The Japan Society for Precision Engineering

Introduction of JSPE PRIZES 2014

1. Tojiro AOYAMA (Keio University)

Professor Tojiro AOYAMA has been carrying out research on hardware and software to intellectualize and sophisticate a machine tool structure; the tooling, table, and sensing systems of a machine tool; robot systems; jig-fixture systems; etc. The tremendous achievements from these studies have significantly contributed to improvements in production technology in Japan and worldwide. For his contributions, he has won many awards from various professional societies.

He has been contributing to the activities of JSPE for many years as a member, the secretary, and the chairman of committees; an ICPE international conference chairman; a director; a vice-president; and an auditor. He has also played a significant role in the activities of JSME (Japan Society of Mechanical Engineers), JSAT (Japan Society for Abrasive Technology), CIRP (College International pour l'Etude Scientifique des Techniques de Production Mecanique), and SME (Society of Manufacturing Engineers). Furthermore, his deep knowledge is reflected in the activities of the Science Council of Japan, JMTBA (Japan Machine Tool Builders' Association), and JMAA (Japan Machine Accessory Association). He has played a major role in education and research in many fields in Japan.

Thus, professor Tojiro AOYAMA has contributed not only to the field of machining and production systems but also to engineering, industrial, and educational development in many fields related to precision engineering. He has been awarded the JSPE PRIZE because of his major achievements.

2. Yoshimaro HANAKI (Okuma Corporation)

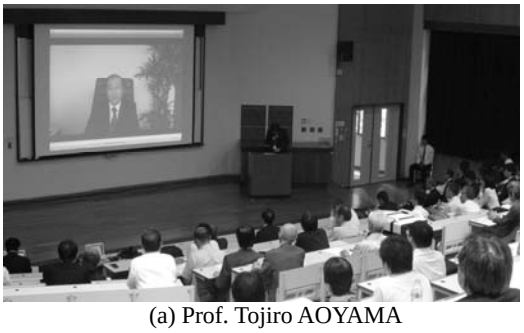
Mr. Yoshimaro HANAKI joined Okuma Machinery Works (at present: Okuma Corporation) in 1965. He has been consistently working on the research and development of machine tools and NC systems. In 1972, he developed a high-speed miniature computer specialized for NC systems and constructed a practical CNC system for the first time worldwide. The numerical control software enabled high functionality and high reliability and dramatically evolved the performance of NC machine tools.

In 1982, he developed a high-precision digital servo system. In this system, he developed the world's first brushless servo motor. Using this digital servo technology, he developed fast contour machining control, which processes the free-form surfaces of a press die of an automobile with high-speed and high-precision, and significantly contributed to developments in the manufacturing industry.

Since taking a position within corporate management, he strongly promoted the development of intelligent technology based on machine tools and pushed for practical realization of this technology including a heat displacement compensation function called the "Thermo-Friendly Concept", an anti-collision function called the "Anti-Crash System," a machining conditions search function called "Process Navi," and a geometric error compensation function called "Five Tuning." For these achievements, Okuma Corporation won JSPE Technology Award, JSPE Award, JSPE Numata Memorial Paper Award, and JSME Medal for New Technology, among others.

For his society activities, he was awarded the title of Fellow by JSPE in 2006 for his contributions to the development of machine tools. He has contributed to the Japan Society for Die and Mould Technology as a director of society activity and as the Tokai Branch Chief of JSPE. In addition, he has served as the chairman of the Japan Machine Tool Builders' Association since 2013 and has been active driver in the machine tool industry.

Therefore, his contributions to developments in the machinery manufacturing industry and machining technology are significant. He has been awarded the JSPE PRIZE for his major achievements.



(a) Prof. Tojiro AOYAMA

(b) Mr. Yoshimaro HANAKI (right)

Fig.1 JSPE PRIZE winners

Introduction of JSPE Technology Awards 2014

1. Development of porous epoxy resin polishing pads for remarkably improved retention properties of abrasives

Nobuyuki NOMURA, Takahiro MOCHIZUKI, Tomoya SAWAHATA, Hiroo WAKASUGI, Ryoichi HIROKAWA (Kokonoe Electric Co., Ltd.)

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This achievement involves the development of polishing pads used when carrying out mirror polishing of the glass used for electronic devices. By developing porous polishing pads that adopted an epoxy resin, the high retention property of the abrasives was realized. It is difficult to achieve the high-quality requirements associated with the precision polishing of glass using conventional urethane resin polishing pads. However, the developed technology makes it possible to obtain an excellent surface roughness and greatly reduce the polishing time.

