry and research Institutions and move into the realm of Innovation. The Global Competitiveness Report 2013-14 states "India's capacity for innovation has been lower than that of BRICS countries (Brazil, Russia, India, China and South Africa) except Russia. Though, India scores better than China, Brazil and Russia on quality of scientific research institutions, the research undertaken in such institutions is not percolating down for commercial usage.
3. Stronger IP protection will reduce business uncertainty and increase investor confidence. It is already seen that the states that protect IP best also have the highest rates of per capita GDP growth. The need of the hour is to create a trusting environment, as well as bolster problem-solving mechanisms to address the trust deficit whenever the situation arises.

In this issue, keeping the trending subject of ‘Make in India’ in mind we have focussed most of our articles on electronics as a sector that has ushered in wide ranging innovations. Also featured are some of the most exciting innovations from the Fraunhofer Universe

Enjoy Reading and do give us your feedback!

Anandi Iyer



Fraunhofer India at Hannover Messe 2015

By: Mohan Venkat, Manager - Production Technology, Fraunhofer India

The fourth industrial revolution is already under way, the borders between the virtual and the real world are becoming increasingly blurred. Numerous Fraunhofer research activities have been supporting the industry for many years. At Hannover Messe 2015, Fraunhofer establishments present exhibits in the fields of adaptronics, surface engineering, simulation, subsea and production.

The world's largest industrial exhibition - Hannover Messe was jointly inaugurated by German Chancellor Dr. Angela Merkel & Indian Prime Minister (PM) Narendra Modi. India being the partner country of this Hannover Messe, more than 350 Indian companies participated. The Government of India took large number of initiatives to augment the 'Make in India' brand. Many Fraunhofer experts participated in seminars conducted as a part of the 'Make in India' campaign. Ms. Anandi Iyer, Director, Fraunhofer India was invited to a special dinner held in the honour of PM Mr. Modi at the Indian embassy at Berlin as a part of high level delegation of the Indian industry leaders. Fraunhofer experts also participated in the India Partner country Night cultural event which saw exposition of Indian music, dance & food.

Fraunhofer India had a dedicated India corner where Fraunhofer institutes active in India exhibited technologies relevant to India in line with the 'Make in India' campaign. The institutes which demonstrated their technologies were Fraunhofer IWU, Fraunhofer LBF,



Theme	Speakers
Suppliers Convention - The International forum for suppliers	Ms. Anandi Iyer, Director, Fraunhofer Office India
Make In India – 'Opportunities in electronics and electrical sectors' – The New Sunrise.	Prof. Dr. Christoph Kutter, Director, Fraunhofer Research Institute for Microsystems and Solid State Technologies EMFT
Market Potentials and Business Applications for Renewable Energies & Energy Efficiency in India.	Mr. Gerhard Stryi-Hipp, Head of Energy Policy and group leader of Thermal Collectors and Applications, Fraunhofer ISE
Make in India – Government of India initiatives Heavy Engineering & Motion, Drive & Automation: Investments & Business Opportunities.	Mr. Michael Hoffmann, Head, Department of Automation, Fraunhofer Germany

1: Shri Narendra Modi woos investors at Hannover Messe, seeks strong India-Germany ties "We are creating an environment that is stable, where rules will not be changed frequently and there will be no surprise elements," the Prime Minister said.
Source: ibnlive.com



"India's participation as the Partner Country in Hannover Messe 2015 has put India back on the minds of German and Global investors and business community."

PS Gangadhar, First Secretary, Economic & Commercial, Indian Embassy Berlin.

Fraunhofer IPT & Fraunhofer IZM. Fraunhofer IWU displayed its processes with emission-neutral E³-factories with energy and resource-efficient process of bulk material forming technology cold forming of gears & weight reduction of camshafts. Fraunhofer LBF displayed its solutions in designing, testing & simulating light weight wheels. Fraunhofer IPT displayed local wear protection of complex components by laser processes by modifying the materials.

Fraunhofer IZM displayed its solution in monitoring and consultancy for Reliability and Safety Issues, showcasing the joint project of Fraunhofer IZM with the Indian client TAFE Pvt Ltd in developing electronic controls system for their tractors. TAFE is India's second largest tractor manufacturer and Mr. Sujit Piri head of the project from TAFE was present at the Fraunhofer India Stand to reinforce the value of collaboration with Fraunhofer. India being partner country in this Hannover Messe the Fraunhofer stall attracted a lot of visitors from India. The Fraunhofer experts in the India corner were Mr. Robert Keplin, Mr. Ivo Krause, Dr. Andreas Middendorf, Mr. Stephan Benecke, and Mr. Martin Bock.

The Fraunhofer India corner also attracted high level Delegations from the Indian and German side. These include the Parliamentary State secretary Mr. Thomas Rachel, Ministry of Education and Research (BMBF), Govt. of Germany; The Fraunhofer Board led by Prof Dr Reimund Neugebauer, Secretary of Department of Heavy Industries India (DHI) Mr. Rajan Katoch and senior officials, Chairman and Managing Director of BHEL Mr. BP Rao, Joint Managing Director of Bosch Mr. Soumitra Bhattacharya, Additional Secretary Energy and CEO Punjab Invest Mr. Tiwari etc.

On the side lines of Hannover Messe, Vikram Solar a leading PV manufacturer of India signed a Memorandum of Understanding with Fraunhofer ISE and the companies Meyer Burger and Centrotherm photovoltaics. The goal of the partnership is to further optimize the module production technology at Vikram Solar, make preparations for cell manufacturing at the company, and establish a solar academy in India.

A high level Delegation of Department of Heavy Industries led by State Secretary Dr. Rajan Katoch visited Fraunhofer IFAM. The delegation included Mr. Vishvajit Sahay, Joint Secretary Department of Heavy Industry, Mr. Sanjay Chavre, Sr Development Officer, Department of Heavy Industry, Mr. B.P. Rao, CMD, Bharat Heavy Electrical Limited (BHEL), Mr. Avijit Ghosh, CMD, Heavy Engineering Corporation (HEC), Mr. M.R. Saraf, Deputy Director, Automotive Research Association of India, Mr. Naveen Kumar CTO HEC, Mr. DK Sinha DGM HEC, Mr. R Krishnan Director (HR) BHEL

2. Fraunhofer LBF experts explaining to delegation of DHI

3. Ms. Anandi Iyer meeting the Prime Minister of India Mr. Narendra Modi



Electronic capabilities @ Fraunhofer

Source: Fraunhofer Mikroelektronik

Technology - Application - Society: Bridging the Gap

With a unique range of expertise not found elsewhere in the world, the Fraunhofer Group for Microelectronics bridges the gap between fundamental research and product development in the areas of Microelectronics and Nanoelectronics, including microsystem technologies and power electronics, and Nanotechnologies, new materials, photonics, and advanced manufacturing technologies.

As the leading international research and development provider, we are working on solving social challenges such as aging society, urbanization, globalization, energy and resources, environment and climate, health, mobility, and living and working in the knowledge society. We support our customers along the entire value chain: from the basic technologies to the end product. We are contributing to shaping our future by bridging the gap between short-term, application-oriented and our longer-term strategic research for small and medium-sized enterprises and large companies.

