WPK 4. Wiener Produktionstechnik Kongress 2018

26. - 27.9.2018

PROGRAM

4. Wiener Produktionstechnik Kongress

EFFICIENCY, FLEXIBILITY, INTEGRATION

25th - 27th September 2018

Hofburg Vienna

25th September 2018

Come together

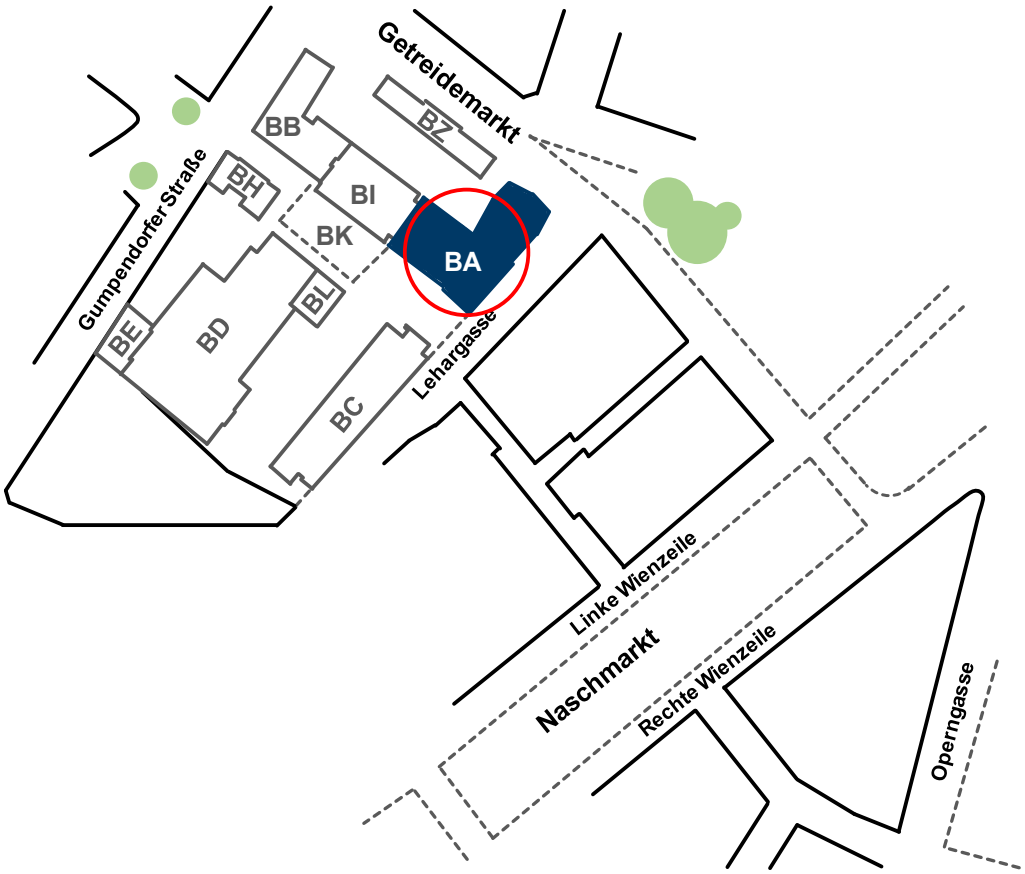
TU Wien - TUtheSKY
Getreidemarkt 9, 1060 Wien

11th floor in Building BA, the tower
(If possible, please take the entrance from Lehargasse 4.)

Start: 19:00 h
End: 22:30 h

Dresscode: Business Casual

How to get to the Come together venue:



26th September 2018

Congress - Day 1

Hofburg Vienna
Heldenplatz, 1010 Wien

Entrance: Schweizerhof / Botschafterstiege

Registration: 08:00 - 09:30 h
Opening: 09:30 h
End: 17:20 h

Parking: limited parking space at Heldenplatz in front of the Hofburg Vienna

Program: Keynote sessons & Parallel sessions
Topics: Machine, Technology, Automation

WLAN: Network: HofburgSecured
Password: wpk_2018

Dresscode: Business / Business Casual

During the whole day, you can come visit the registration desk to sign up for one of the guided tours which will take place at the Conference Dinner venue in the evening.

Conference Dinner

Naturhistorisches Museum Wien
(Natural History Museum Vienna)
Maria-Theresien-Platz, 1010 Vienna

Welcome: 18:30 - 19:30 h
Dinner: 19:30 - 23:45 h

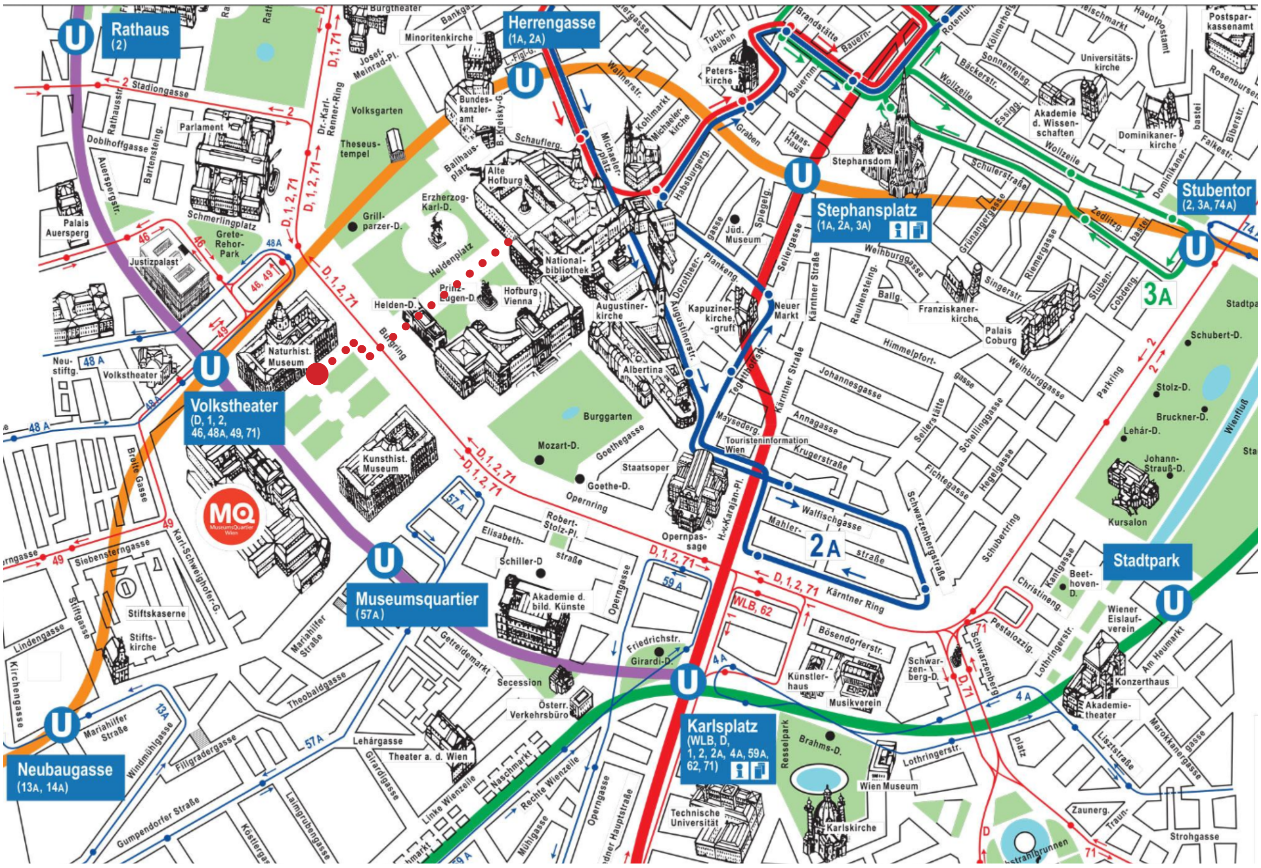
Dresscode: Business / Business Casual

Free entrance to the museum:
Please show your conference name badge or mention that you are attending the "Wiener Produktionstechnik Kongress" or the "WPK Conference Dinner" at the museum entrance.

