

## GREY TAGUCHI ANALYSIS ON MILLING OF AL-7075 MMCS AND ITS MICRO- STRUCTURAL STUDY

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### ABSTRACT

In the current global manufacturing scenario, the material selection and its manufacturing with specific characteristics are very tough. The Hybrid MMCs are frequently used in the aerospace, automobile and electronics field for its outstanding material characteristics as compared to the conventional metals or alloys. Very often due to the reinforcement of high strength material, MMCs are considered to be very difficult to machine. In the current research, MMCs is subject to end milling operation by CNC milling, which is an important operation in the present industrial production system. The Al-7075/Al<sub>2</sub>O<sub>3</sub>/B<sub>4</sub>C is manufactured by stir casting operation in two varying composition of 92% Al-7075, 5% Al<sub>2</sub>O<sub>3</sub>, 3% B<sub>4</sub>C and 97% Al-7075, 2% Al<sub>2</sub>O<sub>3</sub>, 1% B<sub>4</sub>C powder respectively. The material composition after the casting of MMCs is studied by the SEM and EDX. After the composition and micro structural study, the composite having 92% Al-7075, 5% Al<sub>2</sub>O<sub>3</sub>, 3% B<sub>4</sub>C is considered suitable for machining. Taguchi technique grey relational analysis (TTGRA), a multiple standard optimization is carried out for optimizing the milling parameters. This paper emphasizes the productivity goals on surface roughness (SR), material removal rate (MRR), chip thickness (CT) and machining time (MT). Grey relational grades (GRG) are used for determining the optimal process parameters obtained from Taguchi L<sub>9</sub> Orthogonal array (OA) after the grey generation. The influence of different variables with respect to different objective was predicted by Analysis of variance (ANOVA) with effective parametric contributions. Finally it is concluded that, GRG is improved by 3.68% after selecting A<sub>1</sub>B<sub>3</sub>C<sub>3</sub> optimal parameters and spindle speed is the most influencing milling factor.

**KEYWORDS:** Mmcs (Metal Matrix Composites), Taguchi Method Grey Rational Analysis (TTGRA), CNC Milling, SEM, EDX, GRG (Grey Relational Grade), ANOVA