Wear behavior of austempered ductile Iron (ADI) in cutting and forming tools

The special cast material austempered ductile iron (ADI) is currently in use as a construction material for a few selected components, for example in the powertrain of cars. An application of ADI for tools or tool components is so far not realised. The specific of ADI is the combination of the positive attributes of conventional cast iron materials regarding part design and economy with significantly improved mechanical properties. The wear resistance in shear cutting of sheet grades DP600 (HCT600X) and HX260LAD+Z100 as well as the suitability for repair welding for various ADI materials and reference materials were investigated. The cutting results show a potential to substitute conventionally hardened cast irons in cutting and forming tools due to better wear resistance. Laser beam welding of ADI without preheating achieved good results without cracks and significant change of microstructure in the heat-affected zone. However metal inert gas welding without preheating led to cracks due to the higher thermal input in the ADI material. In addition to the manufacturing aspects of ADI design guidelines were developed and an economic analysis was made. In summary
ADI materials have better wear resistance with comparable costs than conventional cast irons ENJS 1070 (GGG-70). Compared to cold working steels, such as 1.2379, ADI grades show a worse wear behaviour in combination with a large cost potential. Possible applications for ADI, dependent on sheet strength, are monoblock forming tools as well as jaws for post forming and edge bending.

Stichworte: Cutting, Deep Drawing, ADI, Austempered Ductile Iron, Wear Behavior, Welding

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