The 16th International Machine Tool Engineers' Conference

16th IMEC

The 16th International Machine Tool Engineers' Conference

Innovation to Create the Future
—Advanced Machine Tool Technologies—

Oral Session

October 31st (Fri.) ▸ November 1st (Sat.), 2014

Venue: Reception Hall A, Tokyo Big Sight

Poster Session

October 30th (Thu.) ▸ November 4th (Tue.), 2014

Venue: East Hall 3, Tokyo Big Sight

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

RING!RING! プロジェクト 競輪の補助事業

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

On the hosting of the 16th International Machine Tool Engineers' Conference

Over many long years since the first time it was held in 1984, the International Machine Tool Engineers' Conference (IMEC) hosted by the Japan Machine Tool Builders' Association has contributed to the development of machine tool technology. This year too, we hope to draw together under a single roof of engineers, researchers, users and dealers from Japan and overseas, and provide a forum for them to share the latest information on machine tool technology.

The overall theme of the 16th IMEC will be "Innovation to Create the Future—Advanced Machine Tool Technologies," accompanied by a keynote session entitled "Monozukuri Strategies in EU, USA and Japan," ("monozukuri" is the Japanese term for skilled manufacturing) and three further technical sessions. These three sessions will be composed of "Impact of Additive Manufacturing," "Advanced Materials for Machine Tool Structures," and "Intelligent Machine Tools in the Next Generation." All of the sessions have been structured so that the technical topics will be of profound interest to technicians and researchers who are involved in machine tool technology. The following is a simple introduction to each of the sessions.

Monozukuri Strategies in EU, USA and Japan
The European nations and America are formulating all sorts of technical strategies, and taking initiatives in the areas of boosting the international competitiveness of the Monozukuri industry, creating new innovations through industry-academia-government collaborations, and nurturing human resources. This session will feature prominent specialists from within and outside Japan who will talk about the actual effects on the Monozukuri industry of theses technical strategies.

Impact of Additive Manufacturing
In recent years additive manufacturing (AM), typified by 3D printers, has been closely watched for its response to value-added processing. As well as presenting the latest research findings on what can be described as the new machine tool technology of AM, the session will also cover future developments in the aircraft industry, metal molding industry, medical equipment industry and a wide range of other industries.

Advanced Materials for Machine Tool Structures
There are increasing demands with regard to the functions and structure of machine tools, and it has been suggested that switching structural materials is a key technology in achieving further performance improvements in machine tools. This session will introduce research findings and case studies of applications of an array of advanced materials to machine tool structure.

Intelligent Machine Tools in the Next Generation
In order to construct a manufacturing environment for the future, the increased intelligence of machine tools is absolutely imperative. Attempts are underway in Japan and overseas to incorporate the latest elemental technology, particularly sensor and software technologies, to try to make a reality of new intelligent machine tools. In addition to research finding presentations on the latest in intelligent machine tools, this session will also cover the essential elemental technologies.

We expect the 16th IMEC to provide a forum where lively exchanges of information will take place between all the participants, the oral session presenters and poster session presenters, and also hope that the Conference will lead to the further progress of the manufacturing industry.

Hidenori SHINNO, Prof. Dr.
Chairman of Organizing Committee of 16th IMEC, JMTBA
Precision and Intelligence Laboratory
Tokyo Institute of Technology

Outline

Name

The 16th International Machine Tool Engineers' Conference (IMEC)

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 16th IMEC 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 Tokyo Chapter, Machine Tool Foundation, Japan Society for the Promotion of Machine Industry, Advanced Machining Technology & Development Association, Machine Tool & Related Products Committee*, Japan Forming Machinery Association, 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

*Machine Tool & Related Products Committee
Japan Machine Accessory Association, Japan Precision Machine Association,
Japan Gear Manufacturers Association, Japan Fluid Power Association
Japan Grinding Wheel Association, Japan Cemented Carbide Tool Manufacturers' Association
The Japan Solid Cutting Tools' Association, Industrial Diamond Association of Japan
Japan Precision Measuring Instruments Manufacturers Association,
Japan Optical Measuring Instruments Manufacturers' Association, Japan Testing Machinery Association

Organizing Committee

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Mr. Martin Kapp, Chairman, VDW (Germany)

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 “Innovation to Create the Future－Advanced Machine Tool Technologies－” 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	October 31st (Fri.) - November 1st (Sat.), 2014
Venue	Reception Hall A (Ground floor), Tokyo Big Sight
Maximum Number of Participants	300 (on a first come, first served basis.)
Main Theme	Innovation to Create the Future－Advanced Machine Tool Technologies－ Keynote Theme: Monozukuri Strategies in EU, USA and Japan Technical Theme 1: Impact of Additive Manufacturing Technical Theme 2: Advanced Materials for Machine Tool Structures Technical Theme 3: Intelligent Machine Tools in the Next Generation

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 22nd (Wed.), 2014

Method for Registration:

1: Please access and apply to the IMEC Website for registration or Please fill out the attached application form and send to Secretariat 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" about 2 weeks after confirmation of payment.
4: Please submit the "Registration Card" to the registration desk on the day of IMEC.

Conference Secretariat:

Secretariat of IMEC, Technical Department,
Japan Machine Tool Builders' Association (JMTBA)
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E-Mail: IMEC16@jmtba.or.jp URL：http://www.jmtba.or.jp/english/events/1543/

Cancellations:

If you want to cancel your registration, please inform the Secretariat 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. 22.
All refunds will be made after the conference.