You have the option to explore the museum on your own or join a guided tour.

Meeting point for guided tours: entrance hall of the museum.
Tour starting times:
18:00 h - Group 1 (Language: German)
18:10 h - Group 2 (Language: English)
18:20 h - Group 3 (Language: German)
18:30 h - Group 4 (Language: German)
18:45 h - Group 5 (Language: English)

How to get to the Conference Dinner venue:



27th September 2018

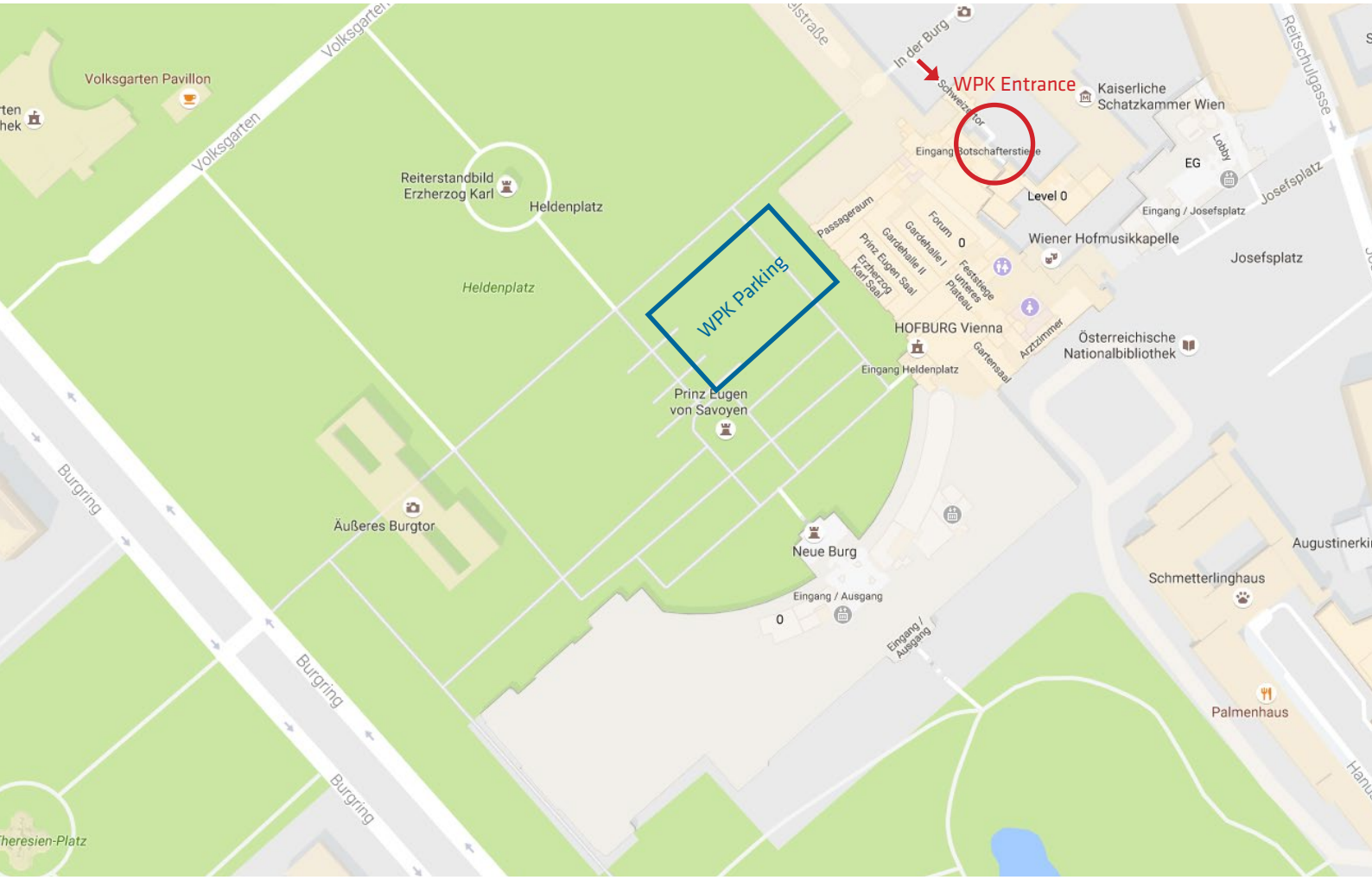
Congress - Day 2

Hofburg Vienna
Heldenplatz, 1010 Wien

Entrance:	Schweizerhof / Botschafterstiege
Registration:	08:00 - 09:00 h
Start:	09:00 h
End:	17:00 h

Parking:	limited parking space at Heldenplatz in front of the Hofburg Vienna
Program:	Keynote sessons & Parallel sessions & Special session
Topics:	Machine, Technology, Automation, Digital Production
WLAN:	Network: HofburgSecured Password: wpk_2018
Dresscode:	Business / Business Casual

