



IMEC2018

The 18th International Machine Tool Engineers' Conference

Future Monozukuri Now into View

Oral Session

November 4th (Sun.) / 5th (Mon.), 2018

Venue: Reception Hall A, Tokyo Big Sight

Poster Session

November 1st (Thu.) - 6th (Tue.), 2018

Venue: East Hall 7, Tokyo Big Sight

Organizers: Japan Machine Tool Builders' Association, Tokyo Big Sight Inc.



This conference is subsidized by JKA through its Promotion funds from KEIRIN RACE.

On the hosting of the 18th International Machine Tool Engineers' Conference

Ever since the 1st Conference in 1984, the International Machine Tool Engineers' Conference (IMEC) hosted by the Japan Machine Tool Builders' Association has been held every other year to coincide with the Japan International Machine Tool Fair (JIMTOF), and has contributed to the development of machine tool technology. Hosted again this year for the 18th time, IMEC 2018 will once more draw together under a single roof technicians, researchers, users and dealers from Japan and overseas, and we hope to share information on the latest machine tool technology.

The overall theme of IMEC 2018 will be "Future Monozukuri Now into View", accompanied by a keynote session entitled "Machine Tools Responding to the Changing Production Environment" as well as three technical sessions, namely, "Smart Factories Utilizing IoT and AI," "The Current and Future of Metal Additive Manufacturing," and "Machine Tools with New Functions and Structures." All of the sessions cover technical topics that will be both useful and of profound interest to technicians and researchers who are involved in machine tool technology. The following provides an outline introduction to each of the sessions.

Machine Tools Responding to the Changing Production Environment

The environment surrounding the machine tools that serve as the bedrock of industry is changing remarkably more than in the past due to the mutual influence of political, social, economic and technological factors. New machine tools that take these environmental changes into account have to be developed. In the course of doing so there are many points that should be used for referential purposes by Japanese machine tool technicians, including the corporate strategies of long-established overseas machine tool manufacturers, the technical challenges being taken on by the users of machine tools, and the research into machine tools that is being conducted by the leading universities of Europe. This session will feature reports by renowned specialists regarding the success story of a long-established Swiss machine tool maker, the development of a large-scale next-generation rocket engine using hybrid machining, and a machine tool research project conducted at a German university.

Smart Factories Utilizing IoT and AI

In recent years the manufacturing industry has witnessed the dramatic progress of digitization and networking typified by Industrie 4.0, the Internet

of Things (IoT), as well as the introduction of artificial intelligence (AI), and the manufacturing industry environment with machine tools at its core is undergoing huge changes. This session will feature reports on how four major domestic machine tool makers view smart factories, the challenge of making a reality of them, the essential elemental technologies required by smart factories, and their prospects for the future.

The Current and Future of Metal Additive Manufacturing

There is growing interest in additive manufacturing (AM) technologies, and the application of various AM techniques in the manufacturing workplace is being pursued. In particular, a marked growth in demand for metal machining using AM is being witnessed. This session will feature reports by Japanese and overseas specialists on metal AM technology for large size parts, the latest metal AM technologies and examples of how they are being used, the development of hybrid metal 3D printers, and prospects for the future.

Machine Tools with New Functions and Structures

In order to logically construct the manufacturing environment of the future, there will be a need for new machining functions and innovative machine tools equipped with structures that make it possible to attain these new functions. In this session, the application of new materials to structural materials, ideal structural design for machine tools, the machining principles and structure design for the latest gear machining technologies, the results of ultrasonic-assisted machining technologies used on difficult-to-machine materials, related elemental technologies, and case studies will all be reported on.

We sincerely hope that IMEC 2018 will provide a forum where lively technical exchanges will take place between all those attending, and the oral session presenters and poster session presenters. In closing, I would also like to state my confidence that the Conference will be an opportunity leading to the further progress of the machine tool industry.

Dr. Hidenori Shinno

Chairman of the IMEC2018 Organizing Committee
Professor of the Laboratory for Future Interdisciplinary
Research of Science and Technology,
Tokyo Institute of Technology



Outline

Name The 18th International Machine Tool Engineers' Conference (IMEC 2018)

Aim IMEC is the international conference led by the industrialists. This conference aims at promoting level up of worldwide machine tool engineering by information exchange with participation of worldwide researchers, engineers, users and dealers related with machine tool.

Structure Two sessions of the IMEC 2018 are as follows:
The first one is oral session for real example and the trend of engineering development in the industry, using technique by the users and the topics having special attention;
The second one is poster session widely announcing the results of advanced research and development on machine tool by poster format.

Organizers Japan Machine Tool Builders' Association, Tokyo Big Sight Inc.

Supporting Organizations
Overseas
 euspen ((European Society for Precision Engineering and Nanotechnology)
 KSMTE (Korean Society of Manufacturing Technology Engineers)

Domestics
 The Japan Society of Mechanical Engineers, The Japan Society for Precision Engineering, The Japan Society for Abrasive Technology, The Robotics Society of Japan, The Institute of Electrical Engineers of Japan, The Institute of Electronics-Information and Communication Engineers, Japan Welding Society, The Society of Instrument and Control Engineers, The Institute of Systems-Control and Information Engineers, SME Japan Chapter, Machine Tool Foundation, Japan Society for the Promotion of Machine Industry, Advanced Machining Technology & Development Association, Machine Tool & Related Products Committee*, The Japan Machinery Federation, Japan Machine Tool Importers' Association, Japan Die&Mold Industry Association, The Japan Society for Die and Mould Technology, Japan Foundry Society, Inc., The Society of Japanese Aerospace Companies, Japan Auto Parts Industries Association, Society of Automotive Engineers of Japan, Inc., Japan Management Association, The Japan Electrical Manufacturers' Association, The Japan Society Of Industrial Machinery Manufacturers, The Japan Bearing Industry Association, Japan Robot Association, The Japan Welding Engineering Society, The International Academy for Production Engineering

*Machine Tool & Related Products Committee

Japan Precision Machine Association, Japan Forming Machinery Association, Japan Machine Accessory Association, Japan Gear Manufacturers Association, Japan Fluid Power Association, Japan Grinding Wheel Association, Japan Cutting & Wear-resistant Tool Association, Industrial Diamond Association of Japan, Japan Precision Measuring Instruments Manufacturers Association, Japan Optical Measuring Instruments Manufacturers' Association, Japan Testing Machinery Association

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I. Oral Session

Oral session conducts productive discussions among participants, also mainly consists of the speech for the results of advanced research and development on machine tools in the world to aim at innovative advancement of the machine tool in the future.