Strategic Core Competences

our expertise in the areas of microelectronics and smart systems integration allows us to bridge the gap between application-oriented fundamental research and product development along the entire added-value chain within our business units. The solutions developed in our application-oriented business areas -:

- Ambient Assisted Living, Health and Well-being - electronic assistance for the user's individual needs
- Energy Efficient Systems – taking us towards the 'all-electric society'
- Mobility and Urbanization - quality of life in urban areas
- Smart Living - living and working in a knowledge-based society

These are based on seven core competences in which our member institutes bundle their knowledge and with which they cover important parts of the value chain and they are :

- Design for Smart Systems: This comprises research, services, and developments in the area of digital, analog, and mixed-signal systems, including sensors and embedded software.
- Semiconductor based Technologies: This bundles the specialist knowledge of the member institutes in this technology platform – particularly within the area of More-than-Moore technologies, as they are known. The basics are the technologies available at the institutes.



Fraunhofer Research Institution for Microsystems and Solid State Technologies EMFT



Fraunhofer Institute for Electronic Nano Systems ENAS



Fraunhofer Institute for High Frequency Physics and Radar Techniques FHR



Fraunhofer Heinrich Hertz Institute HHI

1: Image Source : Fraunhofer



Fraunhofer Institute for Integrated Circuits IIS



Fraunhofer Institute for Integrated Systems and Device Technology IISB



Fraunhofer Institute for Microelectronic Circuits and Systems IMS



Fraunhofer Institute for Nondestructive Testing IZFP

2. Fraunhofer Institute for Reliability and Microintegration IZM

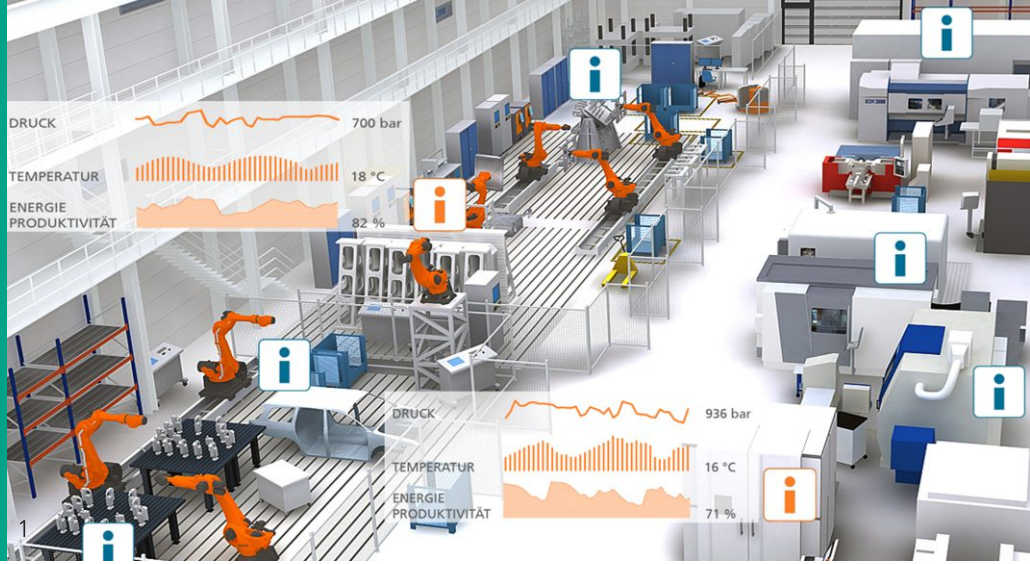
3. Fraunhofer Institute for Open Communication Systems FOKUS

- Power Electronics and System Technologies for Energy Supply: This bundles the specialist knowledge of the member institutes in the areas of power electronics and information technology for the smart grid as well as energy harvesting, energy storage, and energy management.
- Sensors and Sensor Systems: This bundle all the technologies needed for the development of reliable, robust, energy-efficient, yet cost-effective sensor systems in the 'Sensors and Sensor Systems' core competence
- System Integration Technologies: This is the basis of a shared development of multifunctional systems that addresses different sectors in a targeted manner and is able to offer end customers attractive and fast application solutions.
- Quality and Reliability: Reliability is evaluated at different levels of integration, starting from the system and passing over the electronics assembly, the interconnect device, the device itself, and the semiconductor, right up to rewiring and the transistor structures. To assure the quality of electronic systems, the Fraunhofer scientists in the Microelectronics Group are working on coming up with solutions for inspection along the entire added-value chain.
- RF and Communication Technologies: With the cross-institute technology platform 'RF and Communication Technologies' for wireless network solutions, the Group for Microelectronics is pursuing the aim of countering today's heavy, sometimes even extreme, dependency on external suppliers

Fraunhofer Microelectronics Member Institutes

There are currently 16 member institutes (11 regular plus 5 guest members).

- Fraunhofer Research Institution for Microsystems and Solid State Technologies EMFT
- Fraunhofer Institute for Electronic Nano Systems ENAS
- Fraunhofer Institute for High Frequency Physics and Radar Techniques FHR
- Fraunhofer Heinrich Hertz Institute HHI
- Fraunhofer Institute for Applied Solid State Physics IAF
- Fraunhofer Institute for Integrated Circuits IIS
- Fraunhofer Institute for Integrated Systems and Device Technology IISB
- Fraunhofer Institute for Microelectronic Circuits and Systems IMS
- Fraunhofer Institute for Photonic Microsystems IPMS
- Fraunhofer Institute for Silicon Technology ISIT
- Fraunhofer Institute for Reliability and Microintegration IZM
- Fraunhofer Institute for Embedded Systems and Communication Technologies ESK
- Fraunhofer Institute for Open Communication Systems FOKUS
- Fraunhofer Institute for Digital Media Technology IDMT
- Fraunhofer Institute for Ceramic Technologies and Systems IKTS
- Fraunhofer Institute for Nondestructive Testing IZFP



Smart Manufacturing - The Future Revolution

By: Frank Walter Jaekel, Project Manager, Fraunhofer IPK, Berlin

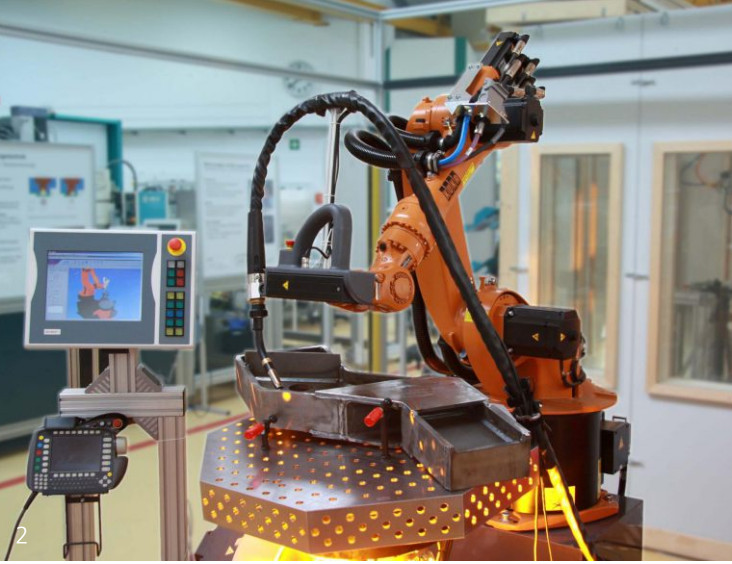
Industrie 4.0 and its vision of the intelligent networked factory of the future are major talking points as mobile technologies like cloud computing are revolutionizing industrial processes. With embedded systems, components and machines can now talk to one another and self-optimize, self-configure and self-diagnose processes and their current state, providing intelligent support for workers in their increasingly complex decision-making. Today's centrally organized enterprise is turning into a decentralized, dynamically controlled factory whose production is defined by individuality, flexibility and speed. Industrie 4.0 is no longer some futuristic vision.