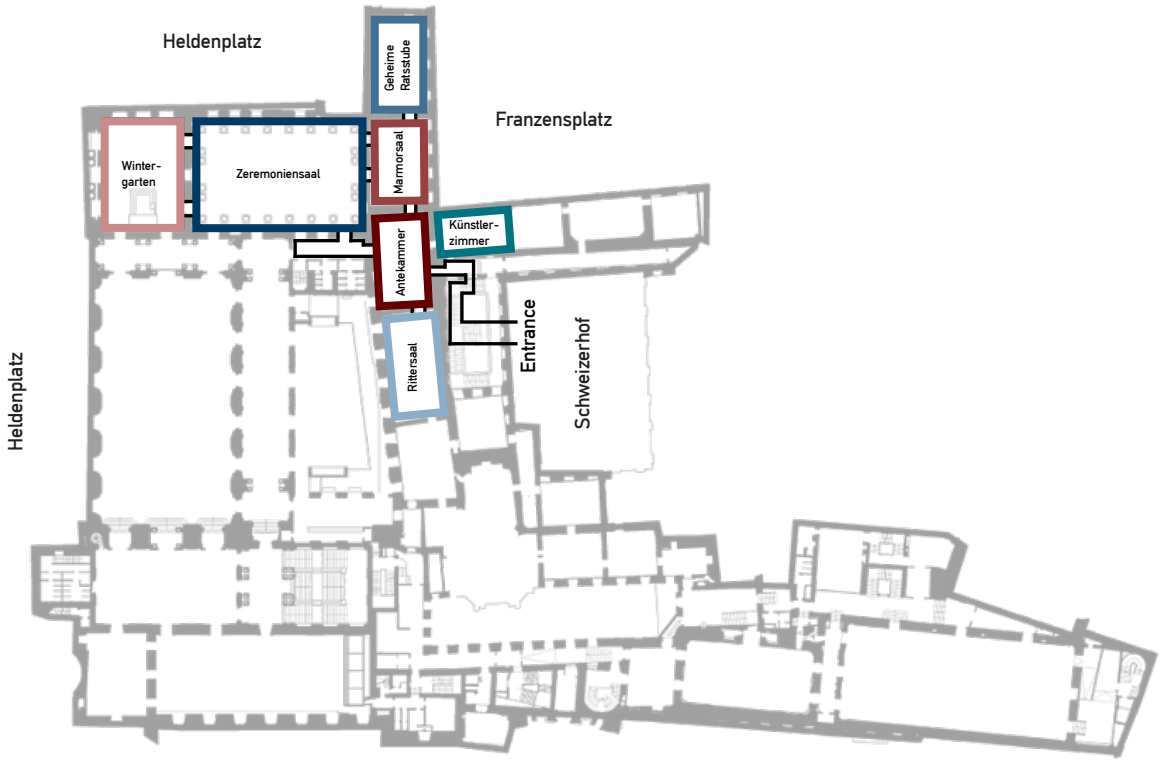
Plan Congress Centre Hofburg Vienna



Entrance: Schweizerhof / Botschafterstiege

Room overview

Registration & Information desk:	Antekammer
Keynote Presentations:	Zeremoniensaal
Parallel sessions MACHINES:	Zeremoniensaal
Parallel sessions TECHNOLOGY:	Geheime Ratstube
Parallel sessions AUTOMATION:	Rittersaal
Special sessions:	Künstlerzimmer
Breaks & Lunch:	Antekammer, Wintergarten, Mamorsaal



Program overview

Wednesday, 26th September 2018

08:00 – 09:30
Registration

09:30 – 10:00
Opening

10:00 – 12:00
Plenary session 1

12:00 – 13:10
Lunch break

13:10 – 15:10
Plenary session 2

15:10 – 15:40
Coffee break

15:40 – 17:20
Parallel session block 1

MACHINE	TECHNOLOGY	AUTOMATION

18:00
Tours in Natural History Museum

18:30
Conference Dinner

Thursday, 27th September 2018

08:00 – 09:00
Registration

09:00 – 10:40
Parallel session block 2

MACHINE	TECHNOLOGY	AUTOMATION

09:00 – 10:40
Special session
"Center for Digital Production"

10:40 – 11:10
Coffee break

11:10 – 12:35
Parallel session block 3

MACHINE	TECHNOLOGY	AUTOMATION

11:10 – 12:25
Special session
"Joint Industry Symposium"

12:25 – 13:25
Lunch break

13:25 – 14:55
Plenary session 3

14:55 – 15:25
Coffee break

15:25 – 16:55
Plenary session 4

Plenary session 1, 10:00 - 12:00 h

Additive Manufacturing on ist way to serial production – an innovative addition to conventional manufacturing

Edmar Allitsch

Chairman of the Supervisory Board, EOS holding AG

Additive manufacturing of metal and polymer parts – often referred to as industrial 3D-printing – originally was developed as a technology for prototyping and customer specific products.
The success in this area led to further development of the technology, enabling additive production of small and medium series today.
From numerous additive technologies powder bed fusion processes due to complex geometries, good surface and superior mechanical properties have experienced the highest acceptance and dynamic global growth.
The increasing understanding of the unique advantages of this technology which exceed widely reported features such as freedom of design and short and material saving manufacturing processes by far will drive industrialization and keep up the momentum.

Path of Innovation towards the Future of Production

Dr. Eng. Masahiko Mori

President, DMG MORI CO., LTD

Machine tool industry has experienced innovations decade by decade, supported by the development of fundamental and elemental technologies in mechanical and electrical engineering.
Now, coming up to 2020, industrial demands and core technologies for effective and flexible manufacturing lead us to the era of sophistication, automation and integration of machining surrounded by IoT / Industry 4.0.
This presentation shows how DMG MORI thinks over and works on it as one of practical examples, with some real cases in its innovative products, technologies and solutions.

Innovative Automation Solutions for the Digital Future in Industrial Production

Hans Wimmer

Managing Director, B&R Industrial Automation GmbH

Product customization has increased across all industries in recent years – all the way down to batch size one. This trend directly influences the machines used to manufacture these products. At the same time, the production machines have to be connected for a plant-wide data exchange, remote data access and the analysis of data from heterogeneous sources.
By systematically analyzing and networking large volumes of data, the production efficiency can be improved. Optimizing the collection and processing of digital data can yield particularly large benefits for legacy equipment. The key factor for success is the digitalization of manufacturing systems. This requires innovative automation solutions – from the sensors and actors up to edge computing hardware to ensure that data gets from its source to the cloud safely and securely.

Emerging Technologies for Advancing Future-oriented Manufacturing Systems and Processes

Prof. Kazuo Yamazaki

Distinguished Professor, Intelligent Manufacturing Systems Laboratory, University of California Davis / Precision Manufacturing Center, University of California Berkeley

The lecture will overlook the emerging technologies which are driving today's manufacturing systems toward the future. The presentation includes the integration of non-traditional technologies just came out from research at academia into today's innovative manufacturing operations in industries. The introduction of new opto-mechatronics based technologies are also focused and explained from the view points of the state-of-the-art applications in today's manufacturing.

Plenary session 2, 13:10 - 15:10 h

Automated production systems for the manufacturing of large aluminium structural parts in the aerospace industry

Dr. Marcus Queins

Technical Director, Starrag Technology GmbH

The presentation provides an overview of typical structure parts, which have to be machined to produce modern aircrafts. Because of the complex topology of the parts and the high amount of chip removal, the speaker will introduce a parallel kinematic machining solution, which provides the power and agility to machine large structures with highest productivity and quality. Further the speaker will outline how to fully automate such systems and create a fully digitalized set up in the meaning of industry 4.0.

Sensor Integration and Web Services - the key to Industry 4.0

Christoph Müller

Senior Vice President - Industrial Integration Space, SICK AG

The sensor that detects reality, and the web application that makes the data available in the cloud for numerous services, are the natural end-point of any Industry 4.0 installation. They make it possible to meet and exploit the challenges and opportunities of the industrial internet.
Sensors detect reality and convert it to a digital representation. The more intelligent and robust the sensor, the more reliable the input in the process chain of Industry 4.0. Sensors profit from the possibility of integrating ever-greater computing power, and thus intelligence, directly in the sensor itself (edge computing). The sensor thus becomes a symbol for application and process competence as a result of the conversion of data into information. A prerequisite for this is knowledge on individual customer processes.
Data services on servers create possibilities for archiving, visualization, linkages, and further processing of the data and information supplied from the edge. In terms of the consumer world, thinking is dominated by economy of scales and standardized dismantled processes. Costs sink to almost zero as soon as a critical mass for such a micro-service exists.