This time, Oral session is held under the theme "Future Monozukuri Now into View" for future development of Machine Tool Technologies and Monozukuri ("monozukuri" is the Japanese term for skilled manufacturing).

*Official languages: English and Japanese (with simultaneous interpretation service)

Date	November 4th (Sun.) - November 5th (Mon.), 2018
Venue	Reception Hall A (Ground floor), Tokyo Big Sight
Maximum Number of Participants	300 (on a first come, first served basis.)
Main Theme	Future Monozukuri Now into View Keynote Theme: Machine Tools Responding to the Changing Production Environment Technical Theme 1: Smart Factories Utilizing IoT and AI Technical Theme 2: The Current and Future of Metal Additive Manufacturing Technical Theme 3: Machine Tools with New Functions and Structures

Registration Fee: 10,000 Yen for One day, 20,000 Yen for Two days, per person (including tax)
"Proceedings" Fee is separately, 10,000 yen (including tax)

Deadline for Application: October 25th (Thu.), 2018

Method for Registration:

- 1: Please access and apply to the IMEC Website (<http://www.jmtba.or.jp/english/events/1543>) for registration or Please fill out the attached application form and send to Secretary of IMEC by Telefax or E-mail.
- 2: Payment (through a bank transfer) is due upon receipt of invoice.
- 3: To notify of the completion of registration, you will receive a "Registration Card"
- 4: Please submit the "Registration Card" to the registration desk on the day of IMEC.

Conference Secretariat:

Secretary of IMEC, Technical Department,
Japan Machine Tool Builders' Association (JMTBA)
3-5-8, Shibakoen, Minato-ku, Tokyo 105-0011, Japan
Tel: +81-3-3434-3961 Fax: +81-3-3434-3763
E-Mail: IMEC18@jmtba.or.jp URL : <http://www.jmtba.or.jp/english/events/1543>

Cancellations:

If you want to cancel your registration, please inform the Secretary of IMEC immediately in writing for refund of the registration fee. The cancellation will be processed based on the date when your cancellation notice is received after Oct. 25.

All refunds will be made after the conference.

(date received) (rate of refund)

on and before Oct. 2650%

after Oct. 270%

Program for Oral Session Day1: November 4th, 2018

09:10 ~ 09:20	Opening Address Mr. Yukio Iimura, Chairman of Japan Machine Tool Builders' Association Prof. Dr. Hidenori Shinno, Chairman of IMEC Organizing Committee
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Keynote Session

Machine Tools Responding to the Changing Production Environment

Chairperson: Prof. Dr. Hidenori Shinno, Tokyo Institute of Technology
Co-Chairperson : Dr. Atsushi Ieki, Okuma Corp.

09:20 ~ 09:30	Chairperson's Address
09:30 ~ 10:20	Keynote Speech : "Forming different machine tool companies to a united group by common strategies" Mr. Stephan Nell, CEO, United Grinding Group AG (Switzerland)
10:20 ~ 10:40	Coffee Break
10:40 ~ 11:30	Keynote Speech : "Large-scale rocket engine manufacturing with hybrid-additive/ subtractive machine tool " Mr. Andrew Duggleby, Propulsion Advanced Manufacturing Manager, Mr. Kevin Zagorski, Senior Propulsion Advanced Manufacturing & Integration Engineer Virgin Orbit (U.S.A)
11:30 ~ 12:20	Keynote Speech : "Research on Machine Tools in Germany - related infrastructure, public support, selected projects" Prof. Dr.-Ing. Michael F. Zaeh, Department of Mechanical Engineering, TUM, Technical University of Munich (Germany))
12:20 ~ 12:30	Q & A for Keynote session
12:30 ~ 12:45	Awards ceremony for the Poster Session
12:45 ~ 13:30	Lunch Break

Technical Session 1

Smart Factories Utilizing IoT and AI

Chairperson: Prof. Dr. Keiichi Shirase, Kobe University
Co-Chairperson: Mr. Yasuhiko Suzuki, Yamazaki Mazak Corp.

13:30 ~ 13:40	Chairperson's Address
13:40 ~ 14:25	Technical Speech : "Production system for Mass customization" Mr. Yuichiro Tsuchiya, Executive Officer S.I.T. Division, MAKINO Milling Machine Co., LTD. (Japan)
14:25 ~ 15:10	Technical Speech : "Smart factory realized by the integration Smart Manufacturing and Smart Machine" Mr. Katsunori Kunimitsu, General Manager, FA R&D Department, Okuma Corporation (Japan)
15:10 ~ 15:30	Coffee Break
15:30 ~ 16:15	Technical Speech : "Realities and challenges at manufacturing premises for constructing smart factories" - FIELD system and FANUC AI - Mr. Takayuki Tamai, Assistant General Manager-R&D Administration Division, Vice General Manager -FIELD Promotion Division, Manager-AI Research Department, Basic Research Laboratory, FANUC Corporation(Japan)
16:15 ~ 17:00	Technical Speech : "Smart Factory where humans have the lead role" that JTEKT is working on" Mr. Toshio Aono, Executive Technical Advisor, IoE Promotion Office, JTEKT Corporation (Japan)
17:00 ~ 17:10	Q & A for Technical Session 1

Program for Oral Session Day2: November 5th, 2018

Technical Session 2

The Current and Future of Metal Additive Manufacturing

Chairperson: Prof. Dr. Hiroyuki Sasahara, Tokyo University of Agriculture & Technology
Co-Chairperson: Mr. Koichi Amaya, Matsuura Machinery Corp.