'Integrated Industry' is the keyword summarizing the increasing interaction between production and business in the context of Industrie 4.0. For example, machine-to-machine communications, safe fence-less co-operation of human workers and robots, or globally networked business models are the future. All these have already been under development at Fraunhofer IPK for years, because the philosophy of 'Integrated Industry' is a living reality here.

In a summary, Prof. Dr. h. c. Dr.-Ing. Eckart Uhlmann, director of Fraunhofer IPK, defines Industrie 4.0 as follows:

- Implementation and use of internet of people, things, services and processes in industry, in manufacturing companies.
- Ubiquitous, surrounding networking, assistance and intelligence of people, machines, objects, IT-systems.
- Approach:
 - Horizontal integration in value added networks
 - Vertical integration of production and IT-systems
 - Digital consistency in engineering
 - Decentralization of intelligence and functions
 - Sociotechnical system design
- Organization and control of the entire value-added chain over the life cycle of products.
- Increasingly individualized customer requirements extend from the idea and commission to development and manufacturing, as well as delivery to the end customer and recycling, including associated services.
- Availability of all relevant information in real time through linking of all entities involved in value creation as well as the ability to derive at any time the optimal flow of added value from the data.
- Interlinking humans, objects and systems leads to dynamic, real time-optimized and self-organized cross-company added value networks that can be optimized according to different criteria.

1. Effizienter High-Speed Physical Layer 10+ Gbps für die nächste Generation der Video-Übertragung.
© Fraunhofer IIS/Udo Rink



Current IPKs Industrie 4.0 research

SOPRO, IWEPRO, Picasso, MetamofAB and VIB SHP are the current Industrie 4.0 projects at Fraunhofer IPK. The backbone of the research and development work on self-organizing production with distributed intelligence performed in these projects are concepts for intelligent self-organizing workshop production, a cloud-based industrial control platform for production with cyber-physical systems, a transformation cockpit for the metamorphosis to the intelligently networked factory and a modular system for tangible hedging of production systems.

Industry Cockpit

The Industry Cockpit enables the interplay of processes, data, analyses and decisions, providing the necessary flexibility and agility required for all relevant actors to respond to changing production conditions. Advantages of the Industry Cockpit are that it

- reduces the effort of setting up dashboard views,
- facilitates a better information transfer,
- creates a dynamic performance measurement environment,
- produces better usability due to model-based configuration of dashboards.

The Industry Cockpit illustrates the structure of intelligent and networked production and links people, products, equipment, information systems and connected organizations.

Business Integration for application of Industrie 4.0

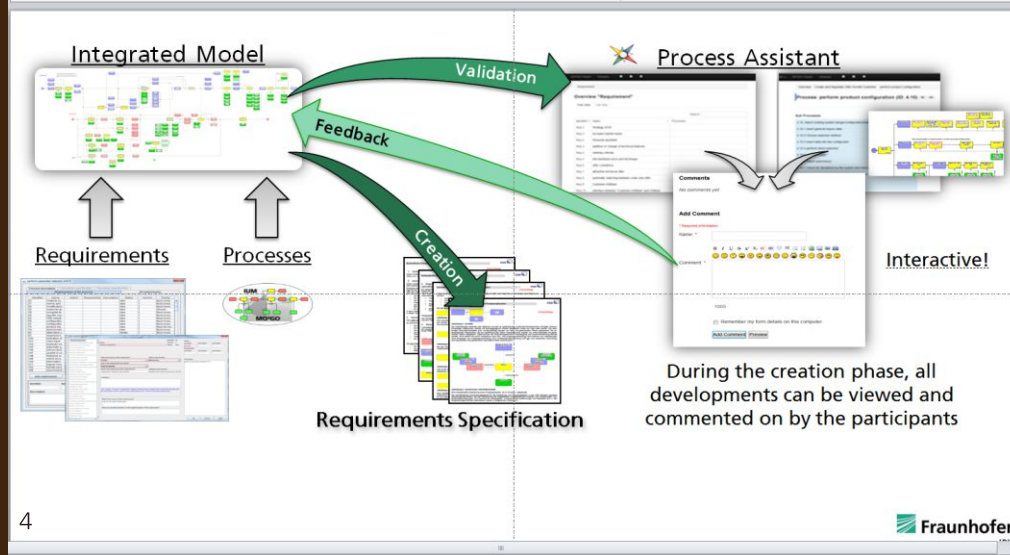
A lot of current Industrie 4.0 approaches are looking purely to the technological aspects. As well it is important here to develop the right strategy using new technological enabler and realise into the operationalization quickly. This is one topic in the EC project on "Intelligent Systems Configuration Services for Flexible Dynamic Global Production Networks" (FLEXINET). In its context, Fraunhofer IPK provides approaches and tools for accelerating the implementation of new business opportunities by applying the results of the METAMOFAB project; enabling criteria for Industrie 4.0 are included already into the entire framework.

Industrie 4.0 and the ismart shop floor

Typical production lines for today's mass production are built from a number of specific components. Yet with increasing diversity in the range of manufactured products, such rigid production systems are now straining at their limits – particularly in terms of their ability to respond quickly, their workloads and their ability to meet delivery deadlines. In the IWEPRO – Intelligent Cooperation and Networking for Shop Floor Production project, partners from science and industry are designing innovative production concepts to enable smart shop floor manufacturing with decentralized production control. They are

2: SMErobot invention by IPA:
Five-Minute-Robot in Welding Cell
(Image credit: Fraunhofer Institute for
Manufacturing Engineering and
Automation IPA)

3: SMErobot technology bin-picking
on a COMAU SMART robot
(Image credit: Fraunhofer Institute for
Manufacturing Engineering and
Automation IPA)



engineering solutions with intelligent networked products, production machines, transport systems and manufacturing resources that can communicate with one another and cooperate with workers by adapting to particular tasks and situations. The project is funded by Federal Ministry of Education and Research (BMBF).

Industry application example

Fraunhofer IPK has for decades successfully been working on manufacturing execution systems and their implementation in medium-sized and large organisations. IPK developed and applied a complete model driven approach for implementing MES systems in the industry. By using this methodology and the supporting software tools IPK achieved:

- Reduction of the entire implementation time from specification to start of operation up to 50% compared to traditional approaches
- Increased satisfaction level of users
- Better support of the individual production systems
- An early return of investment estimation already in the design phase

The model ensures the consistency and coherence of the target manufacturing execution system regarding the operational processes and plays the integration role in the entire live cycle of the MES.

An integrated requirements management component which is directly connected to the enterprise model provides a consistent relation between the IT requirements, enterprise processes and IT systems. Further on this integrated system supports the sw programming phases. So the enterprise model serves as the central focal point for all this information. A view concept allows for providing specific views for each end user in a distributed manner.

The MES approaches at Fraunhofer IPK already started long time ago and are now extended by Industry Cockpit solutions such as dash boards for the fulfilment of requirements.

