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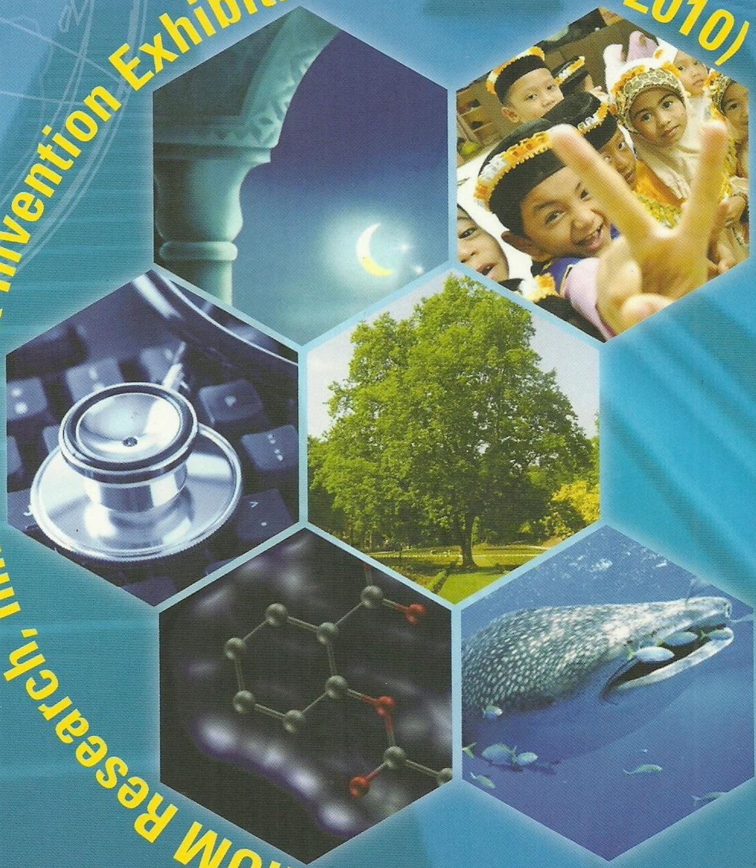

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experimental study has been performed to assess the effect of work-piece preheating using induction heating in enhancing machinability of AISI H13. The preheated machining of AISI H13 under different cutting conditions conducted with TiAlN coated carbide tool is evaluated in terms of tool wear, surface roughness and vibration. The results illustrated the advantages of preheated machining by a much extended tool life, better surface finish and stable cutting with much lower vibration/chatter amplitudes. The effects of preheating temperature on the chip morphology were also investigated and it is found that preheating resulted in the formation of relatively stable chips and reduction of chip serration frequency.

P-129 Enhancement of Machinability of Nickel Based Alloy - Inconel 718 by Induction Preheating in End Milling using Ceramic Inserts

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Unique combinations of high strength properties maintained at elevated temperature and high resistance to chemical degradation have made Nickel based alloy, Inconel 718 suitable for application as aerospace components. However, the same properties are responsible for very poor machinability of the material, as Inconel is one of the most difficult to cut materials. The main reason for poor machinability is generation of high heat during machining which lead to premature failure of the tool due to plastic deformation and diffusion. Uncoated and coated tools have been found to be not efficient in cutting this materials and the application of preheated resulted in not significant improvement in their machinability. PCD tools are not recommended for machining this material since it contains iron which acts as a catalyst to convert diamond into graphite at temperatures in excess of 700 0C. PCBN tools are very costly and also did not show very good performance in machining Inconel 718. Ceramic tools have proved to have performed well in machining the material. However, there was so far no work performed performance of ceramic tools in machining Inconel 718 using preheated technique. Since ceramic tools can perform under high temperatures, it was expected that preheated machining using ceramic tools would desired results. In this research work induction heating technique in combination of the application of ceramic tools was adopted as one of the machining techniques in order to improve the machinability of the material. The effect of preheated machining of Inconel 718 has been analyzed in terms of tool wear, surface roughness and chip formation. The advantages of preheated machining are demonstrated by appreciable increase in tool life, better surface roughness values and improved chip formation compared to room temperature machining.