09:00 ~ 09:10	Chairperson's Address
09:10 ~ 10:00	Keynote Speech : "Large-Part Metal Additive Manufacturing: Industrial Adoption Trends and a Technical Overview" Mr. John O'Hara , Global Sales Manager, Sciaky, Inc. Inc. (U.S.A)
10:00 ~ 10:50	Keynote Speech : "Latest AM technology and expansion of real applications" Dr. Takashi Ishide, Fellow, MITSUBISHI HEAVY INDUSTRIES, LTD. (Japan)
10:50 ~ 11:10	Coffee Break
11:10 ~ 11:55	Technical Speech : "Advantage and Challenge of Hybrid Metal 3D Printer." Mr. Tetsushi Midorikawa, Senior Manager, Additive manufacturing Technology, Engineering Division, Matsuura Machinery Corporation (Japan)
11:55 ~ 12:40	Technical Speech : "Next generation process innovation with the HYBRID multi-tasking machines" Mr. Kazuya Horibe, Division Manager, Solution ENG Division, YAMAZAKI MAZAK Corporation (Japan)
12:40 ~ 12:50	Q & A for Technical Session 2
12:50 ~ 13:50	Lunch Break

Keynote Session

Machine Tools with New Functions and Structures

Chairperson: Prof. Dr. Naohiko Sugita, The University of Tokyo
Co-Chairperson: Mr. Kazuhiro Takeuchi, Toshiba Machine Co., Ltd.

13:50 ~ 14:00	Chairperson's Address
14:00 ~ 14:50	Keynote Speech : "Mineral casting for Mechanical Engineering" Mr. Fabian Werner , CEO, RAMPF (Taicang) Co.,Ltd (Germany)
14:50 ~ 15:35	Technical Speech : "The Newest Machine Tool Structural Design and Processing Technology Accomplishing Super Precision Processing" Mr. Ryota Shindo, Director/General Manager, Engineering Dept., Nagase Integrex Corp. (Japan)
15:35 ~ 15:55	Coffee Break
15:55 ~ 16:40	Technical Speech : "Introduction of latest gear cutting technology, the Super Skiving System" Mr. Yukihiisa Nishimura, Director, Engineering Headquarters, Mitsubishi Heavy Industries Machine Tool Co., Ltd. (Japan)
16:40 ~ 17:25	Technical Speech : "ULTRASONIC machining : advanced technology for challenging materials" Dr. Jens Ketelaer, Technical Site Director ULTRASONIC, SAUER GmbH(Germany)
17:25 ~ 17:35	Q & A for Technical Session 3

Abstract of Speech

Keynote Session

Machine Tools Responding to the Changing Production Environment

Keynote Speech : “Forming different machine tool companies to a united group by common strategies”

Mr. Stephan Nell, CEO, United Grinding Group AG (Switzerland)



The paper describes the recent history of United Grinding Group with regard to R&D, product design and manufacturing philosophies.

Mergers and acquisitions of independent machine tool companies manufacturing grinding machinery located in Switzerland and Germany have historically accumulated the United Grinding Group, formerly Schleifring Group.

In the early years of the group, the members have been controlled and steered by common financial reporting systems, but the strategies for R&D, product management and production setup have been left with the single units. As a result, capacities were wasted and processes were inefficient, in addition, it was not clearly visible to customers that the eight brands MÄGERL, BLOHM, JUNG, STUDER, SCHAUDT, WALTER and EWAG belonged to the same group of companies.

At the beginning of this decade, the United Grinding Group started to implement common strategies for R&D roadmaps, product design, corporate identity and machine assembly and manufacturing. In order to be able to make the group's customers even more successful, PuLs® has been established as the company philosophy to optimize processes and procedures.

Keynote Speech : “Large-scale rocket engine manufacturing with hybrid-additive/ subtractive machine tool ”

Mr. Andrew Duggleby, Propulsion Advanced Manufacturing Manager,

Mr. Kevin Zagorski, Senior Propulsion Advanced Manufacturing & Integration Engineer Virgin Orbit (U.S.A)



Virgin Orbit are pioneering the next generation of rocket engine manufacturing capabilities. Using the hybrid AM/SM machine which uses direct energy deposition additive paired with 5 axis mill-turn center platform, new designs and techniques for manufacturing are enabled with the ability to alternate between printing and machining.

This new manufacturing process enables an order-of-magnitude reduction in manufacturing time of rocket engines. This talk gives an overview of the process, lessons learned, and future outlook for this technology.

Keynote Speech : “Research on Machine Tools in Germany – related infrastructure, public support, selected projects”

Prof. Dr.-Ing. Michael F. Zaeh, Department of Mechanical Engineering, TUM, Technical University of Munich (Germany)



Germany has a long tradition concerning development and production of machine tools. Together with Japan it has for long been and still is one of the world leading nations in machine tool building. The machine tool is sometimes referred to as the mother of all machines, meaning that a strong machine tool industry is a key success factor for a healthy industry based economy. This strong economy, though sometimes disrespectfully dubbed “old economy” , has helped Germany to overcome the financial crisis of the years 2008 and 2009.

The German machine tool industry can rely on two very important competitive advantages: First, there is strong political support, and governments on the EU level, the federal level and the regional level have recognized the importance of a healthy machine tool industry. Considerable budgets are available to fund projects related to the issues of machine tool builders and machine tool user. Second, there is a powerful research infrastructure working in the field of machine tools as well as cutting, forming and joining technologies. German professors with research interest in one of these fields are connected in the Scientific Society of Production Engineering (WGP) and thus have a reliable network to coordinate their activities. This is also a good basis for bilateral projects with industrial partners. The presentation will outline these two factors.

Furthermore, the presentation will give an insight into typical project examples. Funded on all three geographical levels (EU, Germany, regional states) is considered and issues related to machines, components, technologies, tools and applications are pointed out and explained.

Speech : “Production system for Mass customization”

Mr. Yuichiro Tsuchiya, Executive Officer S.I.T. Division, MAKINO Milling Machine Co., LTD. (Japan)



The factory (assembly industry) which manufactures Machine Tools is fully manual operation to support with mass customization. In this case, automation is very difficult and inefficient. Although we would like to implement automation system for Machine Tool. But the mass customized products which machine tools are different production way each time, and the bottleneck always moves. In order to solve these problems, we need to struggle a real-time bottleneck solution. We must solve bottlenecks by solving productivity monitoring by IoT, Mobile Robotics, application of shortest time path planning, simulation by Digital Twin, dynamic scheduling, optimization problems. To maximize the throughput of the factory that manufactures our machine tool. We will develop production system for mass customization by autonomous operation and production support system according to different requirements.

