Editorial

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Biographical notes: V.K. Jain received his MTech and PhD from University of Roorkee (now, IIT Roorkee). He has about 38 years of teaching and research experience. He has served as a Visiting Professor at the University of Nebraska at Lincoln, USA and University of California at Berkeley, USA. Currently, he is a Professor at Indian Institute of Technology Kanpur. He has around 200 publications to his credit. He has written four books. He has various research areas of interest, viz. advanced machining processes (ECM, EDM, AFM, MAF, MRAF, and others), machining of advanced engineering materials, shear strain acceleration phenomenon in metal cutting, and CAPP.

U.S. Dixit is currently a Professor in Department of Mechanical Engineering at Indian Institute of Technology, Guwahati, India. He received his BE in Mechanical Engineering from erstwhile University of Roorkee (now IIT Roorkee) in 1987 and MTech and PhD from IIT Kanpur in 1993 and 1998 respectively. He has about five years experience in industry and 15 years experience in academia and has contributed several papers to journals of international repute. He has also authored two books. His main research interest is in the modelling of manufacturing processes by finite element method and soft computing.

In the present era of micromanufacturing in general, and micromachining in particular, the emphasis is shifting from conventional machining processes to advanced machining processes (AMPs) (electrochemical machining, electric discharge machining, laser beam machining, etc). These AMPs are capable of not only macro machining, but they are equally or even more capable of micro and nano machining. Definitely, under certain circumstances, say, 3-D micro structures, the traditional micromachining processes (micro milling, micro turning, etc.) have an edge over AMPs. However, keeping in view the present day industrial requirements across the globe, most of the conferences related to manufacturing have special sessions on 'AMPs'. This was true in case of 3rd International and 24th All India Manufacturing Technology, Design and Research Conference-2010 (AIMTDR-2010) held at Vishakhapatnam, India. In AIMTDR-2010, a

number of papers on AMPs were presented. Initial screening and peer review of these papers was done by the renowned reviewers, and the papers accepted by them are included in this special issue of International Journal of Manufacturing Technology and Management. This special issue on 'advanced machining processes' contains eight papers. These papers are revised and expanded versions of the selected papers that were presented in 3rd International and 24th AIMTDR-2010 conference held at Vishakhapatnam, India, during 13–15 December 2010.

Many AMPs are now well-established and are being used in industries. The focus of the research is on understanding the physics of these processes and optimising the process parameters. This is reflected by the papers of this special issue that covers abrasive jet machining, electrochemical discharge machining, electro discharge machining and laser machining.

First paper applies Taguchi method to optimise the machining of glass using abrasive jet machining. Two objectives considered are maximisation of material removal rate and minimisation of surface roughness. Optimisation is accomplished with the help of grey relational analysis. Decision variables are pressure, nozzle-tip-distance and abrasive grain size. Effectiveness of the approach is demonstrated by confirmation tests.

Second paper applies Taguchi method to maximise material removal rate in electrochemical discharge machining. Authors developed an experimental setup to conduct experiments to machine acrylic plate using an electrolyte of NaOH salt solution and identified the voltage, electrolyte concentration and feed rate as the main parameters. They also used adaptive neuro fuzzy inference system (ANFIS) for modelling the material removal rate. Experiments show the potential of this process in the micromachining of non-conducting materials.

Third paper explores the possibility of using helium gas as dielectric medium instead of a liquid dielectric in electro discharge machining. Taguchi method has been used to systematically study the influence of process parameters and helium gas dielectric on material removal rate, tool wear rate, oversize and depth achieved. It is observed that the use of helium gas significantly reduces thermal damage on machined surfaces and lowers work material deposition on the tool as well as the oversize in dry electro discharge machined holes. Fourth paper presents a detailed experimental study on electro discharge machining and reports a few unexpected results. Some physical explanations have been provided, but the paper motivates for further exploration of the physics of electro discharge machining. Fifth paper investigates the effect of spark gap in dry micro electro discharge machining of SiC-10BN nano-composite. Based on the experiments, empirical expression has been developed to estimate the debris size. Sixth paper attempts to minimise surface roughness in wire-electro discharge machining of M2-high speed steel by optimising pulse peak current, pulse-off time and wire feed. The surface texture was found to have greater dependency on pulse peak current and pulse-off time.

Seventh paper optimises the process parameters for cutting Ni-based super alloy (SUPERNI 718) thin sheet along straight profile using Nd:YAG laser. The attempt is to minimise average kerf taper as well as surface roughness. The main process input parameters are identified as oxygen pressure, pulse width, pulse frequency and cutting speed. The last paper carries out an experimental parametric study of Nd:YAG laser marking on zirconia ceramic material. Authors also carried out multi-objective optimisation.

We hope that these papers will be useful for the readers of the special issue. We thank the authors and reviewers. We are also grateful to the organisers of AIMTDR-2010 conference. Finally, we are grateful to the Editor-in-Chief, M.A. Dorgham of *International Journal of Manufacturing Technology and Management* for inviting us as the guest editors of this issue.