Future proofed control technology in production

Hans-Jürgen Koch

Executive Vice President, PHOENIX CONTACT GmbH

Automation is currently experiencing a paradigm shift: Classic system structures are becoming global networked production systems. The desire for smart maintenance, digitization and flexible manufacturing processes is growing. Young engineers and software developers are shaping new working methods and forward-looking industrial business models are becoming possible thanks to cloud computing.

Additive Manufacturing in Aerospace

Gerd Weber

VP Head of Varel / Bremen, Premium AEROTEC GmbH

Premium AEROTEC is one of the world's leading tier 1 suppliers of commercial and military aircraft structures. Its core business is the development and production of large and complex aircraft components from Aluminum, Glare, Titanium and Carbon Fiber reinforced plastics. Premium AEROTEC started the industrialization of additive manufacturing technology in 2013. In 2015, Premium AEROTEC qualified the first structural component out of titanium for Airbus´ A400M program. Beginning 2017, Premium AEROTEC started the cross industry cooperation project "NextGenAM" with eos and Daimler targeting the introduction of cost efficient additive manufactured aluminum parts for Aerospace and Automotive applications. Therefor the state of the art additive manufacturing means require a step change in productivity an integration of post processing.

Parallel session 1 – "MACHINES", 15:40 – 17:20 h

Challenges for machine tool industry in a changing world

Dr. Ömer Sahin Ganiyusufoglu

Consultant to Chairman, Shenyang Machine Tool (Group) Co., Ltd.

Machine Tools are so called „mother machines". In every manufacturing process sure there is a machine tool involved. The breathtaking developments in digitalization do not only change our daily life, they also have tremendous impact on industry. Digitalization empowers the globalization. All these changes lead to new company strategies in machine tool industry thus meaning a totally new way of thinking and acting. New production networks and business models will be created. In addition new manufacturing technologies such as additive manufacturing and laser become more and more mature for industrial applications thus new machine tool design, more room for creativity in design of parts and products as well as new production philosophies will be born. This all require also a new profile for future education at universities and vocational schools.

MIKROMAT 4.0 – Value engineering for product and process optimization

Thomas Warnatsch

Managing Director, MIKROMAT GmbH

MIKROMAT 4.0 is a value engineering strategy for machining to optimize product and process. Starting at rapid prototyping is in MS190 a procedure defined to integrate machining in R&D process. Target is optimization of business model. Milestones are development of human resources, technology, and marketing. Before every decision in expensive investment like machine tool, the MIKROMAT 4.0 certification is an efficient tool to have a short return of investment.

Connected environments as base for future production

Dr. Christian Klapf

Head of R&D, EMCO GmbH

New challenges such as the shortage of skilled labor and the increasingly complex processes and machines will force us to rethink future product developments. Machines have to adapt to their operators and fulfill the workers requirements. This demands uniform networking standards, plug & play solutions, intuitive operating concepts, flexible automation concepts and learning machines. Thus, the machine manufacturer will evolve to a comprehensive solution provider.

Safety functions in modern machines

Dr. Tilmann Bork

Regional Application Engineering, Festo AG & Co.KG

It is no new demand of the European Directive on machinery that machines must be safe. Indeed, the today's machines on account of her complexity and the technology change make substantially higher demands for the machine builder. In the today's machines many technologies are represented: mechanics, electrics, electronics, fluid power systems, optics etc. If the designer of a modern machine wants to carry out this certainly, he tries to transform first an inherent safe design. Because this is not sufficient generally, he will integrate safety functions to the farther risk reduction. Caused by many represented technologies these safety functions shall be carried out not homogeneous. He must connect the different technologies on a safe whole. Besides, the safety functions can be composed from safety sub-functions of the single technologies. The position paper VDMA 24584 with the safety functions supports this approach in the mechanics and fluid power systems: an aid is made available to the designer to the application of standardised safety sub-functions as he knows them already for the electrical power drive systems to EN 61800-5-2.

Parallel session 1 – "TECHNOLOGY", 15:40 – 17:20 h

New Paradigms for AM machinery

Prof. Konrad Wegener

Head of Institute of Machine Tools and Manufacturing (IWF), Department of Mechanical and Process Engineering, ETH Zürich

AM enters industry and thus into new challenges to cope with standard requirements of industrial manufacturing processes. AM-processes are far less simple as might be expected due to the absence of collision geometries and cutting forces. But as the ma-terial is produced together with the geometry, quality manage-ment needs to be reen-gineered. To cope with the process com-plexity and the lack of skilled operators machine learning and teaching, machine intelligence might be key technologies for the future of AM.

Smart Gripping and Clamping: Digitalization 'Closest to the Part'

Johannes Ketterer

Global Head of Business Unit Toolholding Systems & Chuck Jaws, SCHUNK GmbH & Co. KG

On the way to the smart factory, smart gripping systems and clamping technology will take over key functions. Integrated sensor systems and intelligence allow flexibilization of production processes as well as process monitoring and optimization directly on the workpiece. Sensitivity, connectivity, and the integration of as many functions as possible become the key factors for being able to determine quality parts in real time, measuring data on the part's composition, or to monitor the vibration behavior during machining. If deviations are being recognized during the ongoing process, NIO parts can be already identified on the component level, and are removed; or the machining parameters or clamping forces are autonomously adjusted based on the locally determined data. By networking with the system control or cloud solutions, it is additionally possible to perform trend analyses and to include them into the quality scheme of the manufacturing flow. With correlation analyses, complex relationships are recognized and errors can be eliminated. The smart gripping systems and clamping technology components made by SCHUNK offer the possibility to either run single machines or entire value chains at their optimum.

CAM Technology for Additive Manufacturing

Dr. Denys Plakhotnik

Research Manager, ModuleWorks GmbH

Additive Manufacturing has already evolved beyond typical deposition of the material in sequential layers. For multi-axis additive applications, there have been developed special multi-level cladding strategies to build full models or carry out repairs. Due to complexity of the toolpath planning, there have been resolved multiple issues related to maintaining a constant stepover on the surfaces of each curved layer. Spatial movements of complex nozzles are tracked for potential collisions with the machined parts, and these collisions are automatically avoided and linked with safe motions without manual interaction. Optionally, the toolpaths are optimized to preserve constant feed of the nozzle to ensure stable process. Finally, volumetric simulation validates 3-axis, 5-axis and build-up welding applications for absence of cavities or over-extrusion. The simulation result can be used to perform a deviation analysis or for collision control when calculating the post-processing toolpaths.

In-process-quality control in additive manufacturing processes for DLMS and DED

Arnold Braunsteiner

CEO, plasmo Industrietechnik GmbH

Additive manufacturing is on the way to be the production process of the future. Many technologies, like material sciences, big-data or electronics have been developed and improved to make this technology real. One aspect of this technology is quality assurance in-situ of the production process. During printing of a part user want to know about progress and quality. Also recorded data can be used to improve and analyze this new method of production. Plasmo has developed such systems based on sensor and camera based technologies for DMLS and DED. Results and conclusions this development process will be presented.