4. Holistic model-based requirement management approach (Wintrich, N., Gering, P., Meissner, M.: Interactive Process Oriented Requirements Management. In Meersman, R. Panetto, H. et al. (eds.) OTM 2015 Conferences, Springer (2015) to be published)



Fraunhofer World - Recent Awards

Annual Conference of the Fraunhofer-Gesellschaft

During the annual conference of the Fraunhofer-Gesellschaft on June 9 2015 in Wiesbaden the following prizes were awarded: Three Joseph von Fraunhofer prizes and the Technology Prize for Human-Centered Technology.

1. Joseph von Fraunhofer Prize 2015 - Diamond-like coatings save fuel

This prize has been awarded by the Fraunhofer-Gesellschaft every year since 1978, in recognition of outstanding scientific work by members of its staff leading to the solution of application-oriented problems.

Coating engine components with hard carbon reduces friction to almost zero – a development that could save billions of liters of fuel worldwide every year. Now researchers have developed a new laser method to apply the coating on the production line. Scientists already know how to coat components with diamond-like carbon to minimize friction. But now researchers of the Fraunhofer Institute for Material and Beam Technology IWS in Dresden have developed a laser arc method with which layers of carbon almost as hard as diamond can be applied on an industrial scale at high coating rates and with high thicknesses. By applying carbon coatings to engine components such as piston rings and pins, fuel consumption can be reduced.

2. Joseph von Fraunhofer Prize 2015: Natural rubber from dandelions

Dandelions are modest plants that are an excellent alternative source for a raw material of high demand: natural rubber, the fundamental ingredient in rubber products. Fraunhofer researchers have established the basis for the large-scale production of high quality rubber with Russian dandelion. Approximately 40,000 products of everyday life contain natural rubber. It's the material that provides extreme elasticity, tensile strength and low-temperature flexibility in products from mattresses and gloves to adhesive tape and tires. As yet, it has no artificial replacement. However, researchers from the Fraunhofer Institute for Molecular Biology and Applied Ecology IME in Aachen were able to identify a cost-effective and eco-friendly alternative to the natural rubber tree: the dandelion.

3. Joseph von Fraunhofer Prize 2015: A concert hall for on the move

Researchers have developed new audio software that creates a natural three-dimensional sound. Whether you're listening on your smartphone or in the car, it feels like you're right there in the concert hall. Optimum playback of digitized music requires superior software solutions. The Fraunhofer Institute for Integrated Circuits IIS has developed intelligent

1: Dr. Volker Weihnacht, Prof. Andreas Leson and Dr. Hans-Joachim Scheibe (left to right) successfully developed a laser arc method of depositing friction-reducing, wear-resistant coatings on components.
© Dirk Mahler/Fraunhofer

2: Left to right: Dr. Christian Schulze Gronover, Dr. Carla Recker (Continental Reifen Deutschland GmbH) and Prof. Dirk Prüfer make use of the Russian dandelion to obtain natural rubber for subsequent use in the manufacture of car tires.
Source: www.fraunhofer.de



3



4

algorithms known as Cingo and Symphoria that produce a natural and immersive 3D audio experience. So you get to feel like you're at a live concert – even when you're actually listening on a mobile device or in the car.

4. Fraunhofer Prize Human-Centered Technology

The award for Human-Centered Technology is funded by former Executive Board members and institute directors of the Fraunhofer-Gesellschaft and outside sponsors associated with them. This prize is awarded every two years – alternating with the Donors' Association Prize – to those employees whose research and development work makes a significant contribution to improving people's quality of life and maintaining their active participation in daily life into old age. The prize of 50,000 euros will be awarded on June 9 at the Fraunhofer-Gesellschaft's annual conference in Wiesbaden.

Plasma makes wounds heal quicker

Many people suffer from skin disorders. Open wounds are a particularly acute problem, especially among the elderly. PlasmaDerm, a new medical technology solution, uses plasma to facilitate faster healing of wounds. Skin disorders are a common problem in this part of the world. Atopic dermatitis, psoriasis and chronic venous leg ulcers – typically caused by diabetes or varicose veins – can cause patients years of suffering. Working in collaboration with the company Cinogy and the Department of Dermatology, Venereology and Allergology at the University Medical Center Göttingen, the Fraunhofer Institute for Surface Engineering and Thin Films IST has successfully developed a new medical technology solution for treating wounds and skin disorders known as PlasmaDerm. Plasma promotes wound healing when it is generated directly on the skin.

All you feel is a slight tingling sensation, says Prof. Wolfgang Viöl from Fraunhofer IST, moving a device approximately the size and shape of a pocket flashlight in small circles over the back of his hand. Holding the device just over the skin, a faint purple mist can just barely be seen at the device's tip. That's plasma, he explains – an ionized gas.

PlasmaDerm – which was developed by a team consisting of medical professionals, biologists, physicists and engineers – is a novel solution. For the first time, the device generates a non-thermal or 'cold' plasma directly on the skin at atmospheric pressure. The patented method involves placing the electrode of the device close to the skin, with the skin itself acting as the second electrode. A high voltage is then applied across the gap, and the resulting electric fields convert the area between the electrode and the skin into non-thermal plasma.

3: A concert hall for on the move
Left to right: Developed by Harald Popp, Oliver Hellmuth and Jan Plogsties, the software solutions Cingo and Symphoria create 3D surround sound in vehicles and on mobile devices.

4: From left to right:
Dr. Andreas Helmke, Dr. Dirk Wandke (Cinogy GmbH), Prof. Wolfgang Viöl and Prof. Steffen Emmert (University Medical Center Göttingen) developed the PlasmaDerm medical technology solution that makes wounds heal faster.



Recent Inventions @ Fraunhofer:

Automated ion analyzer for space missions

Press Release Jun 15, 2015

The German Aerospace Center (DLR) is scheduled to launch its Eu:CROPIS research satellite into orbit in early 2017. Its purpose is to test a biological life-support system for future human space missions. The satellite's payload includes an ion analyzer developed by Fraunhofer. This compact device will automatically monitor all of the system's internal processes.

Merlin – the digital lab notebook

Fraunhofer IPK, Press Release Jun 15, 2015

Scientists have to clearly document their experiments in a reproducible way, but depending on time pressure and the workflow in the lab, that is often a difficult task. 'Merlin', a digital lab notebook developed by the Fraunhofer Institute for Manufacturing Engineering and Automation IPA, aims to make scientific documentation easier in the future.

Better welding with speedy laser mirrors

Fraunhofer ISIT, Press Release May 28, 2015

Silicon micromirrors can guide laser beams at extremely high speeds, allowing operators to dose heat input to workpieces with absolute precision. But to date they have not been robust enough to be used for laser cutting and welding. Now a Fraunhofer team has managed to develop fast, durable mirrors that are capable of performing challenging cutting and welding tasks.

Using a new laser process to custom shape optical fibers

Fraunhofer IZM, Press Release May 05, 2015

Modern medicine relies on optical fibers to cauterize unhealthy veins in a minimally invasive way. Now, Fraunhofer researchers have developed a laser processing method that facilitates automated series manufacture of these fibers at a much finer quality than ever before.