(date received)	(rate of refund)
on and before Oct. 24	50%
after Oct. 25	0%

Program for Oral Session October 31st

Opening Address	**09:10 ～ 09:20**	Mr. Yoshimaro Hanaki, Chairperson of Japan Machine Tool Builders' Association Prof. Dr. Hidenori Shinno, Chairperson of Organizing Committee

Keynote Session

Theme : **Monozukuri Strategies in EU, USA and Japan**

Chairperson：Prof. Dr. Hidenori Shinno (Tokyo Institute of Technology)
Co-Chairperson：Mr. Tetsuro Shibukawa (Mitsui Seiki Kogyo Co.,Ltd.)

09:20 ～ 09:30	Chairperson's Address
09:30 ～ 10:20	**【Keynote Speech】** **"Strategy for Innovation in Japanese Manufacturing Industry"** Mr. Shoji Watanabe, Director, Research and Development Division, Ministry of Economy, Trade and Industry (METI)（Japan）
10:20 ～ 10:40	Coffee Break
10:40 ～ 11:30	**【Keynote Speech】** **"The Manufacturing Strategy in EU"** Prof. Dr. Engelbert Westkämper, University Stuttgart (Germany)
11:30 ～ 12:20	**【Keynote Speech】** **"The Future of Digital Manufacturing"** Prof. Dr. Thomas Kurfess, Georgia Institute of Technology (U.S.A.)
12:20 ～ 12:30	Q & A for Keynote session
12:30 ～ 13:30	Lunch Break

Technical Session 1

Theme : **Impact of Additive Manufacturing**

Chairperson：Prof. Dr. Masanori Kunieda (The University of Tokyo)
Co-Chairperson：Mr. Koichi Amaya (Matsuura Machinery Corp.)

13:30 ～ 13:40	Chairperson's Address
13:40 ～ 14:30	**【Keynote Speech】** **"Additive Manufacturing: Multi-Processes & Multi-Application with great Challenges and Chances "** Prof. Dr. Gideon N. Levy, TTA Technology Turn Around (Switzerland)
14:30 ～ 15:15	**【Technical Speech】** **"Additive Manufacturing in the Aerospace Industry"** Prof. Dr. David Wimpenny, The Manufacturing Technology Centre (UK)
15:15 ～ 15:35	Coffee Break
15:35 ～ 16:20	**【Technical Speech】** **"Practical use of Additive Manufacturing in the medical equipment industry"** Mr. Yukinori Urushisaki, General Manager, Sales Support Engineering Division, Matsuura Machinery Corporation (Japan)
16:20 ～ 17:05	**【Technical Speech】** **"Current status of AM use in dental industry"** Mr. Shizuo Higuchi, Managing Director, Manager of Production Management Dept., Wada Precision Dental Laboratories Co., Ltd. (Japan)
17:05 ～ 17:15	Q & A for Technical Session 1

Technical Session 2

Theme : **Advanced Materials for Machine Tool Structures**

Chairperson：Prof. Dr. Tojiro Aoyama (Keio University)

Co-Chairperson：Dr. Makoto Fujishima (DMG MORI SEIKI Co., Ltd.)

09:00 ～ 09:10	Chairperson's Address
09:10 ～ 10:00	【Keynote Speech】 **"Advanced Materials for Machine Tool Structures"** Prof. Dr. Hans-Christian Möhring, Otto-von-Guericke-University Magdeburg (Germany)
10:00 ～ 10:45	【Technical Speech】 **"High speed, precision and quality machining of machine tools by adopting new material"** Mr. Yoshinori Nishiyama, Assistant Manager, Milling Dept., Machining Center Div., Sodick Co., Ltd. (Japan)
10:45 ～ 11:05	Coffee Break
11:05 ～ 11:50	【Technical Speech】 **"Characteristics of Machine Tools Using Lotus-Type Porous Carbon Steel and Damping Property"** Dr. Makoto Kashihara, Material Laboratory Department, Material Technology Section, Material Technology Team, DMG MORI SEIKI Co., Ltd. (Japan)
11:50 ～ 12:35	【Technical Speech】 **"Composites in Machine Tool Applications"** Mr. Ondřej Uher, CompoTech Plus spol s r.o. (Czech)
12:35 ～ 12:45	Q & A for Technical Session 2
12:45 ～ 14:00	Lunch Break

Technical Session 3

Theme : **Intelligent Machine Tools in the Next Generation**

Chairperson：Prof. Dr. Mamoru Mitsuishi (The University of Tokyo)

Co-Chairperson：Dr. Atsushi Ieki (Okuma Corp.)

14:00 ～ 14:10	Chairperson's Address
14:10 ～ 14:55	【Keynote Speech】 **"Advanced Technologies to Achieve Intelligent Machine Tool"** Prof. Dr. Keichi Shirase, Kobe University (Japan)
14:55 ～ 15:30	【Technical Speech】 **"Machine Monitoring System (MMS) Technology for intelligent machine tool"** Mr. Norimasa Koyanagi, MIDA Group Manager, Sales Engineering Dept., Marposs KK (Japan)
15:30 ～ 15:50	Coffee Break
15:50 ～ 16:25	【Technical Speech】 **"Development of Intelligent functions on Machine tools"** Mr. Yasuhiko Suzuki, Assistant General Manager, Electrical Design Dept., Engineering Headquarters, Yamazaki Mazak Corporation (Japan)
16:25 ～ 17:00	【Technical Speech】 **"Optimum feed control in grinding process and grinding burn detection technology"** Mr. Takayuki Yoshimi, Office Manager, Advanced Process Innovation R&D Dept. R&D Headquarters, JTEKT Corporation (Japan)
17:00 ～ 17:35	【Technical Speech】 **"Simulating the NC Program; It's About Validating the Process"** Mr. William Hasenjaeger, Product Marketing Manager, CG Tech (U.S.A.)
17:35 ～ 17:45	Q & A for Technical Session 3

