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Mechanical Properties of Thin Wall Ductile Iron Cast in Moulding Sand/ Aluminium Dross Mix

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Abstract: *Moulding sand thermal characteristics is vital to defining the solidification mechanism of a cast part, which in turn influences evolving microstructure and mechanical properties. Thin wall ductile iron (TWDI) castings are a viable substitute for lightweight applications for energy saving in automotive industries. Carbide precipitation and non-nodular graphite in the structure of TWDI remains a production challenge in many foundries. Hitherto, charge material composition and liquid treatments were considered important in the production of sound TWDI castings. Literature is very scanty on the strategy for modifying the thermal properties of moulding sand for cooling rate and under-cooling controls for preventing carbide precipitation and non-nodular graphite in TWDI castings. This study investigates the effect of incorporating 2-12 wt. % aluminum dross (AlDr) on the thermal properties of moulding sand and on the microstructure and mechanical properties of as-cast TWDI parts. Microstructural and mechanical property characterisation of TWDI cast samples using sand-aluminum dross mix reduced BHN values from 179, 185 and 123 BHN to 67, 54 and 71 BHN, UTS values from 248, 300 and 389 MPa to 208, 168 and 221 MPa for 0 and 12 wt. % AlDr (2, 3, 4 mm thick samples, respectively). However the percent elongation increased up to 7.3% for the 3 mm thick sample. The results showed that aluminum dross used as a moulding sand additive reduced the hardness and ultimate tensile strength values but significantly improved percent elongation.*

Keywords: *Mould materials, sand mix, cooling rate, mechanical properties, thermal conductivity*