ABSTRACT

In general particle reinforced aluminium matrix composites have attracted substantial interest among researchers as engineering materials due to their mechanical properties like strength to weight ratio and improved hardness, superior to those of general aluminium alloys. Development of metal matrix composites in particular aluminium matrix composites has grown multifold in recent years with new combination of matrix and reinforcement material with different proportions. Further, machinability issues of these AMCs are becoming more complex due to variations in the properties of the newly developed composites. The problem of arriving an optimum process parameters / quantity of matrix and reinforcements for the best suited properties of AMCs for specific application still exist. Adding to this, determination of optimum levels of machining parameters also has attracted the researchers and practicing engineers for quite a long time.

This research work is being focused to develop a metal matrix composite based on AA 6061 matrix and SiC particulate reinforcement through stir casting method. The microstructural characterization and evaluation using SEM, EDS and XRD analyses are being performed to understand the properties of the developed composite. Further, the influence of SiC reinforcement percentage on the mechanical properties of the AA 6061 composites is being determined. The next phase of work focuses on investigating the significance of various machining parameters on the surface roughness, cutting force and metal removal rate (MRR) in the end milling process of Al/SiC composites. Finally, optimization of the machining process through Response Surface Methodology (RSM) and Genetic Algorithm (GA) is being attempted to determine the optimum values of input parameters for a minimum surface roughness and cutting forces with maximum MRR. The optimal configuration of factors and its responses with desirability value are identified using RSM and GA for the conventional and CNC end milling operations respectively.