

CHAPTER 56
TECHNOLOGY
PRODUCTION ENGINEERING

Doctoral Theses

485. RAJESH KUMAR SINGH
Some Studies on Competitiveness of India Small and Medium Enterprises (SMEs)
Supervisors : Dr. S. K. Garg and Dr. S. G. Deshmukh
Th 15412

Abstract

Attempts to adopt holistic approach for analyzing competitiveness bases on issues related with competitiveness of SMEs such as assets, pressure constraints, strategy development, processes and different dimensions of performance. Being an empirical study on large sample of SMEs (193) from different sectors and regions of India has its own importance for enhancing the knowledge of SMEs management for developing competitive strategies. Understands major pressures and constraints on SMEs, dynamic nature of strategy development as well as relationship of strategies with performance. Also tries to compare SMEs with LSEs as well as different manufacturing sectors of SMEs category.

Contents

1. Introduction. 2. Literature review. 3. Research methodology. 4. Observations and analysis for SMEs. 5. Development and testing of research propositions. 6. Development of case studies on competitiveness of SMEs. 7. Interpretive structural modeling of factors for competitiveness of SMEs. 8. Summary and conclusions. Bibliography and Appendices.

486. SHANKAR SINGH
Investigation of Machining Characteristics of Advanced Difficult-to-Machine Material using Abrasive Electrical Discharge Machining (AEDM) Process.
Supervisor : Dr. Sachin Maheshwari
Th 15411

Modern industrial ultra-demanding applications have been increasing rapidly leading to the development of **advanced materials** having specific set of properties. Machining of these advanced materials such as **metal matrix composites**, super alloys, and engineering ceramics is difficult to carry out due to their design requirements, which demand for complex geometry to be machined having high precision, high surface finish, and less machining costs.

General appearances of machined surface with conventional Electrical Discharge Machining (EDM) is matt surface comprising of recast (white) layer and defects such as microcracks, pores and residual stresses formed by the strong temperature gradient during machining. The recast layer is generally removed by supplementary processes such as hand polishing, etching or heat treatment, leading to increased cost and time.

An experimental investigation was carried out on work specimens **6061Al-Al₂O_{3p}-20% cast aluminium metal matrix composites** using the conventional **EDM** (*without powder dielectric fluid*) and an hybrid manufacturing process **AEDM** (Abrasive Electrical Discharge Machining) with addition of SiC abrasive powder in dielectric fluid and using copper tool electrode, so as to compare the benefits. The experimentation were performed on a modified experimental set up. A mixed orthogonal array L18 ($2^1 \times 3^7$) experimental design was chosen to identify the effect of seven control factors with three levels each, and a noise factor, having two levels. The performance measures considered were **Material removal rate** (MRR-g/min.), **Tool wear rate** (TWR-g/min.), **Dimensional overcut** (DOC-mm) and **Surface roughness**, Ra (SR- μm). The optimal settings of the machining parameters have been determined and results analyzed using **Lenth's Method**, **ANOVA F-test** and **DOE plots**.

Results of this investigation show that the TWR and surface roughness reduce whereas MRR increases considerably, with the suspended abrasive powder additives in dielectric medium. The dimensional overcut was however noticed to increase slightly during AEDM. It is found experimentally that **AEDM can replace the conventional EDM for effective machining** of 6061Al-Al₂O_{3p}-20p Aluminium Metal Matrix Composites (AMMCs).

Contents

1. Introduction. 2. Literature review. 3. Design of experiments. 4. Experimentation. 5. Results and discussions. 6. General conclusions. 7. Future scope and appendices.