Abstract of Speech

Keynote Session

Monozukuri Strategies in EU, USA and Japan

【Keynote Speech】 **"Strategy for Innovation in Japanese Manufacturing Industry"**

Mr. Shoji Watanabe, Director, Research and Development Division, Ministry of Economy, Trade and Industry (METI)（Japan）

Japanese manufacturing industries have to face the problems such as the environmental issue and the energy problem, the decreasing birthrate and the aging population, the fusion of manufacturing industries and service industries and the overseas expansion by using and developing various technologies.
METI(Ministry of Economy, Trade and Industry) has supported R&D in many fields and technological improvements by small & medium-sized enterprises and start-up companies. METI is also promoting R&D and deployments of robots to improve productivities. In addition, METI plans to make AIST enforce "bridging" between innovative technological seeds and their industrializations.
On the other hand, CAO(Cabinet Office) has started SIP(Cross-ministerial Strategic Innovation Promotion Program) and ImPACT(Impulsing PAradigm Change through disruptive Technologies) since 2014. Innovative Design/Manufacturing Technologies Project—one of the 10 projects of SIP is trying to create and realize new patterns of innovations by regional manufactures. In this paper, the outline of SIP and this project is introduced.

【Keynote Speech】 **"The Manufacturing Strategy in EU"**

Prof. Dr. Engelbert Westkämper, University Stuttgart (Germany)

Manufacturing industries are one of the economic engines of Europe, but their relation to the GDP was going down by more than 30 % in the last 40 Years. It is the core objective of European Manufactures to increase growth under the aspects of megatrends and global sustainable development. The European Technology platform ManuFuture developed visions, strategic agendas and roadmaps towards manufacturing 2030 to activate the technical innovation potential for global competition and sustainability.
The European Commission started the Program of Factories of the Future with topics of cooperative industrial research like adaptive or intelligent manufacturing. Beside of that, national and regional initiatives have been started to activate the potential of regional synergies - Called "Factories with regional Roots" – and ICT-For Manufacturing. Bridging the gap between the digital and real world is one of the special actions in Germany, which reflects to the revolutionary change from traditional IT to networking and sensor integration in the WEB.
In this presentation objectives and major topics of the manufacturing strategic intelligence are presented.

【Keynote Speech】 **"The Future of Digital Manufacturing"**

Prof. Dr. Thomas Kurfess, Georgia Institute of Technology (U.S.A.)

Manufacturing has been identified as President Obama's number one priority, as it is critical for the economic prosperity and national security of the United States of America. Dr. Thomas Kurfess, who served as the Assistant Director for Advanced Manufacturing in the Office of Science and Technology Policy in the Executive Office of the President of the United States of America, was the technical lead for the President on the current federal efforts related to manufacturing. One key area within manufacturing is the utilization of Cyber Physical Systems, which is currently available and rapidly expanding. Professor Kurfess will discuss how s Cyber Physical Systems can be employed to move manufacturing completely into a digital domain by employing digital models, in conjunction with readily available High Performance Computing (HPC) platforms (e.g., multi-core, GPU, and cloud) to enable rapid process and production planning for use in both cost estimation/quoting and, ultimately, production and verification. For cloud manufacturing, this will enable even the smallest and least sophisticated manufacturing node in the cloud to rapidly respond to large number of quote requests for complex parts utilizing low cost cyber infrastructure resources that are currently available and expanding on a daily basis.

Technical Session 1

Impact of Additive Manufacturing

【Keynote Speech】 **"Additive Manufacturing: Multi-Processes & Multi-Application with great Challenges and Chances"**

Prof. Dr. Gideon N. Levy, TTA Technology Turn Around (Switzerland)

Since several years the use Rapid-Prototyping is considered as state of the art in the product develop cycle. The community is motivated for Additive Manufacturing. The first recent ASTM standard F 2792 defines it as: "Additive manufacturing (AM) is a process of joining materials to make objects from 3D model data, usually layer upon layer, as opposed to subtractive manufacturing methodologies"

The AM systems open up, never been before, potentials. "Complexity for Free" a near to unlimited geometrical freedom in plastics, metals and ceramics became possible. Moreover, the biomedical manufacturing with relevant Biomaterials and acellular tissue matrices is on the way. AM is application driven. In comparison to the SM or traditional manufacturing AM are a family of technologies with high degree of interaction between System and Material.

The presentation will describe the state of the art of the Additive manufacturing on the way to industrialisation. The AM are considered today as strategic technologies Challenges and bottlenecks as well as success stories and use in praxis. Paradigm changers for mass manufacturing of „customized products"in many industry sectors are predicted. Emphasis will be on the link to material science and options as Gradual Materials, Digital Materials etc. and resulting challenges and opportunities as well as innovation potentials.