Speech : “Smart factory realized by the integration Smart Manufacturing and Smart Machine”

Mr. Katsunori Kunimitsu, General Manager, FA R&D Department, Okuma Corporation (Japan)



To meet the requirements of mass manufacturing, keeping reasonable prices and short lead times, Smart Manufacturing will be important. This means keeping minimum stock and a frequently changing operation plan. The machine tool factory is a typical implementation of super high-mix production and mass-customization for the purpose of producing a machine which best fits the customer's manufacturing requirements. In this lecture, we introduce our Smart Manufacturing initiative, which includes shortened machining preparation by CPS (Cyber Physical System), 24/7 automation, Work ID, and hi-level monitoring of progress and productivity. Also implemented is the Smart Machine, with predictive maintenance AI functionality, intelligent functions for determining the maximum possible performance of the machine, and new manufacturing web services.

Speech : “Realities and challenges at manufacturing premises for constructing smart factories”- FIELD system and FANUC AI -

Mr. Takayuki Tamai, Assistant General Manager-R&D Administration Division, Vice General Manager -FIELD Promotion Division, Manager-AI Research Department, Basic Research Laboratory, FANUC Corporation(Japan)



Amidst the third wave of AI, the attention is drawn on the use of AI in the manufacturing industry. AI can be effective when regarded as a tool for solving problems and is successfully used, rather than when considered versatile. On the other hand, development of AI which is truly useful at manufacturing sites could face various challenges, such as failure to obtain expected results. Unless these challenges are overcome, it is not easy to utilize and disseminate AI at manufacturing sites. To properly utilize AI, quantity, quantity and variation of learning are very important. Furthermore, since the data output by machines and sensors are diverse, efficiently collecting data suitable for learning, cleansing it, and improving its quality are just as important as AI's algorithm itself. When innovating the manufacturing industry with AI, it is important to acknowledge these challenges and to come up with a realistic solution. The efforts and future prospects of FUNUC from on-site data collection to development of AI function will be discussed.

Speech : ““Smart Factory where humans have the lead role” that JTEKT is working on”

Mr. Toshio Aono, Executive Technical Advisor, IoE Promotion Office, JTEKT Corporation (Japan)



JTEKT had been proposing the concept of IoE, Internet of Everything, which connects not only things, but events and humans as well. By connecting, we are able to find problems. Problems are visualized and improved, and the “Kaizen Cycle” starts. With continuous Kaizen Cycles, the productivity, maintainability and quality will increase. In addition, by increasing the on-site capabilities and Kaizen ability in these processes, the workers who play the leading role can also grow. In other words, we believe that a “Smart Factory where humans have the lead role” is a factory where “workers and machines cooperate with each other”, “people's wisdoms are used” and “workers and machines evolve together”. However, the concept of Smart Factory should not be imposed. There are as many ideal Smart Factory images as there are companies. In JTEKT, we strive to realize the Smart Factory that our customers imagine, while facing the various social issues related to manufacturing, such as the aging society and environmental problems. Now, please let us introduce our Smart Factory using some examples.

Abstract of Speech

Technical Session 2

The Current and Future of Metal Additive Manufacturing

Keynote Speech : “Large-Part Metal Additive Manufacturing : Industrial Adoption Trends and a Technical Overview”

Mr. John O’Hara , Global Sales Manager, Sciaky, Inc. (U.S.A)



Additive Manufacturing (AM) has been continually gaining market share since its emergence over the last few decades. The earliest technologies focused on rapid prototyping, while today industry is benefitting from several AM processes in actual production. Many of today’s adopted processes have matured using plastics and metal powders, while the Wire-Fed Directed Energy Deposition (DED) processes have only recently become production viable.

The distinguishing factors that separate the Wire-Fed DED processes from the other technologies is the high deposition rates and the large size of the parts being produced. The large part capability offers solutions and challenges unlike the established processes. The Wire-Fed DED market has recently overcome the challenges, and has positioned these technologies for rapid adoption in several industries. This paper will discuss details of how these DED technologies can offer benefits to these industries. Examples of adoption are discussed, along with supporting discussions on the technical and economic merits of the examples.

The adoption of Large Part AM will continue to grow at an increasing pace, with early successes in low-risk, non-critical parts made of the most common expensive and difficult to machine alloys. As these first successes enter production, and the benefits are realized, we will see adoption of higher risk, more complex parts.

Keynote Speech : “Latest AM technology and expansion of real applications”

Dr. Takashi Ishide, Fellow, MITSUBISHI HEAVY INDUSTRIES, LTD. (Japan)



Latest metal AM application of binder jet type, direct wire type and molten metal spraying will be described. Next, to apply real applications, there are many problems to be solved. First, metal powder price is too expensive, second is selecting proper conditions takes too much time, third is how to do the quality assurance. Here we will show the causes of solutions, and also will show the micro simulation example for understanding the AM phenomena.

Speech : “Advantage and Challenge of Hybrid Metal 3D Printer.”

Mr. Tetsushi Midorikawa, Senior Manager, Additive manufacturing Technology, Engineering Division, Matsuura Machinery Corporation (Japan)



Among the metal AM technologies, we will explain the features of “Hybrid Metal 3D Printer” which can apply laminate additional processing by powder bed fusion and precision cutting processing technology on one machine and the challenges to face.

The ability to realize additional processing and milling processing with the same machine not only makes it possible to consolidate the process but also facilitates the transmission of the coordinate system at the time of changeover to the necessary post process. While there are such advantageous points, it is undeniable that there are specific problems that are not found in conventional processing methods. In addition, a design method for converting the internal structure peculiar to additional processing, which could not be produced by the conventional processing method, to a new function and bringing the product to the unexplored area is indispensable. By looking directly at these advantages and challenges, and necessary change in ideas, we will extend the merits of “Hybrid Metal 3D Printer” and elaborate the concrete prospects to overcome disadvantages.