Parallel session 1 - "AUTOMATION", 15:40 - 17:20 h

Requirements and Challenges for the Digital Twin Concept in the Context of Industry 4.0

Prof. Detlef Gerhard

Dean of Faculty of Mechanical and Industrial Engineering, Institute of Engineering Design and Logistics Engineering, TU Wien

The Digital Twin concept is currently widely discussed in the production domain – among stakeholders from academia as well as industry companies and solution providers. Though similar ideas and approaches have been around for many years and the term was coined more than 15 years ago, it seems that the Digital Twin today is seen as solution for major challenges in industry and at the same time door opener for exploiting opportunities and creating new businesses. With the advancements of IoT technologies and ubiquitous availability of required infrastructure and computing power, many obstacles and barriers of implementing Digital Twins have significantly decreased. Nonetheless, there are many unsolved issues from different perspectives and readiness levels, e.g. model and data representations, master data quality, IT architectures, standards, processes, and lifecycle phase consideration. The contribution gives insight and structure to the different concepts and perspectives behind the Digital Twin, illustrates requirements and challenges, and provides project examples for different approaches and solutions from current projects and research.

What if plastic could talk ... ?

Michael Sander

CEO, proALPHA Business Solutions GmbH

Mark Hannah

Head of Corporate Marketing, Gabriel-Chemie GmbH

Digitization well underway but you are still not quite sure how to deal with it?
The provider for ERP software proALPHA and its customer Gabriel Chemie, a family-owned masterbatch producer based in Austria, will explain how to tackle the challenge of successful digitization. After a brief overview of the areas where masterbatches are used, this paper will focus mainly on the company Gabriel Chemie, giving more information about the business itself. Furthermore it will provide deeper insights on how they have managed to digitize their factory, what steps and measures they took, how proALPHA supported them on their path of digital transformation and lastly what results they achieved thanks to digitizing their processes.

Bending moment and force – the key information for reliable manufacturing processes

Dr. Rainer Wunderlich

CTO, pro-micron GmbH

Digitization well underway but you are still not quite sure how to deal with it?
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Kompetenz 4.0 – Vom Homo sapiens zum Homo digitalis

Johann Hofmann

Founder and Venture Architect of ValueFacturing®, Maschinenfabrik Reinhausen GmbH

Since Homo sapiens moved through the steppes of the planet, old technologies have regularly been replaced by new ones. To survive, the residents had to constantly adapt their skills to new situations. This process is not new. But what is new is the rapidly increasing speed of change on the way to a Homo Digitalis.
In 1861, the first business model has already been a victim of digitization. Based on this, the presentation will highlight different stations in the course of time and especially the increasing demands on the people („e-skills"). „E-skills" should not be confused with „IT-skills", which include JAVA, PHP or .NET competencies. „E-Skills" are electronic competences and include personality traits that enable people to master the digital transformation.
In this personal report, Mr. Hofmann will talk about project experiences in the digitization of manufacturing processes, and how the necessary organizational and cultural change can take place together with technical transformation.

Parallel session 2 - "MACHINES", 09:00 - 10:40 h

Machining of Optical Surfaces by HSC-milling

Dr. Oliver Gossel

Head of Sales, Röders GmbH

The machining of tool inserts in hardened tool steel for production of parts by injection moulding for optical applications (like automotive lighting, LED technology) becomes more and more important. They require highest accuracies as well as surface qualities. Röders, a well-known manufacturer of HSC milling machines, has developed milling and grinding technologies and machines to manufacture these inserts with an outstanding quality. For reaching the target Röders realized 32 kHz drive technologies in combination with linear motors as well as special path and speed planning control functions.

New productive and flexible solutions from Diskus Schleiftechnik GmbH

Christoph Wernz

CEO, DISKUS WERKE SCHLEIFTECHNIK GmbH

Productivity and flexibility are competing factors in the design of a production system. At the moment, the demand is high for flexible systems due to batch size reductions. Stock value optimization and lead time improvements as well as new parts driven by new developments in mobility are the root causes for these demands. To meet the actual demands of the market, Diskus Schleiftechnik GmbH has developed new productive solutions with maximum flexibility. The systems are relatively low in investment and also flexible in technology, so that the investment is safe, even if the parts change in near future.
In high productive systems, short changeover times are the key to batch size reductions. In the DDS660XL (successful in the bearing industry), 15 NC axis were added to be able adapt the machine by programming. The solutions based on the DDS600 series, a camera system for parts detection increases the necessary flexibility. Process flexibility has been reached by process integration. The DFine, presented at the emo 2017, now is suitable also for brushing. And the U-Grind has all necessary tooling and cycles for turning and grinding.

Product and process digital twin for zero defect manufacturing

Dr. Roberto Perez

Head of Innovation - New Technologies, GF Machining Solutions

Current limitations for zero defect manufacturing lie on the availability of relevant data from both product and process in complex manufacturing, automated lines in a common, standardised data space. This work introduces both a framework for standardising data aggregation from different sources, components, process control, and dimensional measurement systems, and a cognitive solution improving defect detection and prevention for manufacturing production parts with robotised lines of milling and electroerosion machines.The system proves to be effective for anticipating deviations in terms of geometric tolerances and surface quality while allowing the decrease of costs related to unexpected maintenance interruptions with higher confidence algorithms.

PRÄZOPLAN – the first multidimensional Comparator for highest precision in milling

Dr. Sascha Jaumann

Head of Development, Krause&Mauser, Mauser-Werke Oberndorf Maschinenbau GmbH

The world's first milling machine with planar guide has proven itself through its extremely high precision and productivity. These characteristics are the result of the guiding concept in which a slide slides aerostatically over a high-precision granite plane, generating the travel directions X and Y and avoiding the problematical stacking of linear axes required in the conventional method.
A consistent further development of this two-dimensional principle is the integration of the cross grid measuring system. The machine becomes a comparator by having the tool, workpiece and measuring standard lie flush in one plane. Measurement errors are excluded in accordance with Abbé's comparator principle, thus substantially increasing the system accuracy of PRÄZOPLAN. The integrated cross grid measuring system has proven itself over a test period of several years under a wide range of application conditions.
A customer machine has already been equipped with the cross grid measuring system. The machine is used in the preparation of components for optical wave guide systems, in which in particular maximum position tolerances of the workpieces in the sub-µm range are required. Equipped with the cross grid measuring system, PRÄZOPLAN is predestined for this job. Provided, however, with good temperature control, PRÄZOPLAN is operated in a „normal workshop environment" next to other machine tools. The machine has a distinctive unique selling point compared with machines from the market due to its extremely high positioning accuracy and its combination of productivity, workshop suitability and ultraprecision. This allows very demanding ultraprecision parts to be produced economically.

Parallel session 2 – "TECHNOLOGY", 09:00 – 10:40 h

New challenges for cutting tools in aircraft and e-mobility applications

Dr. Dirk Sellmer

Vice President Research and Development, MAPAL Dr. Kress KG

In addition to digitisation, there are currently two major topics whose transformation has a direct impact on the precision tool industry.
On the one hand, the importance of electromobility in the automotive industry is steadily increasing, as the quantity of vehicles with electric drives produced is increasing. The automotive industry has completed the planning and testing phase and is now investing in the innovative drive technology. In addition to the classic powertrain based on the internal combustion engine, there are a large number of drive units based on electric motors. Only the energy supply and the proportion of electric propulsive power in the driving profile differentiate the systems.
A steady increase in the components featuring fibre composites has been recorded in the aircraft manufacturers industry. As a result, both production time and tool costs are much higher than in conventional aluminium designs. At the same time, the demand for airplanes has risen steadily and skilled workers are more expensive or no longer available. Manufacturers are therefore looking for ways to avoid this cost dilemma. This results in new technologies such as: one-way assembly, dry drilling and robot drilling.

