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HEAT TREATMENT AND ITS EFFECT ON MECHANICAL
PROPERTIES OF GREY AND NODULAR CAST IRONS

BY

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ABSTRACT

Without doubt iron is the world's most important metal. The industrial civilisation is largely based on iron and on its alloys.

Cast iron is produced by remelting pig iron and scrap in a cupola furnace, where the charge is in contact with the fuel and fluxes; or in a reverberatory furnace, a rotary furnace, or an electric furnace. The majority of commercial plain cast iron is produced by the foundry cupola method.

Its low melting point, compared with steel, allows full use to be made of the economical cupola furnace, resulting in a cheaper end-product. The fluidity of molten cast iron is greater than that of molten steel, while the shrinkage in the mould is much less, permitting the production of thin-section and intricate castings. Cast iron has a high resistance to compressive forces, a moderate tensile strength and an ability to absorb and dampen vibrations. Its structure is partially self-lubricating, due to the presence of graphite, making machining relatively easy.

Modification to the microstructure of cast iron can be made by varying the cooling rate in the mould, by varying the composition at a suitably convenient stage in the molten state, or by heat treatment of the finished casting. These procedures are adopted for specific purposes to assist in giving a wide range of cast iron products, which includes : pipes, columns, struts and support brackets, engine cylinder blocks and crank shafts; turbine casings and generator frames; high temperature, corrosion-resistant castings used in grates and fire boxes and in the construction of chemical plant; non-magnetic castings used in the manufacture of electrical components; malleable cast iron products and wear-resistant components such as machine tool beds, cams, gears, and pulleys.

Two basic types of cast irons are used in this study; namely grey cast iron and ductile cast iron (Nodular Cast Iron). Their basic properties were studied as in as cast condition as well as after heat treated condition. Test and experiments were carried out for this purpose and their procedures and results are written in the subsequent chapters.

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