

## Machining Response of Austempered Ductile Iron with Varying Cutting Speed and Depth of Cut

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**Abstract :** This work mainly focuses on machinability studies of Austempered Ductile Iron (ADI). The Ductile Iron (DI) was austempered at 250 oC for different durations and the process window for austempering was established by studying the microstructure. The microstructural characterization of the material was done using optical microscopy, SEM and XRD. The samples austempered as per the process window were then subjected to turning using a TiAlN-coated tungsten carbide insert to study the effect of cutting parameters, namely the cutting speed and the depth of cut. The effect was investigated in terms of cutting forces required as well as the surface roughness obtained. The turning was conducted on a CNC turning machine and primary (Fx), radial (Fy) and feed (Fz) cutting forces were quantified with a three-component dynamometer. It was observed that the magnitude of radial force was more than that of primary cutting force for all cutting speed and for various depths of cut studied. It has also been seen that increasing the cutting speed improves the surface quality. The observed machinability behaviour was investigated in light of the microstructure of the material obtained under the given austempering conditions and a structure-property- co-relation was established between the two. For all cutting speed and depth of cut, the best machining response in terms of cutting forces and surface quality was obtained towards the centre of process window.

**Keywords :** process window, cutting speed, depth of cut, surface roughness

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