Will it be possible to earn money on the cutting edge in the future?

Sebastian Oeking

Business Development Aerospace, ISCAR Germany GmbH

With the keyword Industry 4.0 and all of its technologies, it seems that the development of tools, grades and coatings is no longer important for productivity.
Of course, digitalization will progress and sensors will provide a lot of information about the cutting process which also influences the application. However, at the moment it is not foreseeable when sensors on tool or cutting edge will provide reliable data (e.g. about tool wear).
And even if everything will be realized, the tool will still be crucial, because the tool decides how fast the component is manufactured. Tool, grade and geometry have a significant impact on productivity, no matter whether workpieces are made of new workpiece materials, alloys, additives or CFRP/GFRP. In future money will still be earned on the cutting edge. In this lecture you will become familiar with new developments.

Nucleation and Growth Mechanism of CVD Diamond thin film on Cemented Carbide

Kazutaka Fujiwara

Principal Researcher, Thin Films and Coatings Department, Central Research Institute, MITSUBISHI MATERIALS CORPORATION

In the cutting of CFRP using diamond-coated cutting tools, Diamond films are sometimes peeled off from the cemented carbide substrate before reaching the tool life. As a means for improving the adhesion strength, we have been working on improving the nucleation density at the initial stage of crystal growth. However, the nucleation mechanism on cemented carbide was unknown ,so it was necessary to clarify the nucleation mechanism. It was confirmed that nuclation density depends on the scratch size on cemented carbide,and graphite was formed at the initial stage of nucleation and changed to diamond during crystal growth process. A correlation was found between the nucleation density and the crystal grain size of growth film, it was confirmed that as the nucleation density became higher, grain size became smaller.

Surface Layer States after Manufacturing Processes – Generation and Evaluation

Prof. Volker Schulze

Head of section Manufacturing and Materials Technology, wbk Institute for Production Science, Karlsruhe Institute of Technology

The sum of thermo-mechanical loads during manufacturing of metallic parts across process chains defines surface layer states like topography, work hardening state, residual stresses and microstructure evolution. Single processes along the chain influence the final surface layer states depending on their severity and/or position within the process chain. Simulation-based optimization of processes which are applied to nearly finished products can greatly enhance features like wear resistance or fatigue strength. This paper outlines the influence of mechanical finishing on resulting surface layer states. This includes analyses of machined surfaces produced by scientific orthogonal cutting, as well as industrial operations like machining and mechanical surface treatment or combinations thereof.

Parallel session 2 – "AUTOMATION", 09:00 – 10:40 h

'mapp Technology' - a Revolutionary Solution for Integrated Automation Systems

Dr. Gernot Bachler

Business Manager Automation Software / Motion, B&R Industrial Automation GmbH

'mapp Technology' is a new service oriented architecture for integrated automation solutions. 'mapp Motion' is a completely new software system for CNC, robotics or single axes applications fully integrated in B&R's machine control systems. This high degree of integration is the key for connectivity on all levels, synchronization with microsecond precision on control level and easy access to edge and cloud computing on the top level.
The intuitive configuration and programming interfaces make the realization of user tailored production machines easier than ever before. As a basis, the mapp Motion core delivers powerful CNC technology functions based on a state of the art modular software architecture that is open for customized technology extensions even down to the level of path planning.
In general mapp Technology offers a solution for different kinds of automation systems that benefit from essential and high quality software components like user roles, customized visualizations, alarm handling or recipes.

Worldwide production excellence by controlled and networked processes

Robert Adam-Thaller

Head of Product Management, STIWA Automation GmbH

Thanks to growing quality requirements and global availability accompanied by rising cost pressures, manufacturers are facing increasing challenges. Volatile markets and call quantities also represent additional risks.
With controlled and networked processes, reliable conditions within production can be implemented worldwide.
An outstanding production process requires information and communication technology to be integrated into day-to-day production in a goal-oriented manner. The STIWA Group develops mechatronic systems which can be used to achieve this objective while simultaneously reducing the number of interfaces. Efficient linking of traditional automation technology with intelligent software is an integral component in achieving networked production.
TPD-CI, a software product for developing and distributing processes, plays a key role in terms of efficiency, flexible automation, and the integration of processes.
This software product, developed by STIWA, ensures the highest process quality, from development testing to high-performance assembly systems right through to separate fixture construction.

Balanced Manufacturing, Production Simulation- and Optimization

Philipp Trummer

Project Management, AutomationX GmbH

The balanced manufacturing method uses monitoring data and technical specification documents in order to create a simulation model (virtual twin) and derive optimal operation strategies based on the behaviour of this model. Balanced Manufacturing (BaMa) tries to deliver plant operation strategies, planning, and control that not only consider the conventional success factors but also include energy demand and energy-related CO2-emissions as evaluation criteria. The method is illustrated through two use cases.
GA-Solver combined with a hydride simulation (discrete flows of material and continuous flow of energy) results in the AutomationX BaMa Toolbox.

Digitization – challenges and solutions

Holger Langhans

Managing Director, Comara GmbH

More and more, 'Digital Transformation' becomes a common term in a modern working environment. It seems like not many organizations today know what this really means in the operative practice. Mature companies with core competences in physical products will experience a tough clash of cultures and attitudes. Holger Langhans will give insight to the current state, the challenges and rise some questions that organizations need to answer to be successful in the transformation process. Besides the organizational challenges in the digital transformation process 'Industry 4.0' becomes a buzzword and one might have the impression that there are not really valuable and viable solutions available today that are ready to deploy. Comara developed such solutions long time before Industry 4.0 was born. The audience will get a quick insight in what these solutions look like.

Special session – "Center for Digital Production", 09:00 – 10:40 h

Research Collaboration 4.0 - IFT and CDP as Technology Incubator for HOERBIGER Engine Division

Hannes Hunschofsky

Head of Engine Division, HOERBIGER Wien GmbH

In 2015, HOERBIGER defined a new vision for its production network called „1-1-1" - a strategy to increase flexibility and reconfigurability on the shop floor of a high-mix/low-volume manufacturer. To lead this vision to reality, HOERBIGER built several close partnerships with universities and research centers in recent years. One of the most promising collaboration models has been set-up together with the Institute for Production Engineering and Laser Technology (IFT), the recently established COMET K1 "Center for Digital Production" (CDP) and Division Engine – a newly created Division within the HOERBIGER group. The article explains the structure of the collaboration model, how first quick wins have been realized within the project "Mobility" and which areas are in focus to set the path for the future.

The Austrian Center for Digital Production: Mission, Technologies, Applications

Dr. Christoph Pollak

Managing Director, Center for Digital Production GmbH

centurio.work - Higher Productivity Through Intelligent Connectivity

Jürgen Mangler

Florian Pauker

Center for Digital Production GmbH

Manufacturing companies face great challenges: increasing cost pressure, higher quality requirements, shorter product life cycles and a growing variety of variants. The resulting complexity demands efficient and sustainable production concepts from automation to the office level. Coping and improving internal production processes are decisive factors for success in the dynamic markets of industry. This paper discusses a modular manufacturing orchestration framework called centurio.work with a particular focus on securing the data exchange between different machines.