【Speech】 **"Additive Manufacturing in the Aerospace Industry"**

Prof. Dr. David Wimpenny, The Manufacturing Technology Centre (UK)

Additive Manufacturing (AM) offers unrelieved flexibility in terms of part geometry, material composition and production volumes. It could revolutionize the aerospace sector, enabling highly complex, lightweight parts to be produced with limited material waste. Despite the clear potential, until recently AM has been largely restricted to the production of prototypes and components for rig testing. However, the move towards increasingly complex, thin walled parts, manufactured from difficult-to-machine materials is forcing the aerospace sector to embrace the widespread use of the AM for "flying" production parts. Although the impact of AM on the machine tool sector could be profound it will not be immediate. The adoption of AM is being hampered by the need to qualify new processes and materials. Moreover, current AM technology is struggling to meet the required part quality, size and cost. Indeed, for the machine tool sector AM could present a significant opportunity, as well as a threat.

This paper will present the current state-of-the art in AM within the aerospace sector, the barriers to adoption and the potential opportunities for the machine tool sector.

【Speech】 **"Practical use of Additive Manufacturing in the medical equipment industry"**

Mr. Yukinori Urushisaki, General Manager, Sales Support Engineering Division, Matsuura Machinery Corporation (Japan)

In the medical field, high quality manufacturing technology for high-mix, low volume production is required. Compared with Western countries, Asian nations have a rapidly aging population, and Japan's rate of aging is the fastest of all the Asian nations. So in the future, technical developments in this field are urgent for Japanese companies. In high quality manufacturing technology for high-mix, low volume production, development of the component production technology for implants using Additive Manufacturing such as Electron Beam Melting technology and Selective Laser Melting technology has increased worldwide recently. Although this technology has been tested for dentistry and orthopedics, there are many problems of legal approval and licensing for practical use.

In this lecture, the merits and demerits are reported for the case of using Metal Laser Sintering Hybrid Milling Process which is one of the Additive Manufacturing processes used in the medical equipment industry.

【Speech】 **"Current status of AM use in dental industry"**

Mr. Shizuo Higuchi, Managing Director, Manager of Production Management Dept., Wada Precision Dental Laboratories Co., Ltd. (Japan)

Recently, CAD/CAM system has been developed remarkably in dental field. Many kinds of them have already been used in our country, and have been used effectively in several clinical site. On the other hand, resin layering fabrication technique by using 3D printer which is grabbed attention lately is utilized to fabricate bone model for implant simulation and surgical guide since the technique provides greater precision than before. Using the technique is essential in order to provide safety implant treatment.

Regarding prosthesis, the resin model is fabricated from CAD data which is changed from the design of crown, metal plate and so on. And The system which combined the resin model with conventional lost wax technique has started to be used to fabricate the prosthesis.

There are many kinds of 3D printer, but The system I'm introduce this time is Additive Manufacturing (AM) system which changes into metal directly from CAD data at a time under the circumstances used combination technique. We implemented AM at an early stage and we have applied AM to clinical case. I would like to report the present situation of dental technique used these AM system and the clinical cases related to crown and implant.

Technical Session 2

Chatter free technologies

[Keynote Speech] "Advanced Materials for Machine Tool Structures"

Prof. Dr. Hans-Christian Möhring, Otto-von-Guericke-University Magdeburg (Germany)

A variety of materials is used in modern machine tool structures, beginning with welded steel and cast iron, and ending up with polymer concrete, metal foams and carbon fiber reinforced plastics (CFRP). This speech gives an overview about developments, findings and applications of advanced materials for machine tools and machine tool components. Based on the fundamental characteristics of the different materials, design aspects and optimization methods are presented. Benefits and drawbacks of the material solutions are compared and discussed. Furthermore, potentials of new materials, which offer more degrees of freedom in the design and layout of structural properties, are assessed. Hybrid approaches of combined material application as well as function integrated materials and structures are introduced.

[Speech] "High speed, precision and quality machining of machine tools by adopting new material"

Mr. Yoshinori Nishiyama, Assistant Manager, Milling Dept., Machining Center Div., Sodick Co., Ltd. (Japan)

This presentation explains the adoption of CFRP and ceramics in a structure of machine tools improves machining performance related to high speed, high precision, and high quality.
The important point for electrical discharge machine; such as die-sinker EDMs and wire-cut EDMs, is how to flow electricity in between an electrode and a work piece. To do so, other area must be well insulated. The ideal material for insulator is ceramics. Ceramics features high rigidity and lightweight compared with steel. This characteristic realizes high speed, high precision, and high quality machining.
In machining centers, it dramatically improves machining speed, precision, and efficiency by adopting CFRP in originally developed XY axes orthogonal table and Z axis quill.
This introduces the features of machining performance in each machine.

[Speech] "Characteristics of Machine Tools Using Lotus-Type Porous Carbon Steel and Damping Property"

Dr. Makoto Kashihara, Material Laboratory Department, Material Technology Section, Material Technology Team, DMG MORI SEIKI Co., Ltd. (Japan)

Lotus-type porous carbon steel (lotus carbon steel) is expected such as a lightweight structural material. This paper describes the evaluation results of effectiveness when lotus carbon steel is used for the machine tools structure. Unlike widely known porous metals which have a lot of conventional spherical pores, lotus metals have a lot of cylindrical pores aligned in one direction like lotuses. Lotus metals can contribute to weight reduction of the machine structure without decreasing the strength. Lotus carbon steel using low-carbon steel which can be welded was developed for the machine tools structure. Long lotus carbon steel slabs with the size of cross-section of 20×100 mm 2 were fabricated ,and the moving body (saddle) of the machine tools by the special welding method was built. The machine tools with the saddle made of lotus carbon steel was measured static rigidity, dynamic behavior, cutting performance, and power consumption. The evaluation results of the saddle made of lotus carbon steel were compared with the conventional saddle made of casting iron. In addition, the latest experimental result of damping properties of parts which use lotus carbon steel is introduced as another application example.