We propose how the “Hybrid Metal 3D Printer” can contribute even among the new manufacturing methods of “AM” which will demonstrate further practicality in the future.

Speech : “Next generation process innovation with the HYBRID multi-tasking machines”

Mr. Kazuya Horibe, Division Manager, Solution ENG Division, YAMAZAKI MAZAK Corporation (Japan)



Recently there has been growing interest in “Additive Manufacturing (AM)” technology and discussing its implementation in actual production.

Based on the concept of “DONE IN ONE®” (typified by INTEGREGX, multi-tasking machine), we have been striving to improve productivity by process integration. On top of it, we could be introduced HYBRID multi-tasking concept, which has combined both metal removal and additive processes on single INTEGREGX machine platform at the JIMTOF2014 show.

Since then, even though AM technology has been developing, Yamazaki Mazak has been trying various methods to optimize for specific target workpieces based on their features. We would like to introduce case examples including new technology which will be introduced at JIMTOF 2018 this time.

Keynote Speech : “Mineral casting for Mechanical Engineering”

Mr. Fabian Werner , CEO, RAMPF (Taicang) Co.,Ltd (Germany)



Providing manufacturers of production machinery basic knowledge about alternative machine bed material. In addition to the application relevant properties of mineral casting, this includes information and guidelines on the material specific design and manufacture of solid cast machine beds and machine bed components.

Mineral casting is suitable for particularly challenging applications in all areas of highly dynamic production engineering from machine tools and machinery for electronics, solar modules to laser applications. The focus is on machine beds and substructures like load bearing components of a machine. It will give an overview how material specific design, engineering and application can help deliver the key static, dynamic, thermal, acoustic and aesthetic functions of machine beds optimally.

Speech : “The Newest Machine Tool Structural Design and Processing Technology Accomplishing Super Precision Processing”

Mr. Ryota Shindo, Director/General Manager, Engineering Dept., Nagase Integrex Corp. (Japan)



In general, the main body structure of machine tools have a combination of square blocks and it keeps up appearance better by covering with decorative covers. In other words, a machine tool with a beautiful structural appearance is very rare. On the other hand, we feel many of architectures structurally beautiful beyond the age, for example, the Sagrada Familia, the Kintai Bridge and the Eiffel Tower. It' s because they are structurally optimized by combining reasonable curves.

This time, upon development of cutting edge ultra-precision machine, we pursued an ideal structure without being bound by conventional practices and challenged a completely new structure using by topology and shape optimization methods. As a result, we achieved a structural design that secures overwhelming strength, eliminates structural waste and improves the dynamic accuracy drastically.

“Add a new page to the history of machine tools.” The enthusiasm of our development team is reached to cooperating companies and we coherently united to accomplish the ideal structure with the beautiful appearance which was thought impossible. Some development instances will be introduced in the talk.

Speech : “Introduction of latest gear cutting technology, the Super Skiving System”

Mr. Yukihisa Nishimura, Director, Engineering Headquarters, Mitsubishi Heavy Industries Machine Tool Co., Ltd. (Japan)



In this lecture, an explanation of the latest gear cutting technology, Super Skiving System, will be made. Skiving cutting for gears, invented over 100 years ago, is being widely noticed for internal gear production. Although effective for the cutting of internal gears with high accuracy, issues with tool life has limited its use at actual production. The usual skiving cutting uses gear-shaped tools and uses the same teeth for roughing and finish cutting. The newly developed Super Skiving cutting method uses specially designed tools with separate teeth for rough and finish cutting for greatly extended tool life. Powerful simulation software was developed to aid in the design of the tools and cutting conditions. Together with the newly developed machine to take advantage of the new tool, we were able to achieve tool life of more than five times greater than conventional tools with the same accuracy and efficiency.

In this lecture, the explanation of machining principle of Super Skiving and cutting simulation software will be made. Also, necessary machine structure and structural design suitable for Super Skiving cutting technology will be introduced.

Speech : “ULTRASONIC machining:advanced technology for challenging materials”

Dr. Jens Ketelaer, Technical Site Director ULTRASONIC, SAUER GmbH (Germany)



Cost-efficient machining of advanced materials is very challenging for the applied machining technologies. Among the hybrid processes, the ultrasonic-assisted machining has been established especially for grinding hard and brittle materials. Lower process forces to the grinding tool are the basis of several positive effects depending on the application case like increased productivity, reduced surface damages at the workpiece or reduced tool wear. Some of the mentioned effects can be also observed using geometrically defined cutting edges, e.g. when milling or drilling composite materials or heat-resistant super-alloys.

Meanwhile, development efforts are directed towards enabling different oscillation modes besides the widely used linear oscillation in industrial applications.

The presentation gives an overview on the ULTRASONIC technology in machine tools. It presents the present state of technology and gives an outlook based on recent results from research projects in this field.

II. Poster Session

Poster session conducts discussions and technical exchange among researchers and engineers of machine tools by widely announcing the results of advanced research and development on machine tool from universities, technical colleges, public laboratories by poster format. In this session, all visitors of JIMTOF have an opportunity to discuss directly with presenter of poster session.

Briefing Assistants of each exhibitor shall provide explanations about research contents on 1 to 4 pm, November 3 and 4, 2018.

Period Six days from November 1st (Thu.) through November 6th (Tue.), 2018,

Venue East Hall 7, Tokyo Big Sight

Participants The participants shall be limited to the teaching staff members and researchers of universities, technical college, public laboratories, etc.

Applicable theme for the poster session

Research and development themes in the area as follows:

- Machine tool and elements (design procedure, thermal deformation, structural analysis, spindle design, feed drive system design, etc.)
- Machining technologies and machining phenomena (cutting, grinding, special machining, Additive Manufacturing, micro machining, chattering, etc.)
- System and control technology (CNC, CAM, Intelligent System, etc.)
- Tools, Tooling System for machine tools (Tools, Accessories, etc.)
- Measuring and evaluation technology (surface condition, configuration, performance evaluation technology, accuracy evaluation, monitoring technology, sensor technology, etc.)
- Production system and their components (FMS, Robotic Cell and technology related with FA)
- Other technology related with Machine tools

Briefing Assistants

Briefing Assistants of each exhibitor shall provide explanations about research contents on 1 to 4 pm, November 3rd and 4th, 2018.

