

Advanced Cast Irons of ADI/CADI Type for Service Life Enhancement of Biomass Compacting Tools

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Abstract. According to the world trend, lifetime of biomass compacting tools can be increased by applying the advanced cast irons with spheroidal graphite of ADI (Austempered Ductile Iron) type. It is characterized by a good abrasion resistance and favourable combination of strength and toughness which in the range of strength of 800-1500 MPa exceeds properties of heat treated steels. Modulus of elasticity is ranging from 185 to 195 GPa. Despite the fact that the production of ADI cast iron consists in heat treatment of an initial ductile cast iron (isothermal heat treatment – austempering process) the process's costs are much lower in comparison to costs of chemical-thermal treatment of steel. Choosing this material to make the complex shape compacting tools is grounded in that prior to austempering (in as-cast state) the ductile iron exhibits excellent machinability produce dense, discontinuous chips that are easily handled, and it gains its final mechanical properties after following heat treatment. Wear resistance of ADI which is superior to steel in any given hardness level can be further increased by inducing a certain amount of carbide (typical range of 5-30%) present in ausferritic matrix. This type of carbidic cast iron has got a designation of CADI. For producing the stabile primary carbides, which did not dissolve during austenitizing stage the cast iron is alloying with chromium or molybdenum.

The crucial factor that determines whether as-cast ductile iron can be treated to form ADI is the graphite nodule count in the matrix structure. The recommended minimum nodule count for cast iron with spheroidal graphite (CSG) to be austempered is more than 160 nodules per mm². In order to pour ductile iron intended for ADI treatment, the in-mold process using advanced nodularizers of the FeSiMg types will be used, which ensured the formation of between 200 and 400 nodules per mm². This is reliably sufficient to gain the ADI parameters. The authors' workplace has long experience on the in-mold technology application which resulted in development of method of calculating the gating system comprising a reaction chamber.

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