Manufacturing and Machining of AA2024/SiC_p Metal Matrix Composites

B. Venkatesh
PG Student, Department of Mechanical Engineering, JNT University, Hyderabad

Under the Guidance of Dr. A. Chennakesava Reddy, Associate Professor, JNTUH College of Engineering, JNT University, Hyderabad.

ABSTRACT

Machinability of MMCs has received considerable attention because of the high tool wear associated with machining. Although efforts have been made to produce near-net-shape MMCs products by casting or hot forging, the need for machining cannot be completely eliminated and the resulting near-net-shape products still have to be machined to the designed shape and dimension. MMCs reinforced with SiCp particles are extremely difficult to machine (turning, milling, drilling, threading) due to their extreme abrasive. As the presence of hard reinforcement particles makes them extremely difficult to machine as they lead to rapid tool wear.

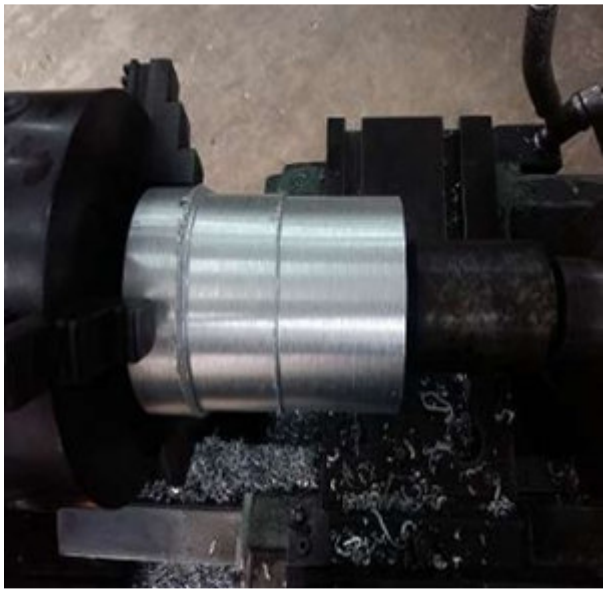

Figure 1: Turning of AA2024/SiC_p metal matrix comosites.

The present study has been carried out to investigate the machinability of the AA2024/SiCp metal matrix composites at different weight fraction of SiCp with the help of tungsten carbide tool. The influences of machining parameters such as cutting speed and depth of cut at constant feed rate on surface roughness and the cutting forces (tangential, feed and radial forces) have been investigated.

Figure 2: Size of chips during machining of as cast AA2024/SiCp MMCs reinforced with (a) 10 wt % SiCp, (b) 12.5 wt % SiCp and (c) 15 wt % SiCp.

The size of chips produced during machining of AA2024/SiCp metal matrix composites reinforced with 10 wt% SiCp are longer in comparison to the size of chips produced in case of 12.5 and 15 wt% SiCp reinforced MMCs. As the presence of SiCp in cast MMCs increases the brittleness of the material, the sizes of chips are gradually decreases. The cutting forces (Ft, Ff and Fr) increased on increasing the depth of cut at constant feed rate and different cutting speed. The cutting force components Ft, Ff and Fr were decreased on increasing the cutting speed of the composites. The surface roughness of MMCs increased on increasing the weight percentage of SiCp in the matrix metal and it increases on increasing the depth of cut at constant feed rate and different cutting speed.

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