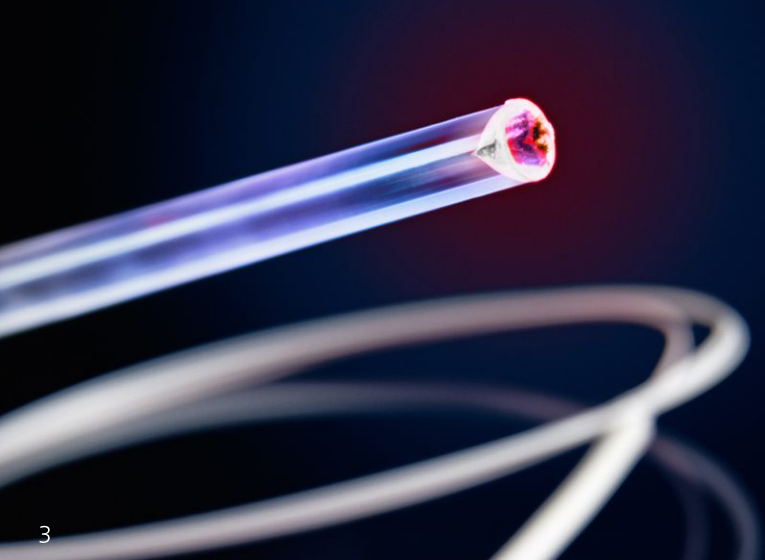
Detecting skin cancer quickly

Fraunhofer IFF, Research News May 04, 2015

Melanoma is aggressive and life-threatening. If it is not detected early, the prospects of recovery drop. Screening is complicated, though. Together with several project partners, Fraunhofer researchers have developed an assistance system that helps dermatologists with diagnosis.

1: Merlin, the digital lab notebook, supports researchers in documenting their processes and controls laboratory equipment.
© Fraunhofer IP

2: Fast, resilient MEMS mirrors deflect the laser beam and guide it precisely over the workpiece. Now they can withstand even high laser powers, enabling them to process aluminum and sheet steel.
© Fraunhofer ISIT
Source: www.fraunhofer.de



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Pressure-monitoring stockings to prevent wounds in diabetics

Fraunhofer ISC, Press Release May 05, 2015

Diabetics often have little feeling in their feet and don't perceive the body's pressure or temperature signals there. This can result in unnoticed wounds that then develop into abscesses. Many diabetics have to have toes or feet amputated. Now, a novel kind of pressure stocking developed by Fraunhofer researchers is set to help protect against wounds via an integrated sensor system that sends a warning when pressure is too high.

Getting the perfect fit for artificial hips

Fraunhofer IWU, Press Release Apr 08, 2015

When a patient receives a new hip, it is usually adjusted only approximately to leg length. Greater accuracy requires a more precise measuring process as well as adjustable implants. Now, a new type of measurement method coupled with a modular implant should allow orthopedic surgeons to precisely calibrate leg length after the operation so it matches its original length.

Produce more flexibly with the Industry Cockpit

Fraunhofer IPK, Press Release Mar 31, 2015

Customers expect products to be tailored to their needs. And not only that: they want to influence the way the product is manufactured as well. As a result, very flexible manufacturing and administrative processes are necessary. This is an enormous challenge for companies – because most processes are quite rigid. Now, with the help of the Industry Cockpit, production has become more variable.

Encryption for everyone

Fraunhofer SIT, Press Release Mar 16, 2015

In the wake of the revelations that intelligence agencies have been engaged in mass surveillance activities, both industry and society at large are looking for practicable encryption solutions that protect businesses and individuals. Previous technologies have failed in practice because they were too expensive or not user friendly enough. Fraunhofer has launched an open initiative called "Volksverschlüsselung" with the aim of bringing end-to-end encryption to the masses. "With this initiative and what it's developing, Fraunhofer is supporting the German government's efforts to better protect people and companies," says Prof. Michael Waidner, Head of Fraunhofer SIT. This is why "Volksverschlüsselung" is to be made available as open-source software.

For further Fraunhofer news please visit www.fraunhofer.de

3: Thanks to a new laser process, optical fibers can now be inserted into even smaller vein branches. In this prototype, the tip is inside the fiber probe.

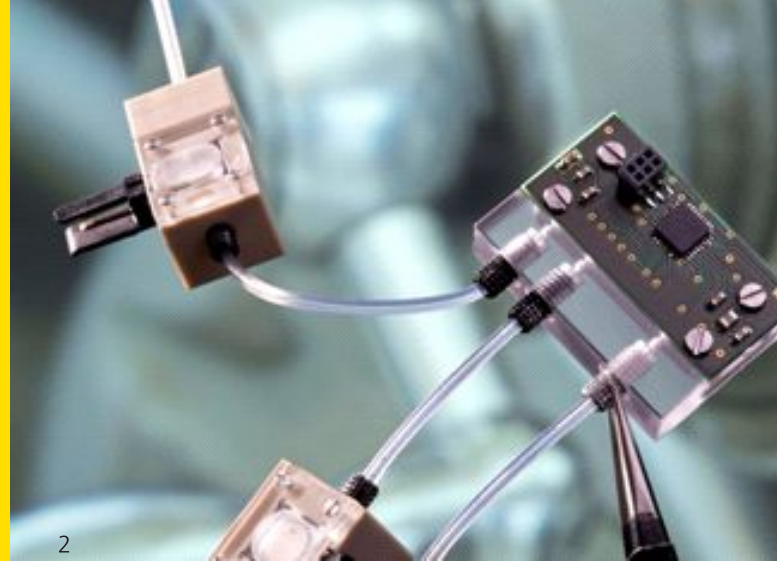
© Fraunhofer IZM

4: The Dermascanner scans the surface of a patient's skin from different positions and divides it into around one hundred individual images.

© Dirk Mahler/Fraunhofer IFF



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Sensors and Actuators – Market with Worldwide Potential

Source : Fraunhofer EMFT

The navigator warns you about traffic jams on your route. The fire brigade is automatically called at emission of dangerous gases in the lab. The lamp at your home door independently switches on at night fall. All this is made possible by intelligent sensors and sensor systems mostly invisible to us. They have already become an important part of our daily lives, and they are bound to gain even more importance in the future. At work, home, and in our leisure time they make our daily life more comfortable, secure and encouraging. In industrial production sensors are used for measuring, controlling, monitoring and automation. Sensors increase the functionality and the value of several products without significant addition to the overall cost. A prime example for this is the mobile phone, which has evolved into an irreplaceable all-round-talent due to integration of various sensors. The end of this development is not yet to be seen.

Visions such as Smart Objects, Pervasive Computing, Internet of Things (IoT) or Industry 4.0 are based on the concept of an internet-based network of physical objects, capable of collecting, analyzing and sharing data autonomously. Such an intelligent network requires innumerable sensors and actuators with new, expanded functionality. Innovative technologies such as energy harvesting enable additional novel applications, e.g. energy-independent wireless sensor networks, capable of autonomous monitoring of large areas. Due to these trends, a continuous market growth for sensors and actuators can be expected in the years to come.

Fraunhofer EMFT is contributing to this future already today, due to its long-term experience in the development of sensors and actuators for a wide range of applications. The interdisciplinary approach is a typical strength of Fraunhofer EMFT as innovations often evolve, where disciplines and technologies meet. Strong partnerships and open innovation are the key to the creation of successful solutions by combining competences from various fields as well as utilization of synergies.