[Speech] "Composites in Machine Tool Applications"

Mr. Ondřej Uher, CompoTech Plus spol s r.o. (Czech)

Thanks to availability especially of high modulus fibres with modulus over 700 Gpa, number of successful composite applications in machine tools is increasing. All aspects of successful composite design is presented, from basic introduction to fibres and matrixes and their comparisons to isotropic materials, laminating principles, environmental issues, dimensional stability, passive damping solutions, integrating principles, design optimization principles and finally on numbers of practical applications, advantages of composites are explained. Especially in detail, including dynamic response measurement, high speed spindle beam application and its comparison to steel design is presented.

Technical Session 3

Intelligent Machine Tools in the Next Generation

【Keynote Speech】 "Advanced Technologies to Achieve Intelligent Machine Tool"

Prof. Dr. Keichi Shirase, Kobe University (Japan)

Existing numerically controlled (NC) machine tools contribute to machining automation and improving accuracy by tool motion control that is specified in part programs. However, there are potential problems. For example, preparing trouble-free part programs is time and labor intensive, in-process control of the machining operation is impossible, and machining trouble is inevitable. To solve these problems, it is necessary to either rewrite the part program or generate instruction commands for machine control during the machining operation.
Several advanced technologies are introduced in this paper to achieve an intelligent machine tool. The process planning system introduced here can create various process plans, and the best one can be selected to achieve flexible machining operations. Digitizing the principle of copy milling, i.e., digital copy milling, can be used to control the NC machine directly using the 3D CAD data of the product shape. Experimental verification shows that direct machining without the need to prepare a part program, adaptive control, which changes the cutting conditions to keep the cutting load constant, and avoidance of tool breakage are possible. The milling process simulator with an integrated milling shape simulator and cutting force simulator could be used for milling process control and fault detection.

【Speech】 "Machine Monitoring System (MMS) Technology for intelligent machine tool"

Mr. Norimasa Koyanagi, MIDA Group Manager, Sales Engineering Dept., Marposs KK (Japan)

Marposs MMS sensor-less in-process monitoring system allows you to obtain data information that the machine has by oneself such as the motor powers of the spindle and each axis through high speed transmission field bus and to control various monitoring on dedicated software CTM.
Likewise, monitoring control is also possible on the data from other various sensors including vibration sensor and coolant-flow sensor so that in-process status could be checked during cutting process from various viewpoint.
Furthermore MMS system, which controls machine parameters and changes the suitable cutting feed-rate, makes it possible to keep the manufacturing on best conditions, contribute to the stability of the work quality and improve the production efficiency.
Data logging, which is one of MMS system's main advantages, enables you to control the traceability for each cutting processes and each work-pieces.
On this presentation for intelligent machine tools I will introduce each sensors, the examples of data controls and data analysis and others.

【Speech】 "Development of Intelligent functions on Machine tools"

Mr. Yasuhiko Suzuki, Assistant General Manager, Electrical Design Dept., Engineering Headquarters, Yamazaki Mazak Corporation (Japan)

What are the intelligent functions of machine tools?
Machine tool operators have been using their physical five senses for working with machine tools up to now. However, machine tools now have to run autonomously because of several reasons. Operators became older, there are few successors, it is difficult to hand skills on to the next generation. Machine tools are becoming complicated as five-axis machines or multi-tasking machines are widely used. There are many inexperienced operators in developing countries. Automation has made it possible for unmanned operation to become widespread.
The demand for machine tools is easy operation, and to make the required amount of accurate products efficiently. Machines and CNC systems have been developed to realize these demands. Especially, functions which have exceptional efficiency are called intelligent functions. This is unrelated to complication of the mechanisms. Yamazaki Mazak has always been developing intelligent functions for 33 years, since the introduction of the Mazatrol CNC in 1981. This paper introduces the essence of developing intelligent functions through the development history.

【Speech】 "Optimum feed control in grinding process and grinding burn detection technology"

Mr. Takayuki Yoshimi, Office Manager, Advanced Process Innovation R&D Dept. R&D Headquarters, JTEKT Corporation (Japan)

Grinding is required to achieve high machining accuracy and high surface integrity, as a finishing process of machining. This paper describes two sophisticated technologies in the grinding process. As a first technology, feed control system based on prediction of workpiece deflection is introduced. In the developed grinding system, actual depth of cut is settled to the targeted value by compensation of infeed amount based on a predicted deflection of workpiece. The experiment confirmed that it was possible to grind in around the same time without depending on workpiece stiffness. As the second technology, non-destructive detection for grinding burn with eddy current sensor is explained. The multi-frequency measuring method, which simultaneously measures the output of the eddy current sensor at two different frequencies, is proposed to avoid the effects of any variations in the basic material of an inspection object. The developed system showed higher sensitivity to grinding burn than the conventional nitric acid corrosion method, and capability of quantitative measurement.

【Speech】 "Simulating the NC Program; It's About Validating the Process"

Mr. William Hasenjaeger, Product Marketing Manager, CG Tech (U.S.A.)

