

Selective Laser Melting (SLM) Process and Its Influence on the Machinability of TA6V Alloy

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Abstract : Titanium alloys are among the most important material in the aircraft industry, due to its low density, high strength, and corrosion resistance. However, these alloys are considered as difficult to machine because they have poor thermal properties and high reactivity with cutting tools. The Selective Laser Melting (SLM) process becomes even more popular through industry since it enables the design of new complex components, that cannot be manufactured by standard processes. However, the high temperature reached during the melting phase as well as the several rapid heating and cooling phases, due to the movement of the laser, induce complex microstructures. These microstructures differ from conventional equiaxed ones obtained by casting+forging. Parts obtained by SLM have to be machined in order calibrate the dimensions and the surface roughness of functional surfaces. The ball milling technique is widely applied to finish complex shapes. However, the machinability of titanium is strongly influenced by the microstructure. So the objective of this work is to investigate the influence of the SLM process, i.e. microstructure, on the machinability of titanium, compared to conventional forming processes. The machinability is analyzed by measuring surface roughness, cutting forces, cutting tool wear for a range of cutting conditions (depth of cut ap, feed per tooth fz, spindle speed N) in accordance with industrial practices.

Keywords : ball milling, microstructure, surface roughness, titanium

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