1: Test stripe indicating the freshness of food. © Fraunhofer EMFT

2: Microdosage system for microlubrication of precision bearings in highperformance spindles. © Fraunhofer EMFT

Some examples of the research activities at the Fraunhofer EMFT:

Optical sensor materials

Fraunhofer EMFT develops sensor materials which indicate the presence of certain substances in the environment by means of changes in color or fluorescence. Integration of this type of sensor material in polymers, foils and textiles opens up a wide range of



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applications, such as test stripes reacting by color change to contamination by toxic or hazardous substances. They could be integrated into textiles (e.g. protective gloves, lab clothing or protective suits) for enhanced occupational safety. The disintegration of products arising when packaged food is spoilt can be made visible by the sensor materials by change in color or fluorescence.

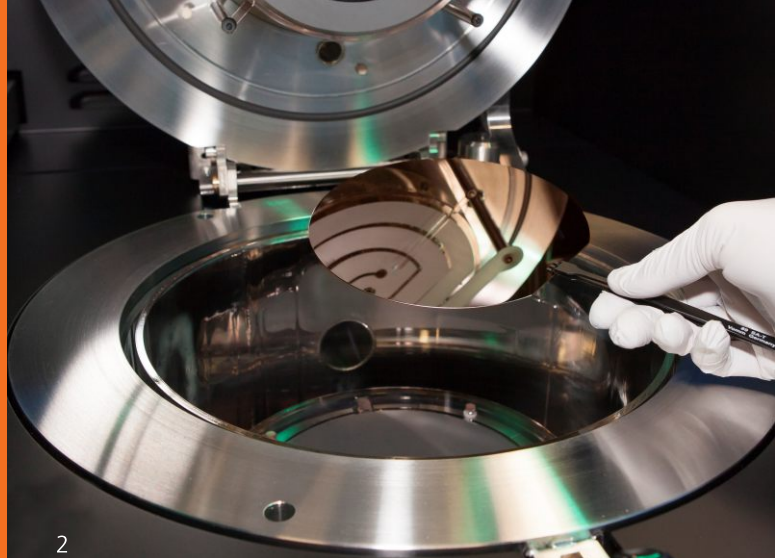
Microdosage systems

Exact dosage of micro quantities of liquids or gases is crucial to a wide array of sectors nowadays. Fraunhofer EMFT is working on robust, precise and yet miniaturized microdosage systems, which offer a considerable application potential: in the area of medication dosage, externally portable microdosage systems could be used for pain therapy, treatment of tinnitus, hormone therapy, tumor therapy and diabetes therapy. All these applications require precise dosage of lowest quantities. Micropumps can also offer valuable services in the area of vacuum therapy, for example when treating chronic wounds. In tumor therapy, implantable microdosage systems made of silicon could be used to target tumor cells directly with very small amounts of a highly concentrated cytotoxin. In the field of mechanical engineering and plant construction, microlubrication systems will make it possible to apply only minimal required quantities of lubrication oil to bearings, thereby saving 98 % of lubricant consumption. The researchers at Fraunhofer EMFT are working on all these challenges, in order to develop robust products for and in collaboration with its customers.

Test and characterization of electronic components and systems

The complexity of microelectronic systems is growing constantly. More and more electronic functions are integrated as a System on Chip (SOC) or installed in a single casing containing several chips and passive elements, even including sensors and actuators. Some systems are operated under extremely demanding environmental conditions at high temperatures and output levels. Due to cost pressure and shorter development periods, it is becoming more and more difficult to ensure their reliability and functional safety. The cost of reworking and market launch delays is exploding. Early identification and elimination of potential weak points, based on sound science and engineering expertise, becomes increasingly important. This in turn requires longstanding multidisciplinary experience with the capacity to manage target-oriented error analyses, measurements and simulation. Fraunhofer EMFT offers extensive performance and reliability tests for electronic components and systems. Based on multiparametric characterization, it is possible to simulate physical input variables such as voltage, current, temperature, light, moisture, gases etc. under laboratory conditions, in order to determine the response of the component or system to these variables. By applying suitable load tests to address the relevant error mechanisms, it is also possible to determine anticipated reliability and service life.

3: CC-TLP electrode above a wafer (raised). © Fraunhofer EMFT



Graphene – from Miracle Material to Application in Mobile Communication

Source: Sonja Kriependorf, Fraunhofer IAF

Graphene is considered a miracle material: stronger but lighter than steel, flexible, environmentally friendly, and the world's thinnest material. Researchers at Fraunhofer IAF now plan to produce nearly massless electrodes based on graphene in bandpass filters of smartphones to improve signal separation precision and energy efficiency.

Graphene Flagship

142 organizations from 23 countries are aboard the "Graphene Flagship." In order to make graphene accessible for the European market, the European Union is funding universities, research institutions, and businesses with an overall budget of 1 billion euros.

GSM, UMTS, LTE, Wi-Fi, Bluetooth – for all these wireless standards, signal processing could not be done without the filtering of frequencies. For frequency filtering, piezoelectric resonators are used; these are excited to oscillation by electrodes. The lighter the electrodes, the better the oscillation characteristics of the resonators. This is currently one of the limiting factors: the metal electrodes usually used today are relatively heavy, but cannot be thinned any more without losing conductivity. They do, however, dampen the oscillation of the resonators through their mass – similar to the felt cover on a piano string. Graphene appears to be a promising alternative: the material still remains conductive even as an atomically thin electrode. With new types of graphene electrodes, the oscillation characteristics of the piezoelectric resonators could be improved, higher coupling factors achieved, and thus the signal separation precision and the energy efficiency of the filters increased. The main challenge at hand is to connect the nearly massless graphene electrodes with the currently used mobile communication components based on piezoelectric aluminum nitride.

Industry-compatible graphene deposition technologies

As part of the EU's "Graphene Flagship" funding initiative, scientists at the Fraunhofer Institute are working on an efficient technology for graphene deposition and graphene transfer to aluminum nitride. One promising approach to graphene deposition on large substrates of the type typically found in the semiconductor industry is chemical gas-phase deposition. In this process, a catalyst surface such as copper is heated to nearly 1000 °C until gas containing carbon is broken down on the hot surface and reorganized into graphene. In the future, this method is intended to be further developed into a technology compatible for industry applications, to directly integrate graphene into existing aluminum-nitride-based bandpass filters. Hence, the development of economical manufacturing and processing technologies is essential for the use of the outstanding theoretical properties of graphene in practice. Researchers at Fraunhofer ICT are working on a further large-scale and cost-effective production method for graphene – in the form of graphene flakes. The graphene experts of Fraunhofer ISI, on the other hand, are developing strategic technology and application roadmaps in order to make it easier to gauge future fields of application.

1: View into the process chamber of the reactor, where graphene is grown on a catalyst surface that reaches temperatures of up to 1000 °C.

© Fraunhofer IAF

2: The new CVD reactor "Black Magic" for the deposition of graphene at Fraunhofer IAF. In future, a cost-efficient and simplified technology will make the deposition and the transfer of graphene onto aluminum-nitride-based bandpass filters possible.

© Fraunhofer IAF



In conversation with Prof Babi Mitra - Brij Mohan Munjal University

Dr. Amitava 'Babi' Mitra is the founder Dean, School of Engineering and Technology, BML Munjal University, Gurgaon, India prior to which he was the founder Vice-Chancellor, Vivekananda Global University, Jaipur, India. Prior to this he was at the Massachusetts Institute of Technology (MIT), USA; NIIT (USA) Inc. and NIIT Ltd.; and at the Birla Institute of Technology & Science (BITS), Pilani, India. His focus has been global and domestic growth opportunities that include the shaping and deployment of hybrid learning, flipped classrooms and eLearning in support of teaching and research.

