Editorial

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Biographical notes: Taghi Tawakoli is Founder and Director of the Institute of Grinding and Precision Technology, KSF, in the Hochschule Furtwangen University, Germany. He is also working as a Full Professor at the Mechanical Engineering/Process Engineering Department of the Furtwangen University of Applied Sciences. He received his Master in Mechanical Engineering from the RWTH-Aachen University and his Doctorate on High Performance and High Speed Grinding from University of Bremen in 1989. He also worked for the Bremer Vulkan and Wohlenberg companies as supervisor of the grinding machines department and developed modern machines. He has invented several grinding tool concepts such as T-Tool, T-Tool-Profile and T-Dress. He organises several conferences regarding abrasives and modern grinding technologies. He has also published more than 180 research papers. He has worked (as director or partner) on various national and international projects and numerous industrial researches and consulting projects for prestigious companies.

T. Özel is Associate Professor of Industrial and Systems Engineering and Director of Manufacturing Automation Research Laboratory at Rutgers University. He received his PhD in Mechanical Engineering from The Ohio State University in 1998. His current research interests include advanced manufacturing, computational modelling of machining processes, mechatronics, automation, control of manufacturing systems, and micro/nano manufacturing sciences. He has extensive experience in teaching and researching about high speed machining, manufacturing processes and systems and manufacturing automation. He has been editor, guest editor, reviewer, and editorial board member for several international journals and member of scientific committee for many international conferences. He has published over 80 refereed articles in international journals and conferences.

This special issue of the *International Journal of Mechatronics and Manufacturing Systems* (*IJMMS*) includes six research articles related to the new and promising developments in grinding and ultra-precision technologies.

The ultrasonic-assisted dressing and grinding processes are currently the focus of various research centres. These processes are very popular and promising due to their advantages including reducing cutting forces and temperatures and improving tool life and surface integrity. The presented ultrasonic-assisted grinding and dressing papers in this issue deal with the newest inventions in this field. These inventions make an important contribution to the development of the ultrasonic-machining processes. These new concepts can help industry and machine manufacturers overcome the current technological constraints in this field.

The current challenges and discussions on resource efficiency and energy savings have also been presented. Most of the present saving methods of the manufacturing industry, in particular in energy intensive applications have been addressed. The grinding technologies, with their high demands on precision and integrity of the boundary layer of components are one such application. In order to make a significant contribution to resource efficiency and energy savings, along with research on tool and process optimisation and innovative machining kinematics, complex machine tools with robot assisted machining strategies are developed in order to simultaneously achieve high flexibility and productivity.

The precision grinding with lapping kinematics is another development in ultra-precision technology which improves tool paths and productivity. Using a novel machine concept which works with finishing foils instead of grinding wheels, very low surface roughness and flatness can be achieved within a short period of time. Studies on the effects of machining parameters such as pressure, cutting speed, foil feed rate and cooling lubricant during finishing of hardened steel have been presented regarding the surface quality and tool wear.

The special issue also includes interesting research articles on machining of silicon wafers. The required tools, machines, measuring techniques and achievable results have been discussed. Rotational grinding processes and ELID techniques have been studied by internationally renowned researchers in this field. For a first-time assessment of the local process forces in rotational grinding, a three-component piezo sensor is integrated under a segment of a resin-bond diamond cup grinding wheel (grit size D3). ELID grinding which requires exactly aligned machining parameters is utilised and studied to produce thin, i.e., below 0.2 mm thickness, sub-surface damage-free wafers which are necessary to produce sensor elements.

The dry cylindrical grinding as another novel and promising grinding process has been presented. The process introduces enormous advantages for the environment and also for workers health. The costs of machining processes can also be reduced significantly by eliminating the cutting fluids from the process. Structuring of the grinding tools which optimises the chip formation is introduced as the most necessary method for the dry grinding process.

The editors, Prof. Dr.-Ing. Tawakoli and Prof. Özel would like to thank all the authors and referees for their collaboration and availability and their thorough evaluations of the published papers in this issue.