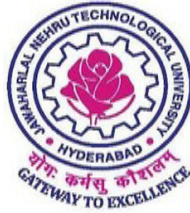


# Feasibility Evaluation of Metal Matrix Composites Used for Gears of Lathe Machine

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## **ABSTRACT**

In many automotive and metal cutting tool applications, gear tooth loading is insignificant and geometrical, environmental and manufacturing factors dictate the choice of material and the gear design. The gears generally fail when tooth stress exceeds the safe limit. Therefore, it is essential to explore alternate gear material. Stainless steel materials provide good mechanical and excellent formability but it has poor tribological property due to its low hardness. The metal matrix composite type has excellent mechanical properties of metals such as ductility and toughness and good wear and corrosion resistance of ceramics.

Noise generation is a major concern in all types of machines. Gear noise can be a particular problem either because of unpleasant audible noise or because of the effect noise has on the operating characteristics of the machine. Thus gear needs to be redesigned providing energy saving by weight reduction, providing internal damping, reducing lubrication requirements, reducing noise without increasing cost. Therefore, the objectives of the present work are concerned with the replacement of existing metallic gears with composite material gears in order to make it lighter and increasing the efficiency of mechanical machines.

## **CONCLUSION**

The following conclusions are drawn from the present work:

1. The Al-7072 matrix material has greater ultimate tensile strength and tensile force than Al-6061 and Al-6063 matrix materials
2. When the matrix materials are reinforced with SiC and Al<sub>2</sub>O<sub>3</sub> particles, the Al<sub>6061</sub> based composite has greater ultimate tensile strength and tensile force than Al<sub>7072</sub> and Al<sub>6063</sub> based composites.
3. The Al<sub>6061</sub> based composite is subjected to ductile fracture whereas Al<sub>7072</sub> based composite results in brittle fracture. The Al<sub>6063</sub> based composite faces ductile — brittle fracture.
4. From the studies in overall it can be concluded that Al<sub>203</sub>/AA 6061 composites exhibit superior mechanical and tribological properties.
5. The composite materials can take up higher tensile force than alloys. The preferred material for gears used for lathes is Al<sub>203</sub> /AA 6061 composite.

## REFERENCES

1. A. C. Reddy, Stir Casting Process on Porosity Development and Micromechanical Properties of AA5050/Titanium Oxide Metal Matrix Composites, 5th National Conference on Materials and Manufacturing Processes, Hyderabad, pp. 144-148, 2006.
2. A. C. Reddy, Effect of Porosity Formation during Synthesis of Cast AA4015/Titanium Nitride Particle-Metal Matrix Composites, 5th National Conference on Materials and Manufacturing Processes, Hyderabad, 139-143, 2005.
3. A. C. Reddy, Wear and Mechanical Behavior of Bottom-Up Poured AA4015/Graphite Particle-Reinforced Metal Matrix Composites, 6th National Conference on Materials and Manufacturing Processes, Hyderabad, 120-126, 2008.
4. A. C. Reddy, Investigation of the Clustering Behavior of Titanium Diboride Particles in TiB<sub>2</sub>/AA2024 Alloy Metal Matrix Composites, 4th International Conference on Composite Materials and Characterization, Hyderabad, 216-220, 2003.
5. A. C. Reddy, Effect of Clustering Induced Porosity on Micromechanical Properties of AA6061/Titanium Oxide Particulate Metal matrix Composites, 6th International Conference on Composite Materials and Characterization, Hyderabad, 149-154, 2007.
6. A. C. Reddy, Finite Element Analysis Study of Micromechanical Clustering Characteristics of Graphite/AA7020 Alloy Particle Reinforced Composites, 4th International Conference on Composite Materials and Characterization, Hyderabad, 206-210, 2003.
7. B. Kotiveerachari, A. Chennakesava Reddy, Interfacial effect on the fracture mechanism in GFRP composites, CEMILAC Conference, India, 85-87, 1999.
8. A. C. Reddy, Essa Zitoun, Tensile properties and fracture behavior of 6061/Al<sub>2</sub>O<sub>3</sub> metal matrix composites fabricated by low pressure die casting process, International Journal of Materials Sciences, 6, 2, 147-157, 2011.
9. A. C. Reddy, Essa Zitoun, Matrix al-alloys for alumina particle reinforced metal matrix composites, Indian Foundry Journal, 55, 1, 12-16, 2009.