1. What is the main objective of signing the Memorandum of Understanding (MOU) agreement with Fraunhofer?

Partnership with Fraunhofer is a first of its kind in India. The kind of knowledge and skills required in the 21st century economy are radically different from those needed in the past. This partnership will further help us in bringing about an innovative transformation in higher education in the country and plug the gaps that prevail in the current education system. With its focus on Applied Research, the tie-up will aid the nation in the mission spelt out by the Prime Minister of India about Make in India.

Not only will this partnership enable BML Munjal University to enhance its education, research levels and ability to innovate; it will also give Fraunhofer an opportunity to address the demands of rapid economic and social development in India with a local strategic partner and centre of excellence.

Fraunhofer and BMU will jointly promote applied research for the Industry. Joint research projects will be conducted with the faculty and students of the university in the form of Industry-Institute cooperation for the Indian Industry. The focus will be on applied research as against mere theoretical knowledge development.

2. Could you please share with us your future plans for BMU?

At BMU, we intend to learn from the successes and failures of higher educational experiments undertaken both within the country and elsewhere. An example of such leapfrogging can be witnessed in the telecommunication sector where an entire generation of technology was skipped in this country.

Our vision is to create a university that is able to take students with reasonable skill sets and hone their abilities to meet the highest of standards. We seek to create a university that will be among the top 100 higher educational institutions in the world within the next 30 years and be within the top 100 Asian institutions within the next 10 years. We



propose to do this by designing a university ecosystem that embraces research, education and service to the community as its pillars.

Specifically, we propose a high performing, financially sustainable university where:

- All faculty members in STEM (Science, Technology, Engineering and Mathematics) and management disciplines are expected to pursue peer reviewed research, funded through competitive research grants from within the University, national research agencies and industry. Faculty are expected to practice and hone their art in professional clinics or serve as consultants to industry
- All faculty demonstrate their continued commitment to excellence by publishing in international peer reviewed journals and conferences
- Faculty are expected to demonstrate their commitment to teaching via student learning outcomes that measure up to global standards
- Programs meet accreditation standards set by international organizations
- Students are educated to think globally and act locally
- Entrepreneurship is fostered within the faculty eco system and the student body
- All students are required to gain exposure to real world problems through internships and co-ops
- Faculty and staff are committed to continuous improvement and benchmarking
- Students are encouraged to have a significant international experience

3. Kindly throw some light on your plans with Fraunhofer

We visualise Fraunhofer as a key technology/applied research partner for BMU. It is envisaged that the cooperation would focus on joint research and qualification courses for students and professionals. These could include specific professional degree programmes for ITI graduates. The joint research with Industry would encompass a core set of identified focus areas as well as those aligned to the need and demand of the industry. The projects will focus on the automobile and transportation industry and envisage consultancy by both BMU faculty and Fraunhofer experts. The cooperation between us shall primarily encompass various fields of key interest to both BML Munjal University and Fraunhofer.

We are looking at joint collaboration at many levels that includes:

- Joint research projects with the university (faculty and students) in the form of Industry-Institute cooperation as practiced by Fraunhofer.
- We intend to offer an exclusive course for midterm professionals where the programmes are planned to be designed to help these professionals attain a strong understanding of engineering concepts and management expertise.



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- The programme also offers opportunities for BML University students to visit Fraunhofer Institutes across the globe to conduct courses and for internships.
- We are also looking at projects funded by the Government of India which will be applied by the BML Munjal University researchers with Fraunhofer as a Joint Partner. These could be in varied areas such as Water or Energy.

4. How is the industrial academia ecosystem of India in contrast to that of the United States?

I have lived, worked, studied and done research in both USA and India including at the Massachusetts Institute of Technology (MIT), USA for over thirteen years, and have seen many US institutions in my capacity as a board member, Sakai and board member, Northeast Regional Computing Program (NERCOMP), USA which has over 280 education institutions as its members. In my experience, applied research is the primary focus of the industrial academia ecosystem of USA, whereas in India it is one of the many goals, and usually not the main goal. In the US, industry and academia are so closely inter-meshed that it's not a topic for discussion but a given, though there's every endeavour to bring the two even closer. I am defining applied research as a form of systematic inquiry involving the practical application of science and engineering. It accesses and uses some part of the research, academic and industrial communities' accumulated theories, knowledge, methods, and techniques, for a specific business, or client-driven purpose.

The Indian authorities are fully cognizant of this situation. The All India Council for Technical Education (AICTE), India stated in 2000 that in the industrially advanced countries of the world, there exists a long tradition of close partnership between academic institutions and industry in promoting technical education and research. In our country, despite a growing awareness of the importance of forging linkages between universities and industry, the interaction between them is still rather limited. The result is that education has remained stagnant while industries have advanced. The curriculum must aim to provide to the student greater exposure of actual industrial processes. Students' projects should be related to actual problems identified with the help of practicing engineers. Greater stress should be laid on the practical training of engineering graduates and sandwich programmes should be encouraged wherever feasible. The Indian higher education system faces the challenges of ensuring equity and quality. The private higher education sector in countries such as the United States, Japan, and Malaysia has been instrumental in tackling these challenges. In India too, the private sector could play a key role in dealing with these issues through innovative models supported by an enabling regulatory framework and environment and can catalyse and help create the kind of platform where industry, academia, research and NGO sectors can come together to address critical problems facing India and the world.

2: BMU: Students in Class

3: BMU: Students Practice School



Shaping the cities of the future

Source: Damian Wagner, Project Co-ordinator - Smart City Triangulam, Fraunhofer IAO

Fraunhofer's competency in developing a Smart City

Urban Development – Electric Mobility – Industry 4.0 – Demographic Change – Climate Crisis – Internet of Things – Shareconomy the world is changing fast and entire industries are reinventing themselves in response to complex transitions in social, economic, and environmental arenas. Increasing urbanization is a key trend and the design of city systems will play an essential role in shaping a sustainable future. Institutions at all levels must be proactive in order to compete successfully and to establish themselves as active, relevant players in the city of the future.

Today's cities are using systems and infrastructure based on outdated technologies, making them unsustainable, inflexible, inefficient, and difficult to change. In order for both people and natural systems to thrive, the city of the future will have to be fundamentally different. Car-congested cities that over-consume energy and resources, emit greenhouse gases, and produce contamination and waste will no longer be the status quo.

How can the vision of Morgenstadt as a sustainable, livable future city look like? The Fraunhofer-Society has initiated a comprehensive and multidisciplinary process that aims at developing an holistic and scientifically validated future scenario. This process is a guiding example for a demand- and implementation-oriented research approach.