When most people think of CNC machine simulation, where software reads NC code and moves a virtual machine, they think about machine motion and collision detection. But the real value is in process simulation; detecting errors and inefficiencies in the complete process. Simulating the process of a CNC machine's operation includes machine motion, but it also includes methods to validate the NC program syntax and logic, the operational strategies that are applied, and the final end result; the workpiece being created. The goal of a successful NC program is not machine motion, but proper and efficient creation of the workpiece.
This presentation will discuss the technical features of reading NC program code, emulating machine motion and detecting collisions. And will additionally talk about the challenges of simulating other CNC process features for machining material removal, composite layup, knife and water jet trimming, automated airframe assembly drilling and fastening and other additive processes.

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 1 and 2, 2014.

Period Six days from October 30th (Thu.) through November 4th (Tue.), 2014,

Venue Venue: East Hall 3, 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, rapid prototyping, 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 (technology related with FTL and FA)
- Application technology of Machine tools for the medical area

Briefing Assistants:

Briefing Assistants of each exhibitor shall provide explanations about research contents on 1 to 4 pm, November 1st and 2nd, 2014.

Conference Secretariat

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List of Participants and Research Theme

A. Machine tool and elements

■**Nontraditional Machining Laboratory, Graduate School of Natural Science and Technology, Okayama University**
Multi-wire EDM Slicing with Group Power Supplying Method

■**Shinno & Yoshioka Group, Precision and Intelligence Laboratory, Tokyo Institute of Technology**
High performance hydrostatic bearing using a variable inherent restrictor

■**Saito&Yoshioka Laboratory, Department of Mechanical and Control Engineering, Tokyo Institute of Technology**
Influence of Excitation Force on Damping of Rolling Guideway in Feed and Pitch Direction

■**Shinno & Yoshioka Group, Precision and Intelligence Laboratory, Tokyo Institute of Technology**
Direct measurement of relative distance between tool and workpiece using an evanescent light

■**Lee & Yamada Laboratory, Department of Mechanical Engineering,College of Science & Technology, Nihon University**
Machining Characteristics of a Newly Developed Electric Discharge Machine with a Generating Mechanism of Electrodes

■**Moronuki Lab., Tokyo Metropolitan University**
Surface Functionalization through Micro-structuring and Material Deposition

■**Machine Dynamics Lab., Graduate School of Engineering, Kobe University**
Development of an internal grinding spindle with a large length-to-diameter ratio

■**Morimoto & Takasugi laboratory, Dept. of Mechanical Engineering, College of Eng., Kanazawa Institute of Technology**
Development of Desktop machine tool

■**Ultra-Precision Machine System Laboratory, Department of Mechanical Engineering, Kanagawa University**
Design of high stiffness water hydrostatic bearing and development of displacement control system

■**Suwa Research Group, Setsunan University**
Energy-Efficient Operation of Machine Tools Based on Electric-Load Profiles

B. Machining technologies and machining phenomena

■**Takeuchi Laboratory, Department of Mechanical Engineering, Chubu University**
Dexterous Machining of Unstable Shape by Providing Support Pillars

■**Suzuki Labo., Chubu University**
High Efficient and High Precision Machining of Ceramics by Single Crystalline Diamond Milling Tool

■**Mitsuishi Sugita Laboratory, Department of Mechanical Engineering, School of Engineering, The University of Tokyo**
Laser-assisted Milling of Zirconia Ceramics

■**Kunieda Laboratory, Department of Precision Engineering, School of Engineering, The University of Tokyo**
Research on Electrolyte Jet Machining

■**Kuriyagawa・Mizutani Lab., Graduate School of Engineering, Tohoku University**
High Value Manufacturing for fabrication of functionality

■**Manufacturing System and Processing Laboratory, Tokyo Denki University**
Cutting Simulation of Aircraft Materials

■**Cats laboratory, Graduate school of Engineering, Chiba University**
Study on thrust-force-free turning

■**Manufacturing Engineering Lab., Graduate School of Natural Science and Technology, Okayama University**
Development of Rapid On-machine Measurement of Surface Finish in Cylindrical Grinding and Applied Technologies

■**Namba Laboratory, College of Engineering, Chubu University**
Shape Adaptive Grinding (SAG) of Freeform Ceramic Molding Dies

■**Suzuki Labo., Chubu University**
Ultraprecision Polishing of Optics by Magnetic Field Assisted Polishing - Polishing of Parabolic Mirror Made of Low Thermal Expansion Ceramic -

■**Tsuchiya lab. Institute of Industrial Science, University of Tokyo**
High precision machining using spiral tool of fixed abrasive grains

■**Kunieda Laboratory, Department of Precision Engineering, School of Engineering, The University of Tokyo**
Clarification of EDM Gap Phenomena Using Transparent Electrodes

■**Precision Lab., Dept. of Mechanical Eng., Osaka Institute of Technology**
Small Hole Open Processing of Zirconia Ceramics

■**Manufacturing System and Processing Laboratory, Tokyo Denki University**
Helical Blade and Dimple Machining in Whirling

■**Dr. Jun Shinozuka Laboratory, Department of Mechanical Engineering, Yokohama National University**
Measurement of the temperature distribution at the tool-chip interface during cutting by means of an indexable insert possessing micro thermocouples on the rake face

■**Manufacturing Engineering Lab., Graduate School of Natural Science and Technology, Okayama University**
Improvement of shape accuracy in cylindrical traverse grinding for a long workpiece

■**Laboratory for Manufacturing Science, Department of System Design Engineering, Keio University**
Ultrasonic-Vibration-Assisted Micro Drilling of Chemically Strengthened Glass

■**Mizutani Laboratory, Department of Mechanical Engineering, Chubu University**
High-performance cutting to improve surface integrity

