

Some Cast Irons are Special

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Most engineers are familiar with the general characteristics and uses of Grey (FC) and Ductile (FCD) Cast Irons especially through their application as vehicle parts such as engine blocks, brake drums and discs, exhaust manifolds and wheel hubs, etc. Less well known are the types of cast irons which are alloyed with elements such as Cr, Ni, Mo, Si, V, Cu, etc. and heat treated, where required, in order to provide special properties such as abrasion, corrosion and heat resistance – these irons are often called the “*Special Cast Irons*”.

This paper reviews the physical metallurgy underlying the control of microstructure and properties in these irons and discusses how service performance depends on correct selection of composition and thermal treatments. The review covers:

- Alloy white irons including Ni-Cr Martensitic White Irons and High Cr Irons which are used for resistance to abrasive & corrosive wear in mining, materials extraction, processing and handling.
- Austenitic Grey and Ductile Irons which are used for resistance to corrosion and heat and also for their physical properties such as low expansion and non-magnetism.
- High Si Ferritic Irons used for heat and corrosion resistance.

Reference is also made to the value of electron microscopy studies in characterizing and understanding the fine scale microstructures in these irons, for example the nature of eutectic, secondary and tempered carbides in High Cr Irons.