Enabling flexible real-time factory networks by combining OPC UA and TSN

Thomas Frühwirth

Pablo Gutiérrez-Peón

Center for Digital Production GmbH

Communication protocols are manifold and today they already fulfill the vast majority of relevant requirements such as low latency and high transmission speeds. However, particularly on the shop-floor level, they are often closely tied to specific vendors and applications and thus suffer from drawbacks regarding interoperability and flexibility. The use of vendor-independent, standardized technologies promises to overcome these problems in the near future. Thereby, OPC Unified Architecture (OPC UA) in combination with Time-Sensitive Networking (TSN) is expected to play a major role. The information modelling capabilities of OPC UA allow to model the functionality of each device – from simple sensors to complex machines. Furthermore, it specifies services to browse these information models, read and write data values, call methods, etc. TSN as a mechanism for data transmission enables standard Ethernet traffic to co-exist with real-time traffic on the same communication network.

Parallel session 3 – "MACHINES", 11:10 – 12:25 h

Development of ultra-precision machine realizing stable machining

Youngpyo Hong

Manager of ROBONANO Research Department, FANUC Corporation

In recent years, applications of ultra-precision machining are expanding in a wide range of industrial fields such as optical molds for automobiles as well as information technology. Stability of surface accuracy and quality in ultra-precision machining becomes very important in order to maintain quality of mass production of the above applications.
In this presentation, we introduce development of the ultra-precision machine ROBONANO that realizes 0.1 nanometer command and simultaneous 5-axis control with FANUC's high CNC and servo technologies and pursues stable machining. And we clarify some subjects for further challenges in ultra-precision machining and propose countermeasures for that.

Optimal tempering of machine tools by interconnected components and processes

Prof. Steffen Ihlenfeldt

Holder of the Chair of Machine Tools Development and Adaptive Controls, Institute of Machine Tools and Control Engineering IWM, TU Dresden
Fraunhofer Institute for Machine Tools and Forming Technology IWU

Cyber-physical components, enhanced controller functionalities and the possibility to gather and analyze a multitude of data in production systems offer a broad variety to optimize machine tools in accordance with the corresponding processes. Thermal issues however are still one of the main failure causes in today's machine tools. In order to increase production accuracy in conjunction with a tolerable energy demand, one key enable is to harmonize the temperature field by means of a "thermal pre-control". After an insight to extended possibilities of cyber-physical production systems, the paper presents a strategy to enable CNC controllers to influence beneficially the temperature field of machine tools. The course of action comprises three major steps.

Machine tool and machining process digital twins for increased productivity of finishing machining

Dr. Matej Sulitka

Head of Collaboration projects, Department of Production Machines and Equipment & Research Center of Manufacturing Technology, Czech Technical University in Prague

Finishing machining represents an important operation in which the part gets its final shape, precision and surface quality. In many cases chip machining by turning or milling is a final manufacturing operation. Productivity of this operation is influenced by a number of effects – setting of the cutting process parameters, tool path planning and dynamic properties of the system workpiece – cutting tool – machine tool.
Impact of the effects mentioned can be optimized by partial technology tests. A challenge is to achieve optimized machining of flexible work pieces by using the machine tool and process digital twins.

Parallel session 3 - "TECHNOLOGY", 11:10 - 12:25 h

Machining of deep holes in challenging dimensions

Prof. Dirk Biermann

Head of Institute of Machining Technology (ISF), TU Dortmund

Machining of deep boreholes with a high length-to-diameter ratio (l/D) is challenging itself, however this paper contains three applications with further enhanced requirements. In the first section, a new solution for cryogenic machining of challenging materials and dimensions is presented. Here, a small amount of lubricant is dissolved in CO2 to combine advantages of cryogenic and MQL machining. The second topic shows current developments for the reduction of heat input and straightness deviation when machining complex gear shafts. Thereby, three parallel deep boreholes with an l/D ≈ 60 have to be produced with a high straightness accuracy to avoid their crossing in high depth. The third chapter focuses on the development of a new chamber boring tooling system for bottom forming in deep boreholes.

High productivity and tool life as well as reduction of digital resources by using optimized MQL

Dr. (ETH Zürich) Nicolas Jochum

Business Development Manager MQL / MMS, Blaser Swisslube AG

The optimum combination of minimum quantity lubrication (MQL) oil, as well as specific MQL tooling, leads to an increase in productivity and higher tool life. With an increase in the feed rate and the cutting speed of 130 m/min to 390 m/min in stainless steel 1.4307, the productivity increased by more than 70%. In addition, tool life was increased by 243%, with this higher material removal rate. In steel as well as in aluminum, but also in high alloyed, heat-resistant cast alloys, a significant improvement in performance is possible with suitable and optimized MQL. In addition to other advantages of the MQL, e.g. low energy consumption, component residue and very clean metal chips; MQL technology also has advantages in the context of Industry 4.0.

Thermoelastic Digital Twin of the Machine Tool Structure for Real Time Control of Thermal Errors

Prof. Helmi Attia

Adjunct Professor, Department of Mechanical Engineering, McGill University
Manager of Advanced Material Removal Processes, Aerospace Manufacturing Technology Center, National Research Council Canada (NRC)

Thermal deformation of machine tool structures cannot be avoided at the design stage. Therefore, real-time compensation of this problem emerges as a viable and practical solution. The compensation system recognizes the fact that the relative thermal displacement between the tool and the workpiece is not accessible for direct measurement. Using the generalized thermoelastic transfer functions of the structure, the input-output dynamic dependencies, the heat input to the structure and thermal displacements are accurately estimated in real-time. This approach allows creating a digital twin that replicates the thermal deformation behavior of the physical machine tool structure, using measured temperature data in real time. A feedforward-feedback control system, incorporating positive heating elements attached to the machine tool structure, is presented. The experimental results showed that a control cycle of less than 0.5 seconds is achievable and that residual thermal errors can be maintained below ± 10 µm.

Parallel session 3 – "AUTOMATION", 11:10 – 12:25 h

Measurement of Dynamic Cutting Temperatures with Embedded Thin-Film Thermocouples

Prof. Frank E. Pfefferkorn, Ph.D.

Director of the Manufacturing Systems Engineering Program, Department of Mechanical Engineering, University of Wisconsin-Madison

This presentation will show how thin-film thermocouples, embedded in the coating of a tungsten carbide cutting insert, can be used to detect transients in the tool-chip interface temperature. The thin-film thermocouples were sputtered directly onto the flat rake face of a commercially available tungsten carbide cutting insert and coated with a protective layer to obtain temperature data 1.3 µm below the tool-chip interface. Results of conventional and climb milling AISI 4130 steel and modulation assisted orthogonal turning of 6061-T6 aluminium will be presented. Modulation Assisted Machining superimposes low frequency oscillations (<1 kHz) in the feed direction of conventional machining to produce discrete chip formation. This study will show the effect of modulation assisted machining on temperature rise at the tool-chip interface in conventional cutting (no modulation) and during sinusoidal modulation operating at oscillation frequencies of 60 Hz and 220 Hz under dry cutting conditions.