■**Ishida & Mizobuchi Laboratory, Department of Mechanical Engineering, Faculty of Engineering, The University of Tokushima**
Hole Fabrication inside a Hole by Means of Electrical Discharge Machining

■**Sasahara Laboratory, Tokyo University of Agriculture and Technology Sasahara Laboratory**
Additive manufacturing with direct metal lamination by using arc discharge

■**Department of Industrial Technology and Innovation, Graduate School of Engineering, Tokyo University of Agriculture and Technology**
Research on Shape Generation with Environment-responsive ECM by Using Electrolyte Suction Tool

■**Laboratory for Precision Machining and Nano Processing (PMNP Lab)**
High Efficiency Machining of Diamond Materials Using Chemical Reaction-Assisted EDM

■**Precision Engineering Laboratory, Sophia University**
Generation characteristics of surface roughness machined with micro ball-endmill

■**Sasahara Laboratory, Tokyo University of Agriculture and Technology Sasahara Laboratory**
High efficiency CFRP cutting using a flexible circular saw

■**Nakamoto Laboratory, Tokyo University of Agriculture and Technology**
Proposal of Flexible Clamper to Realize Dexterous Machining of Soft Objects

■**Laboratory for Precision Machining and Nano Processing (PMNP Lab)**
Freeform machining and surface texturing on difficult-to-cut materials by ultra-precision diamond turning

■**Precision Engineering Laboratory, Sophia University**
Production method of micro-lens-array(MLA) mold applying micro-indentation process

■**Hidetake TANAKA Dr. Eng., Nagaoka University of Technology**
Machinability of thermo-plastic CFRP by inclined planetary milling

■**Tanabe Lab., Mechanical Engineering, Nagaoka University of Technology**
Cutting in Strong Alkaline Water

■**Ogawa Laboratory, Faculty of Science and Technology, Ryukoku University**
High Precision Machining of Micro-cutting Edge Using On-machine Laser Hardening System

C. System and control technology

■**Faculty of Mechanical Engineering, Institute of Science and Engineering, Kanazawa University**
The Present and Future of Open CAM Kernel "Kodatuno"

■**CIMS Lab., Graduate School of Engineering, Kobe University**
Finished Surface Simulator to Predict the Influence of Motion Errors of Machine Tool

■**Laboratory for Digital Design & Digital Manufacturing, Department of System Design Engineering, Keio University**
NC Program Generation Method and Accurate Estimation of Cutting Time in Consideration of NC Control Characteristics for High Speed & High Accuracy Cutting

■**Saitama University**
Simulation method of instantaneous cutting force for complicated fabrication process

■**Hibino Laboratory, Tokyo University of Science**
Simulation for Productivity and Energy Consumption Considering Machining System

■**Ultra-Precision Machine System Laboratory, Department of Mechanical Engineering, Kanagawa University**
Evaluation model of energy consumption of feed drive system in NC machine tools

■**Morishige Lab., Dept. of Mechanical Engineering and Intelligent Systems, The University of Electro-Communications**
Development of machining interface focusing on rapid prototyping by cutting

■**Manufacturing System Design Lab., Doshisha University**
Study of the precision in Skillful Operating of Working Plate to Control of Ball Rolling Motion with a Dual Arm Robot

■**Western Region Industrial Research Center, Hiroshima Prefectural Technology Research Institute**
Prediction system of machining error caused by end mill deflection

D. Measuring and evaluation technology

■**Precision Machining, Measurement and Control Laboratory, Department of Micro Engineering, Graduate School of Engineering, Kyoto University**
Analysis software for measurement and compensation of error motions of five-axis machine tools

■**Measurement and Diagnostic Systems Laboratory, Mechanical Engineering Department, College of Engineering, Nihon University**
Measurement of the Positioning Accuracy of Machine Tools using Image Matching

■**Saito&Yoshioka Laboratory, Department of Mechanical and Control Engineering, Tokyo Institute of Technology**
Study on the error compensation and accuracy improvement of 6-DOF parallel mechanism worktable

■**Eastern Region Industrial Research Center, Hiroshima Prefectural Technology Research Institute**
Development of the Measurement System with imaging Mounted Tool Silhouettes

■**Precision Machining and Mechanism Lab., Nagaoka University of Technology**
Improvement of Cutting / Grinding Performance by using Ultrasonic Vibration

■**YAZAWA laboratory, Graduate School of Engineering, Nagasaki University**
Development high precision projection machine of profile shape for small workpiece

■**Ingenious Micro-Manufacturing Systems Group, Advanced Manufacturing Research Institute, National Institute of Advanced Industrial Science and Technology (AIST)**
Technology for micro manufacturing with ingenious – 'Micro machining manufacture' and 'Micro manufacturing machine'

■**Sasebo National College of Technology**
Measuring Surface Topography of Diamond Wire using Image Processing Method

E. Tools, Tooling System for machine tools

■**Fabrication Laboratory., Department of Mechanical Engineering, College of Science and Engineering, Ritsumeikan University**
Development of innovative loose abrasive processing applying various tools with layered fabric structure

■**Enomoto Lab., Department of Mechanical Engineering, Osaka University**
On-machine tool resharpening process employing LME phenomenon

■**Takeuchi Laboratory, Department of Mechanical Engineering, Chubu University**
Development of CAM system for new drill shape creation