Conference Secretariat

Secretary of IMEC, Technical Department, Japan Machine Tool Builders' Association (JMTBA)
3-5-8, Shibakoen, Minato-ku, Tokyo 105-0011, Japan Tel: +81-3-3434-3961 Fax: +81-3-3434-3763
E-Mail: IMEC18@jmtba.or.jp URL : <http://www.jmtba.or.jp/english/events/1543>

List of Participants and Research Theme

A. Machine tool and elements

- **Graduate School of Engineering, Kobe University**
Shape Evaluation Technique Based on Human Visual Characteristics
- **Nakao Lab., Dept. of Mechanical Engineering, Kanagawa University**
Thermal stability of machine tool spindle
- **Chubu University, Dept. Mechanical Engineering, Adachi Lab.**
Improving Dynamic Balance Performance of Hollow Shaft for High-speed Machining Spindle by A Novel Deep Hole Internal Grinding Technology
- **TANABE Labo., Nagaoka University of Technology**
Development of modelling technique for CAE simulation regarding FRTP structure
- **Murayama Lab., Dept. of Mechanical Engineering Tokai University**
Development and practical evaluation of ultra-compact NC machine aimed at "Tabletop Sized Factory"
- **Sugita Laboratory, Department of Mechanical Engineering, School of Engineering, The University of Tokyo.**
New machine tool structure with composite material for high rigidity and high damping capacity
- **Shinno Lab., FIRST, Tokyo Institute of Technology**
Gravity compensation mechanism with magnetic fluid seal for vertical positioning
- **Yoshioka Lab., FIRST, Tokyo Institute of Technology**
Fine milling by magnetostrictive actuator-driven tool servo
- **Tanaka Tomohisa Lab., Department of Mechanical Engineering, School of Engineering, Tokyo Institute of Technology**
Development of Structure Integrated Passive damper (P-DACS)

B. Machining technologies and machining phenomena

- **Machining, Measurement and Control Lab., Dept. of Micro Engineering, Kyoto University**
Thin-walled workpiece machining using on-machine measurement of workpiece dynamic stiffness
- **Kuriyagawa · Shimada Lab. / Mizutani Lab., Tohoku University**
The exploration of the frontiers of metal additive manufacturing -High value manufacturing by creating functional interface.
- **Kunieda Lab., Dept. of Precision Engineering, The University of Tokyo**
Applications of Electrochemical Machining (ECM) to Precision and Micro Machining
- **Sugita Laboratory, Department of Mechanical Engineering, School of Engineering, The University of Tokyo.**
Ultrafast and precision laser processing of glass by locally exciting electrons
- **Tanaka Tomohisa Lab., Department of Mechanical Engineering, School of Engineering, Tokyo Institute of Technology**
Modification of Metal Structure Based on Burnishing Processing
- **Lee & Yamada Lab., Dept. of Mechanical Engg., College of Science & Technology, Nihon University.**
On machine evaluation of grinding wheel surface conditions by image processing
- **Manufacturing system and processing lab., Dept. of Mechanical Engineering, Tokyo Denki University**
Internal polygon machining with double rotations kinematics
- **Sasahara lab., Mechanical systems engineering, Tokyo University of Agriculture and Technology**
Wire and arc based additive manufacturing
- **Sasahara lab., Mechanical systems engineering, Tokyo University of Agriculture and Technology**
Optimization of tool posture to decrease tool wear on turn milling

- **Kakinuma Koike Lab., Dept. of System Design Engineering, Keio University**
Foam stainless fabrication with direct energy deposition applying titanium hydride
- **Laboratory for Precision Machining and Nano Processing (PMNP Lab)**
Ultraprecision machining of roller molds with wavy microstructures by using a slow tool servo
- **Laboratory for Precision Machining and Nano Processing (PMNP Lab)**
Surface flattening and nanostructuring of steel by laser irradiation
- **Research Center for Advanced Manufacturing Technology (RAMT), Institute of Science and Engineering, Kanazawa University**
Drastic reduction of grinding fluid flow in cylindrical plunge grinding by means of contact-type flexible brush-nozzle
- **Manufacturing Systems Lab. Faculty of Mechanical Engineering, Institute of Science and Engineering, Kanazawa University**
Visualization of melt pool behavior during laser beam irradiation in powder bed fusion process
- **Manufacturing & Process Lab, Dept. of Mech. Eng. Saitama University**
Fabrication of Complicated Shapes by Wire and Arc-based Additive Manufacturing
- **TANABE Lab., Nagaoka University of Technology**
Forced cooling technology of machine tool using mist of strong alkaline water
- **Precision machining and mechanism Lab., Dept. of Mechanical Engineering, Nagaoka University of Technology**
Machining technology by utilizing ultrasonic vibration
- **Graduate School of Natural Science and Technology, Okayama University**
Surface Finishing of Metal Mold by Large-area Electron Beam Irradiation
- **Manufacturing Engineering Lab., Graduate School of Natural Science and Technology, Okayama University**
Abrasive Jet Micropatterning with Profile Control
- **Graduate School of Natural Science and Technology, Okayama University**
High-efficiency and High-quality Laser Welding of Difficult-to-weld Materials
- **Industrial Engineering Lab., Dept. of Mechanical Science and Engineering, Kogakuin University**
Precision Complex Shape Machining by Rotation Axis Grant Wire-EDM
- **Chiba Advanced Technology & science Lab., Chiba University**
Study on crack propagation behavior and fracture surface morphology during wheel scribing of glass sheet
- **Machining Process & System Lab., Dept. of Mechanical Science, Graduate School of Technology, Industrial and Social Sciences, Tokushima University**
Hole Fabrication inside a Hole by Means of Electrical Discharge Machining, and Enlargement of its Diameter and Improvement of its Straightness
- **Ultraprecision machining Lab., Mechanical Engg., Chubu University**
Precision machining of PCD scribing wheel
- **Ultraprecision machining Lab., Mechanical Engg., Chubu University**
Ultraprecision cutting of electronless Ni-P mold by oblique cutting
- **Itoh lab., Dept. of Mechanical Engineering, Ibaraki University**
ELID grinding applying grinding fluid containing fine bubbles
- **Itoh lab., Dept. of Mechanical Engineering, Ibaraki University**
Development of grinding wheels made of fibers containing abrasive grains using twin nozzle PELID
- **SHINOZUKA Lab., Dept. of Mechanical Engineering, Yokohama National University**
Study on the improvement of the cutting performance of low-rigidity elastomers under room temperature
- **ONO Lab., Dept. of Mechanical and Precision Systems, Teikyo University**
Crack less free form cutting on the brittle materials by the edge serrated ball endmill
- **Machining Lab., Dept. of Science and Engineering, Meiji University**
Study on improving efficiency of cutting by discharge assist
- **Ogawa Lab., Faculty of Science and Technology, Ryukoku University**
High quality shoulder cutting for vertical wall using a small diameter end-mill with left hand helical tool with right hand cut
- **Ninomiya lab., Dept. of mechanical engineering, Nippon Institute of Technology**
Continuous sequential processing combining cutting and forming