ToolScope Assistence System for cutting machining

Thomas Wittkowski

Head of Process Management Digital Solutions, Ceratizit Hannover GmbH

ToolScope monitors process and machine to see if they are running as planned. In critical situations, the machine is stopped and the operator or the maintenance will be informed. See the possibilities of TS-PM process monitoring from lot size 1 to series. Protect the machine with CD-xDim collision monitoring. Or do preventive maintenance on machines with TS-CM.
But it is also possible to optimize processes and tool usage. The potential of machine and tool is thereby fully exploited. With TS-AFC tools can be protected, but also machine main times be reduced. In addition, TS-Wear allows optimized operating times for tools.
ToolScope also generate data for a variety of usage analyzes. Ceratizit provides a cloud and applications to analyze this data. The possibilities range from TS-TCLog tool change log, TS-QRep quality documentation, then TS-MDA automatic shiftlog or a custom recording of data with TS-DataPro up to various network applications with TS-Connect.

Highly accurate optical CMM for measurement of micro holes

Dr. Manfred Prantl

CEO, Alicona Imaging GmbH

Highly accurate measurements of small structures are challenging in many applications. An example is the optimization of the hole geometry in fuel injectors. Due to the small size of the structure, tactile approaches are insufficient while standard optical measurement systems cannot provide data on complex geometries. In this presentation, a new purely optical 3D micro-coordinate machine – the µCMM of Alicona and its accuracy by determining the maximum permissible translatory and stationary error is presented. Moreover, we demonstrate that the focus variation principle allows 3D measurements of such small components by presenting the measurement and evaluation of micro injection holes.

Special session – "Joint Industry Symposium", 11:10 – 12:25 h

Concept of probabilistic modelling for real-time prediction of product quality and design automation

Dr. Kathrin Plankensteiner

Digital Factory Vorarlberg, FH Vorarlberg

Industrial practice shows that integration of information from manufacturing processes during the design stage is challenging. In this paper we propose to use design automation applications and real-time prediction models based on manufacturing data to enable systematic reuse of information from manufacturing processes during the design stage. The approach is illustrated by means of an industrial use case for a box-type boom design and the corresponding welding process. The concept results in a more accurate design, reduction of barriers for information exchange between different departments, as well as the usage of data for quality assurance in manufacturing. Future work needs to address the design and integration of databases for storage of real-time data from manufacturing and the complete implementation of the proposed concept.

CRP-DP2, Adaptive Production Systems

Gernot Mauthner

Project Manager "Adaptive Production Systems" , Center for Digital Production GmbH
HOERBIGER Engine Division

In 2017, the Center for Digital Production (CDP) and the research center Pro²Future (P2F), created a project focused on demonstrating aspects of so-called adaptive production systems. A research platform consisting of several levels has been created and is used by the research centers and their partners to (1) develop new technology building blocks, as well as (2) to demonstrate those in an industrial laboratory setup from Vienna University of Technology. The article explains the structure of the research platform and provides more detailed insights on two ongoing developments in the area of machine communication.

Data Analytics for Industrial Process Improvement

Prof. Christian Huemer

Dean of Academic Affairs of Faculty of Informatics, Institute of Information Systems Engineering, Research Division of Business Informatics, TU Wien

Dr. Stefan Thalmann

Area Manager, Key Researcher, Pro2Future GmbH

Plenary session 3, 13:25 - 14:55 h

Driving the Digital Enterprise

Dr. Kurt Hofstädter

Head of Digital Factory CEE, Siemens AG Österreich

The digital transformation of the producing economy is gaining momentum. Companies from a wide variety of industries are already unlocking this potential – they are using end-to-end digitalization to create a lasting competitive edge by reducing the time to market and increasing flexibility, efficiency, and quality. It enables new opportunities for value creation, innovative business models, and trendsetting forms of cooperation.
The technical prerequisites for the implementation of Industrie 4.0 are readily available with the Siemens Digital Enterprise: the connection of the virtual and the real world of production along the entire value chain based on profound industry knowledge and unique expertise in the fields of electrification, automation, and digitalization

Human centric agile transformation

Tomas Hedenborg

CEO, Fastems Oy Ab
President, Orgalime – The European Engineering Industries Association

The need for transformation and renewal of companies and organisations is increasing exponentially in the digital era. The nature of the change is not only about technology and business models but even more about culture and leadership. Embracing agile in parallel with traditional waterfall models represents a major challenge for organisations. The speech looks at the big picture and drivers of the change as well as the practical approach developed within Fastems, both to boost our internal transformation as well as to help our customers tackle the change.

Intelligent Listening to Machining Processes

Prof. Hans-Christian Möhring

Vice Dean of Faculty for Engineering Design, Production Engineering & Automotive Engineering, Institute for Machine Tools, Universität Stuttgart

The human acoustic organ, incorporating some experience, enables to distinguish intact machining process conditions from critical states like overload and chatter. In contrast, it is still a challenge to reproduce this ability by technical systems such as microphones. This contribution introduces an innovative approach to implement process monitoring based on airborne sound signals. By means of a newly developed scanning method, the positioning of microphones is optimized. The acoustic transfer characteristics of each microphone is characterized. Furthermore, strategies to oppress environmental sound influences and disturbances are investigated. A Lock-In amplification stage is applied to extract and separate the useful signal portion from the noisy environment signal. The obtained sound signals are further processed by sophisticated analysis methods.

Plenary session 4, 15:25 - 16:55 h

Automation for the Factory of the Future. NOW, NEXT & BEYOND.

Julian Weinkötz

Head of Product Management PLC and IoT Software, Bosch Rexroth AG

The term „Industry 4.0" exists since 2011 – this means for seven years now. However, most still do not realize what that actually means for them as e.g. machine builder or operator. Furthermore, concrete implementation approaches are still missing. There is also a lot of talk about data analysis - but what to do with these data or even how to generate commercial benefits: Dead loss.
Automation is the key to the digital and highly flexible factory. The presentation shows what automation can do today and in the future and which advantages actually can be achieved. The vision follows a factory of the future, which is fully digitized and highly flexible.

Software Defined Manufacturing – A flexible Production Structure

Prof. Oliver Riedel

Managing Director of Institute for Control Engineering of Machine Tools and Manufacturing Units (ISW), University of Stuttgart
Director, Fraunhofer Institute for Industrial Engineering IAO

The aim of today's manufacturers is a production system that self-adapts its process depending on orders made by customers or rearrangements on the shop floor. To achieve this objective, the production structure needs to change from a static planning environment to a reactive system that controls the production sequences on the shop floor using bidirectional communication. Inspired by the concept of software defined networks, an approach to achieve this structural architecture is presented. The energy, material and information flow between flexible manufacturing cells as well as processes in those cells are dynamically pictured and controlled by a central unit that merges shop floor and office floor logic. Besides this structural change, other prerequisites need to be met. Therefore a data model concept is proposed, distinctly describing the current state of a production process to create a digital process image of that physical task.

Immortality or Reproduction – how technology forces us to become pioneers

Thomas Fellger

CEO, iconmobile GmbH

Advanced sensors, low interest rates, high computing power, new consumer needs, digitalization. Such factors are playing a big role in creating a new competitive landscape for big corporations. We all watch, as new companies enter the market and show how much value their "direct consumer access" really means in today's world. They prove that "owning an experience", is a far more valuable proposition than any brand promise can be. Traditional corporations which rely on old distribution and manufacturing, continue to learn this lesson the hard way as new, agile companies jump ahead. This presentation is a wakeup call to those corporations, and will provide guidance to understand what matters and how to survive in this environment.

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