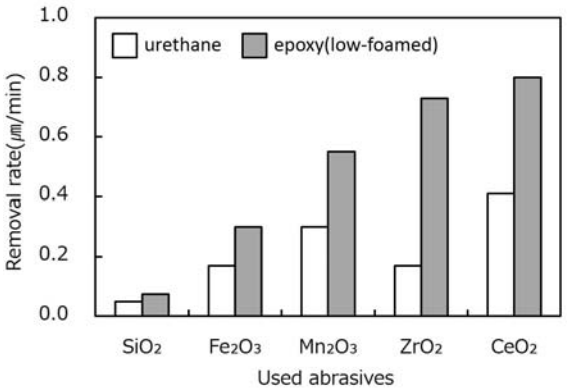

Fig.2 Comparison of removal rates using various abrasives

2. Development and practicality of a point autofocus probe ultra-precision 3D whole circumference measuring instrument (MLP-2SP)

Katsuhiro MIURA, Tadashi MATSUBA, Takao TSUKAMOTO, Hajime HIROSE, Hideo KOTAJIMA (MITAKA KOHKI Co., Ltd.)

A point autofocus probe ultra-precision 3D whole circumference measuring instrument was developed with the following new features:

1. Scanning autofocus method: significantly reduces measurement time. This method achieved a measurement speed that is 80 times faster than the conventional method.
2. Motorized precision rotary axis: consists of a DD motor and a high-resolution encoder to enhance the precision of the radial deflection to 0.1 μm (0.02 μm by software), the maximum measuring speed to 180° per second, and the positioning resolution to 0.6 arc-seconds.

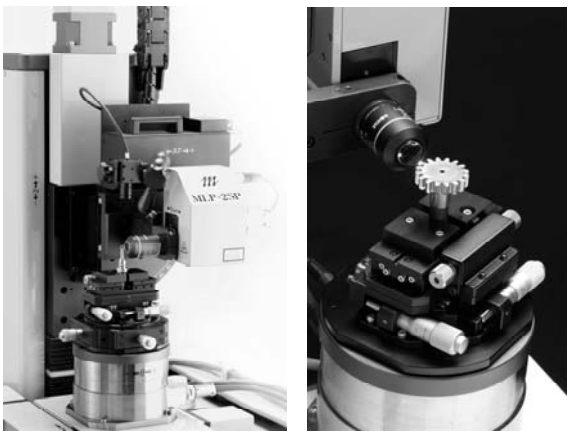

Fig.3 MLP-2SP

3. Inner circumference measuring method: reflects the optical system by a micro-prism instead of a lens to directly measure the surface roughness and form of an inner periphery.
4. International standardization of the measuring principle: proposed an autofocus method to the ISO Technical Committee (ISO/TC 213). ISO standardized the method as “ISO 25178-605 Point autofocus probe” and published it in January 2014.

3. Ultra-low coefficient of thermal expansion ceramics-based method for new material creation, with gauge standard proposed for fine-measurements

Jun SUGAWARA (Krosaki Harima Corp.), Akihiko MATSUURA (Mitutoyo Corp.), Osamu SATO (National Institute of Advanced Industrial Science and Technology), Takeshi WAGO (Iwate Industrial Research Institute), Tohru OHNISHI (Tokyo Metropolitan Industrial Technology Research Institute)

Realizing high accuracy dimensional measurements requires a gauge providing low uncertainty of standard values and high stability against thermal expansion and secular change. Such a gauge was developed from ultra-low coefficient of thermal expansion (CTE) ceramics. Then verification and practical use methods were examined. The ultra-low CTE ceramics were cordierite, Mg2Al4Si5O18 with sintering additives of a few kinds and a few amorphous phases. The material presents some important characteristics, such as zero thermal expansion at room temperature. Moreover, it has long-term stability, high rigidity, and light weight. Several gauges made of ultra-low CTE ceramics were proposed. Fig. 4 shows gauges: a gauge block, hole plate, and ball dimension gauge. Results show that accuracy calibration and suitable interim checking of a coordinate measuring machine can be conducted to apply these gauges.

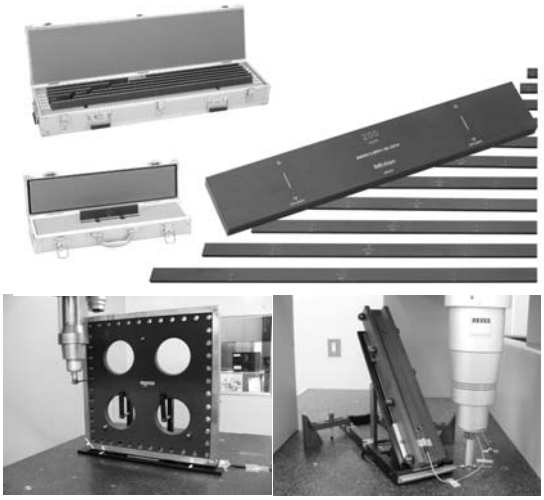

Fig.4 Gauge made of ceramics with ultra-low coefficient of thermal expansion: upper, Gauge block; left, Hole plate; right, Ball dimension gauge.