C. System and control technology

- **The University of Electro-Communications, Graduate School of Informatics and Engineering, Dept. of Mechanical Engineering and Intelligent Systems**
Development of Basic Software Technique for Manufacturing Using Multi-Axis Controlled Machine Tool and Industrial Robot
- **Yoshioka Lab., FIRST, Tokyo Institute of Technology**
Tool path optimization for multi-axis robotic milling system
- **Sophia university, Precision Engineering Research Group**
Development of press molding preform design and fabrication method with unfolded diagram for CFRP

- **ManMachine Lab., Dept. of Natural Science & Technology, Kanazawa University**
The Present and Future of Open CAM Kernel "Kodatuno"
- **Takeuchi Lab., Dept. of Mechanical Eng., Chubu University**
Automatic Polishing of Organ Model Made by 3D-Printer
- **Takeuchi Lab., Dept. of Mechanical Eng., Chubu University**
Development of Turning CAM System for Variable Pitch Screw
- **Graduate School of Engineering, Kobe University**
Automatic Tool Path Generation Applying Skilled Engineer's Know-How
- **Manufacturing & Process Lab, Dept. of Mech. Eng. Saitama University**
Fast Tool Path Generation Algorithm for Giga polygonal shape
- **Manufacturing Engineering Lab., Graduate School of Natural Science and Technology, Okayama University**
Accuracy improvement of internal grinding by the intelligent system
- **Nakamoto Lab., Dept. of Mechanical Systems Engineering, Tokyo University of Agriculture and Technology**
Process Planning System for Multi-axis and Multi-tasking Machine Tools
- **Nakamoto Lab., Dept. of Mechanical Systems Engineering, Tokyo University of Agriculture and Technology**
Dexterous Machining based on topology optimized Workpiece Shapes
- **Suwa Laboratory, Department of Mechanical Engineering, Setsunan University**
Development of Measurement and Control Platform for Green and Smart Manufacturing
- **Morimoto Lab., Dept. of Engineering, Kanazawa Institute of Technology**
Direct control of machine tools using 3D-CAD
- **Morimoto Lab., Dept. of Engineering, Kanazawa Institute of Technology**
Study on cutting of non-axisymmetric three dimensions curved surface
- **Tokyo University of Science**
Simulation to Evaluate Specific Energy Consumption in Production Line Based on IoT
- **Tokyo University of Science**
Decision support for energy-saving idle production facility operations based on IoT environment