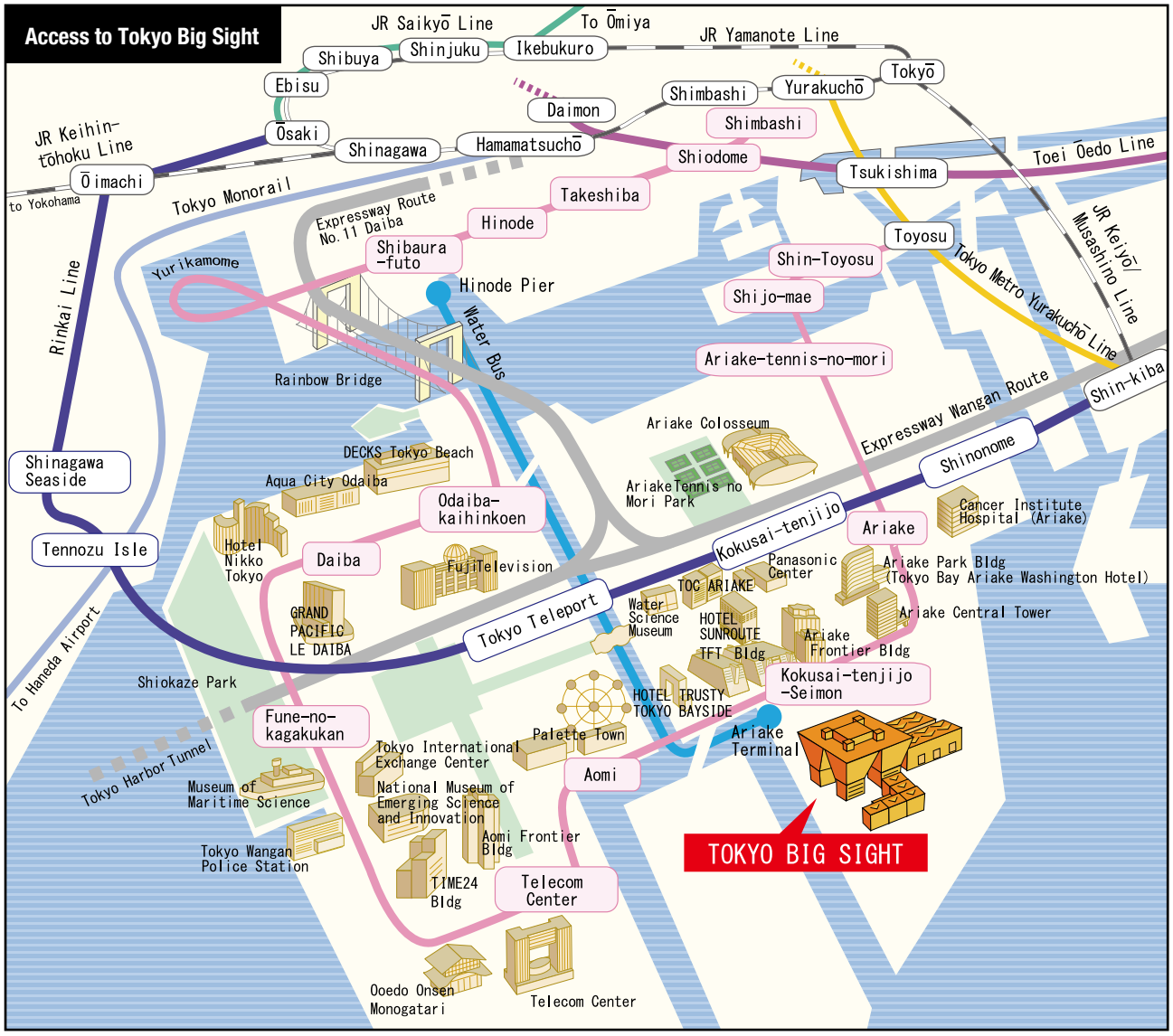
■**Ninomiya Laboratory, Department of MECHANICAL Engineering, Nippon Institute of Technology**
Spin Turning of Hardened Steel Using WC Rod Tool and On-Machine Forming of Spinning Tool

■**Enomoto Lab., Department of Mechanical Engineering, Osaka University**
Study on high speed machining of Inconel 718 focusing on tool surface topography

■**Ultraprecision Engineering Research Group, Department of Mechanical Science and Engineering, Nagoya University**
Development of a novel rotary milling tool for highly efficient cutting of difficult-to-cut materials

■**ITOH laboratory, Collage of Engineering, Ibaraki University**
Fabrication Technology of ELID Grinding Wheel Applying PELID

■**Micro and Nano Engineering Laboratory (HASE Laboratory), Department of Mechanical Engineering, Faculty of Engineering, Saitama Institute of Technology**
Fundamental Study on Intelligent Micro-Machine Tool by AE Sensing: Attempts to Detect Contact and Monitor Cutting State



Rinkai Line

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

Yurikamome

Shimbashi (JR,Subways)	Approx. 22minutes	Kokusai-tenjijo -Seimon	Approx. 3-minutes walk from Kokusai-tenjijo-Seimon Sta.	Tokyo Big Sight
Toyosu (Subway)	Approx. 8minutes			

Toei Bus

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

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)
Tokyo City Air Terminal (TCAT)	Approx. 20minutes	Tokyo Big Sight

Express Bus (Keihin Kyuko Bus)

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

Water Bus

Hinode Pier (Approx.7-minutes walk from JR Hamamatsucho Sta.)	Approx. 25minutes	Ariake Terminal	Approx. 2-minutes walk from Ariake Terminal	Tokyo Big Sight

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

JMTBA

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