

Investigation on Effect of Mn, Sn and Cu on Mechanical Properties of Austempered Ductile Iron (ADI)

By: *Hamidreza Soleimanpour, Vahid Zarif*

This thesis was an industrial project on making a cheap alloy in application of wear resistant part for mining and construction vehicles.

For front parts in mining and construction vehicles such as excavators teeth; good wear resistant (abrasive wear) and toughness is required. ADIs have good potential for using in these applications. Price is a key factor in materials selection. Although ADIs have good price compare to steels but the price can be more reduced.

In this project we tried to cast Austempered ductile iron (ADI) not by usual alloying elements (like Ni) but with using cheaper elements like Mn, Sn & Cu that have the potential for use in this application. For this reason, different compositions of alloying element (Mn, Sn & Cu) were investigated. More than 25 melt was cast for comparing mechanical properties of samples and 3 heat treatment cycles (austempering) were applied for heat treatment of samples.

Some laboratory tests that have been used in this thesis:

- 1- Metallographic studies on microstructure of sample before and after heat treatment.
- 2- Metallographic studies for nodularity measurement of graphite in sample.
- 3- Measurement of tensile strength
- 4- Measurement of fracture strength
- 5- Measurement of hardness

Studies and practical experiences in this project showed that these three metals have good potential for use in making ADI parts. The best composition for mentioned application was 1.5%Mn, 0.15%Sn and 0.2%Cu. The result was a Bainitic microstructure with acceptable hardness for wear resistant application along with enough toughness. After completing the project, 25 teeth part were produced and delivered to a company responsible to supply spare part for heavy trucks for field tests. The results were good because of acceptable performance and durability compare to their sale price of 4 USD per part.