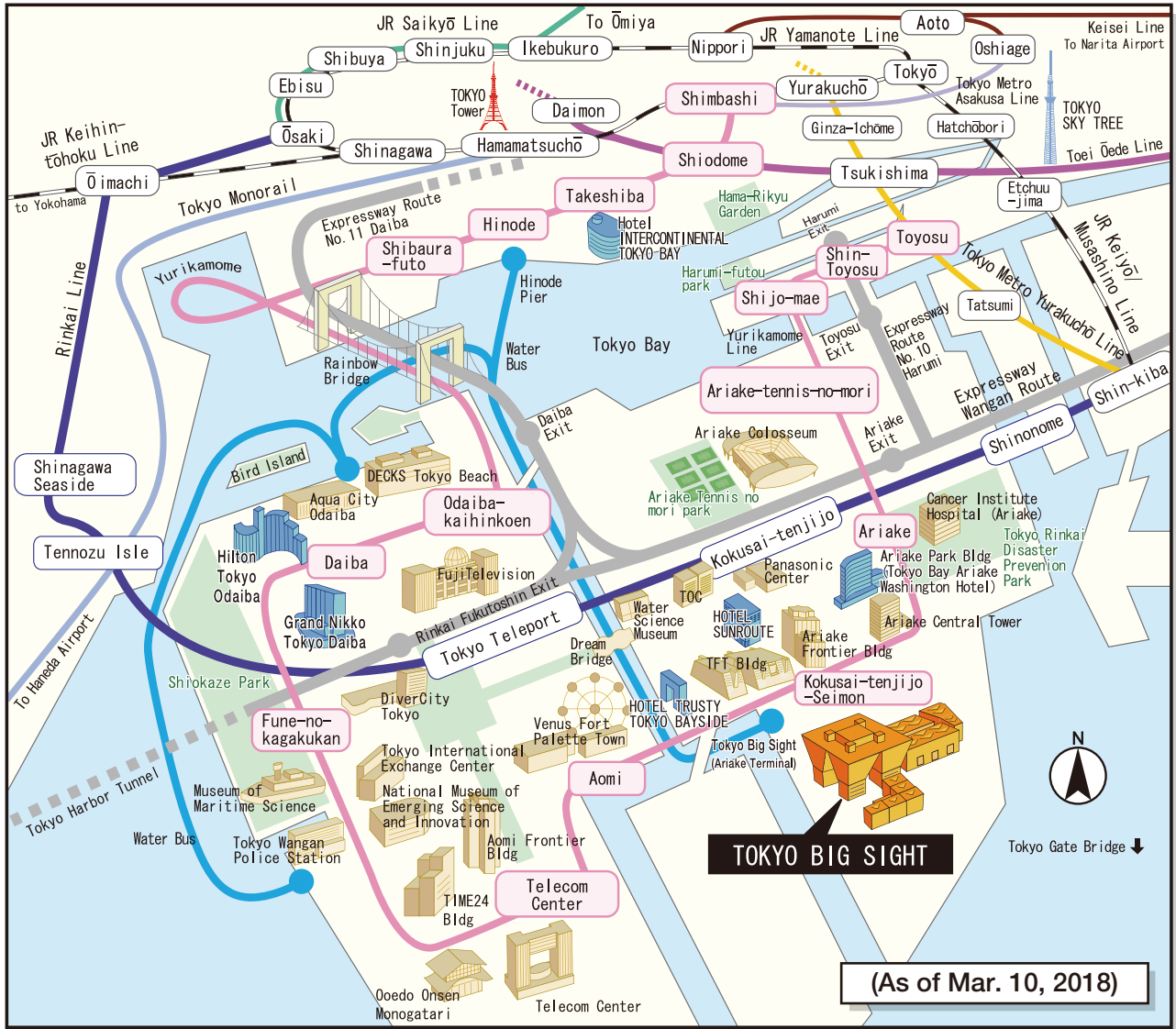
D. Measuring and evaluation technology

- **Mechanical Design and Systems Laboratory, Dept. of Mechanical System Engineering, Hiroshima University**
Machining tests to evaluate machine tool thermal deformation proposed to ISO 10791-10
- **Mechanical Design and Systems Laboratory, Dept. of Mechanical System Engineering, Hiroshima University**
Volumetric error calibration for an industrial robot by using a laser interferometer
- **Precision Engineering Lab., Osaka Institute of Technology**
S-Shaped Test on 5-axis Machining Center
- **Shinno Lab., FIRST, Tokyo Institute of Technology**
Robust profile measurement based on hyper multi point method
- **Micro and Nano Engineering Lab. (HASE Lab.), Dept. Mechanical Engineering, Institute of Technology**
Fundamental Study on AE Sensing for Intelligent Machine Tools
- **YAZAWA & OTSUBO Lab., Grad. Sch. Of Eng. Nagasaki Univ.**
In-Line Inspection of Edge Detection
- **Murayama Lab., Dept. of Mechanical Engineering Tokai University**
Development of new screw loosening inspection system using ultrasound
- **National Institute of Technology, Sasebo college**
Evaluating a grinding tool using a deep learning

E : Tools, Tooling System for machine tools

- **Saito Lab., College of Engineering, Nihon University**
Study on supporting method of thin parts
- **Manufacturing Engineering Laboratory**
Tool design and simulation technology for chatter free milling
- **Tsuchiya Lab., Dept. of Mechanical and Biofunctional Systems Institute of Industrial Science, the University of Tokyo**
Development of fixed abrasive wire tool for mirror cutting
- **Ritsumeikan University**
Development of innovative lapping/polishing tools focused on retention of abrasives
- **Photonics for Material Processing Lab., The Graduate School for the Creation of New Photonics Industries**
Structured PCD end mill and applications
- **Sophia university, Precision Engineering Research Group**
Temperature Measurement of Burnishing process by Electro-conductive Diamond tool

● Access to TOKYO BIG SIGHT ( : Hotels)



Rinkai Line

Shin-kiba (JR, Subway)	Approx. 5minutes	Kokusai-tenjiijo	Approx. 7-minutes walk from Kokusai-tenjiijo Sta.	Tokyo Big Sight
Osaki (JR)	Approx. 13minutes			

* Direct service at Osaki to JR Saikyo Line
 Kokusai-Yenjiijo Sta. → JR Shibuya Sta. (Approx. 20minutes)
 JR Shinjuku Sta. (Approx. 25minutes)
 JR Ikebukuro Sta. (Approx. 31minutes)

Yurikamome

Shimbashi (JR, Subways)	Approx. 22minutes	Kokusai-tenjiijo -Seimon	Approx. 3-minutes walk from Kokusai-tenjiijo -Seimon Sta.	Tokyo Big Sight
Toyosu (Subway)	Approx. 6minutes			

Toei Bus

Tokyo Sta. Yaesu Exit & Marunouchi South Exit (JR)	Approx. 40minutes	Tokyo Big Sight
Monzennakacho (Subway)	Approx. 30minutes	

Airport Bus (Limousine Bus, Keihin Kyuko Bus)

Haneda Airport	Approx. 25minutes	Tokyo Big Sight
Narita Airpost	Approx. 60minutes	Tokyo Bay Ariake Washington Hotel (3 minutes walk)

Please note that some buses may only be available during times of events being held

Express Bus (Keihin Kyuko Bus)

Yokohama Sta. (East Exit, JR)	Approx. 50minutes	Tokyo Big Sight
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Water Bus

Hinode Pier	Approx. 30minutes	Tokyo Big Sight
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*Approx. 7-minutes walk from JR Hamatsucho Sta. *non-regular services as of July 2015

Car

From center of Tokyo	Expressway Route No.11 Daiba	Approx. 5 minutes from Daiba Exit
Yokohama/Haneda	Expressway Wangan Route	Approx. 5 minutes from Rinkai Fukutoshin Exit.
	Expressway Route No.10 Harumi	Approx. 5 minutes from Toyosu Exit
From Chiba/Kasai	Expressway Wangan Route	Approx. 5 minutes from Ariake Exit.
	Expressway Route No.10 Harumi	Approx. 5 minutes from Toyosu Exit



■ Contact

**Secretary of IMEC, Technical Department,
 Japan Machine Tool Builders' Association (JMTBA)**

3-5-8, Shibakoen, Minato-ku, Tokyo 105-0011, Japan

Tel: +81-3-3434-3961 Fax: +81-3-3434-3763

E-Mail: IMEC18@jmtba.or.jp URL: <http://www.jmtba.or.jp/english/events/1543>