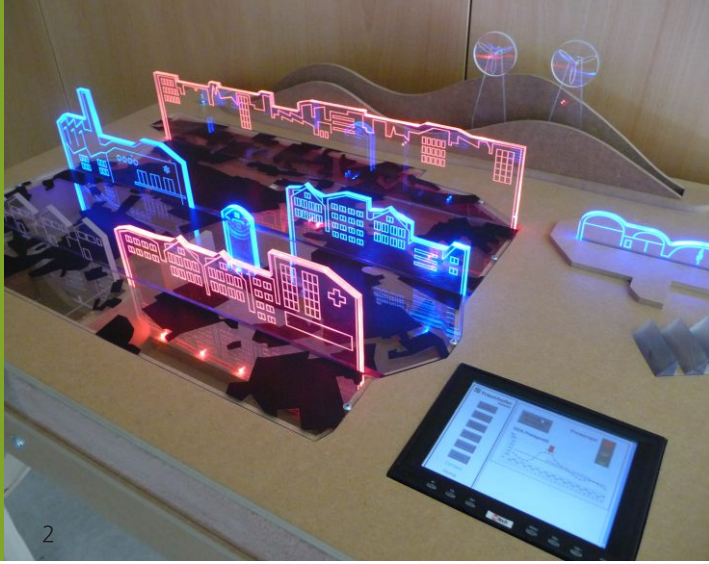
The vision Morgenstadt is based on the following seven core topics.

Energy



The future city will not depend on fossil energy. It will be mainly CO2 neutral and independently from energy from outside. Renewable energies, energy efficient technologies and communicating energy grids will become the drive-train of tomorrow's cities. But where will the energy be produced? The future city will become a hybrid energy storage system. Already

today energy-plus-houses produce more green energy than they need. Integrated community energy solutions that link houses, wind and solar parks, biomass sites and electric vehicles can be a starting point for an integrated urban energy system of the future.



Buildings



There are several groundbreaking technologies that allow buildings to communicate with their environment, to produce more energy than they consume and to work with light, biomass and air from the local environment. In a future city these technologies will be integrated into systems that allow groups of buildings to create closed cycles of energy- and material flows and to shape the micro climate of a city. The building concept will allow a self-sufficient energy supply.

Production & Logistics



In the future city transportation and handling of goods will happen fluently within intelligent structures of production and distribution - presenting the backbone of sustainable trade, services and urban production. At the same time essentials have to be provided at any time to all citizens. The city of tomorrow will be involved more deeply in the provision of production and logistic services by providing, planing and monitoring specific urban infrastructure and services for production and logistics.

Mobility



How can the masses of people in tomorrow's cities be moved most effectively by at the same time assuring quality of life and zero impact on the environment? Highly efficient mass transit systems like in Hong Kong or emission free mobility-on-demand solutions represent some of the groundbreaking solutions to be analyzed and developed further.

Information and Communication



Already today technologies exist that enable communication between devices, buildings, vehicles and people. Geographic information processing, wireless internet and smart-phone technology possess almost infinite potential for the development of smart solutions for urban systems. Some cities like Qatar or Mannheim already try to make use of this potential and thereby provide the framework for innovative business- logistic- and transportation processes.

2: Source: Fraunhofer IBP

3: Source: Nanyang Technical University, Singapore



"Morgenstadt: City Insights« focuses on the interplay of technologies, business models, and governance approaches for sustainable urban development. The fundamental goal of the network is to accelerate development that helps reduce energy and resource consumption while also enhancing the liveability and prosperity of a city."

Damian Wagner, Project Co-ordinator - Smart City Triangulam, Fraunhofer IAO

Urban Processes & Organisation



In the city of the future, life and work will be characterised by short distances and by the freedom to realize individual life and workstyles. At the same time people will have multiple opportunities for participating in decisions on the development of their city.

Rigid value chains will be replaced by innovative and flexible value patterns. Regarding consumption and economy, the possession of goods will be less important than the sustainable use of goods and systems. Inhabitants of Morgenstadt won't be exclusively consumers anymore - they become prosumers: producing consumers.

Security



The resilient city of the future will already integrate security concepts and systems at the design stage of urban planning and policy implementation, therefore ensuring the capability to identify and dominate emerging risks as well as to effectively manage catastrophic situations and quickly return to normal status. New smart and multifunctional protection

technologies and materials complemented by sophisticated planning tools will ensure the security of the future urban system whilst not affecting the civil liberties of its citizens.

Our mission: implement joint systems innovations

Facilitated by the German Fraunhofer-Society, the Innovation Network Morgenstadt: City Insights (m:ci) is comprised of high-level first movers already working in the field of urban sustainability in Europe and around the world. Using leading-edge innovation management methodologies, m:ci aims to develop and implement socio-technical innovations for the city of the future.

Evolutionary innovation: The m:ci Network demonstrates and quantifies new markets and development potentials in urban systems for existing products, technologies, and systems solutions.

Revolutionary innovation: The City Insights Network identifies coming technology-effects and disruptive developments relevant to future cities and designs revolutionary new products, systems, and business models.

4: Smart Mobility world

Source: Veicoliettricinews

5: Smart grid for electric vehicle fleet

Source: Fraunhofer IAO

UPCOMING EVENTS

The Inter Governmental Indo German High Technology group meeting

14th Sept 2015 - Delhi

Fraunhofer to attend the Inter Governmental Indo- German High Technology group meeting that highlights a high level technology cooperation between India & Germany.

Sustainable Cities & Climate change

23rd September, 2015 - Bangalore

Organised by Fraunhofer India with the Consulate General of Germany in Bengaluru & The Energy and Resources Institute (TERI) Bangalore. Dr. Alexander Kraemer, Chair of Public Health, Bielefeld University and Mr. Damian Wagner, Project coordinator – Smart City Triangulum, Fraunhofer IAO, Stuttgart were the key note speakers at the event.

Chancellors Visit to India

05th & 06th October, 2015 - Bangalore

Inter Governmental Negotiations & signing of MoU's

EU — India Science, Technology and Innovation Cooperation Days

14th & 15th October 2015 - Rome

Ms. Anandi Iyer will be delivering a speech on 'Innovation in India'

Bosch Manufacturing Conclave 2015

05th November, 2015 - Mumbai

Organised by Bosch India in collaboration with Fraunhofer India as a technology partner. Prof. Dr. Alexander Verl is the keynote speaker at the event.

Intersolar India.

18th- 20th November 2015, Mumbai

Indias largest exhibition and conference for the solar industry, Prof. Dr. Eicke R. Weber is the keynote speaker at the event.

Launch of BML Munjal University and Fraunhofer Signed MOU

23rd November 2015 - Delhi

Fraunhofer signed a MOU with BML Munjal University (BMU) based on which Fraunhofer will be a key Technology or Applied Research Partner for BMU (BMU). Mr. Frank Treppe will be attending the same.

In Memoriam



Fraunhofer expresses deep condolences over the sad demise of Dr. Surinder Kapur, Founder Chairman, Sona Group on 30th June at 8:00pm IST in Munich.

Fraunhofer's association with Dr. Surinder Kapur has been since past many years with his main intention to reinforce the R&D facility at SONA Groups. He had great vision for the R&D division at Sona Group and had partnered with us to strengthen the same. Dr. Kapur was revered as a noted industrialist and a pioneer in the Indian auto industry. He has held various positions of responsibility in key industry bodies such as CII, National Council for Electric Mobility and National Manufacturing Competitiveness Council. He was a member of Automotive Mission Plan (2006-2016) set up by Ministry of Heavy Industry, Government of India. He founded Sona Group in the year 1987 and today, Sona Koyo Steering Systems is the biggest steering system manufacturer in India.

Cover page credit: Fraunhofer Institute for Integrated Circuits II:
Effizienter High-Speed Physical Layer 10+ Gbps für die nächste
Generation der Video-Übertragung.

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