P-130 Development of a Cost Effective Technique to Eliminate Conventional Finishing Operations Applying High Speed End Milling of Silicon

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Silicon has been widely used in different branches of industrial engineering. Most application of silicon is in computer parts or hardware especially for the production of integrated circuit (IC) chips. Machining of silicon is a big challenge and expensive affair because of it inherent brittleness which is a major limitation as the process of removing the material can generate subsurface damage. Silicon is conventionally finished using grinding followed by polishing and lapping to achieve required surface finish and surface integrity. Numerous research works attempted to conduct ductile mode grinding to avoid cracking and subsurface damages. However, it has been revealed that sub surface damages and micro cracks canâ€™t be avoided if grinding is performed. As a result, lengthy etching operations need to be performed to remove the surface defect crated by grinding. Hence, it is extremely important to develop alternative techniques to improve surface finish and avoid/minimize subsurface damages in order to lower the cycle time in machining and finishing of silicon chips. An attempt has been made in this work to investigate the effect of high speed end milling on surface finish and integrity of silicon to minimizing the amount of finishing requirement in machining of silicon, with the objective of reducing cost and

increasing effectiveness of silicon manufacturing process. This work aimed at machining silicon using small diameter (2 mm) diamond coated tools in ductile mode regime by employing high speed end-milling employing high rpm of the spindle (up to 50,000 rpm). A special fixture was designed and fabricated for holding the silicon workpiece during machining. Low values (micro-meter level) of feed and depth of cut employed during machining helped to ensure nano level surface finish that is able to avoid the need of further grinding and even polishing. This process also leads to much lower sub surface damages since machining was conducted in fully ductile mode causing minimum internal stresses as the feed and depth of cut values were kept very low. This new route of machining employing high speed end milling is expected to be more cost effective since the need for the costly and time consuming finishing operations like grinding and polishing could be avoided and the time for final etching could be substantially lowered.

P-131 Rapid Prediction of Residual Strength of sandwich structure subjected to impact loading.

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The prediction of residual strength of damage structure due to a certain loading becomes crucial for manufacturer especially in aerospace industry. A rapid decision whether a certain damage structure found visually from inspections can still fly without any changes or needs to be subjected to minor or major changes to have a permission to fly becomes a main issue.

Until today, the decision is based on the test results performed for a certain structure and material. This method is very expensive, especially if the whole structure or parts of aircraft need to be tested

The Finite element analysis method becomes one of the candidate tools to replace the tests. Unfortunately, the divergence of calculation and high number of elements and nodes should be employed to simulate the behavior which in turn leads to high cost in term of computation time.

This work proposes to simulate the behavior using “macrostructure level”. The honeycomb is modeled using array of nonlinear springs which the behavior of spring is obtained from a simple test on a block of honeycomb. With this approach, the behavior of impact and its residual strength can be predicted almost in real time. Also the prediction can be obtained from the damage area visually measured on-site and from the data of damage the residual strength can be predicted on-site.

P-136 Compaction of Fly Ash–Aluminum Alloy Composites and Evaluation of their Mechanical and Acoustic Properties

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The density and elastic moduli of green compacts can be determined by ultrasonic method with the help of pre-prepared diagrams. In this way, pressing conditions can be taken under control easily. In this study, fly ash particles were used as fillers in an aluminum alloy matrix material. The weight fractions of fly ash in the composites were in the range of 5–30%. The resulting composites were compacted at pressures ranging from 63 MPa to 316 MPa. It was observed that the green density increased with increasing compacting pressure and decreased with increasing weight percent of fly ash particles resulting in lightweight composites. The green compact composites were also tested using an ultrasonic nondestructive evaluation method. Results showed that ultrasonic velocities are a strong function of the density and the fly ash fraction in this material and could be potentially used to predict the density and the fly ash fraction as well as the elastic moduli of the metal matrix composite.