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STEEL ALLOYS

Mixture of two or more metals

Steel with small amount of alloy metals

Common alloy metals are:

Boron

Manganese

Nickel,

Vanadium

Tungsten

Chromium



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BORON STEEL

Contains small amount of boron

Boron increases *hardening ability* of steel

Deep hardening depends on heat treatment by quenching and tempering

Uses:

Axle shafts

Wheel spindle

Studs



MANGANESE STEEL

Contains 11 to 14 % manganese

Sulphur content is low

Manganese works as a deoxide and desulphurising agent

Contains 0.8 to 1.5 % carbon (**high carbon steel**)

It has properties of **extreme hardness and ductility**

Oil quenching is practically possible

Uses:

Machine parts subject to severe wear



NICKEL STEEL

Contains 2 to 5 % nickel

Contains 0.1 to 0.50 % carbon

Nickel increases strength, ductility is maintained

Chromium is used with nickel to obtain toughness and ductility by nickel and wear resistance & hardness by chromium

Strong

Tough

Ductile

Uses:

In parts subjected to repeated shock and stress like **crankshaft, connecting rod**



CHROME-NICKEL STEEL

Contains 0.3 to 2.0 % chromium

Contains 1 to 4 % nickel

Contains 0.1 to 0.6 % carbon

Heat treatment increases tensile strength and elasticity

Tough, ductile and hard

Uses:

Gears, crankshaft, connecting rod
carbon it is stainless steel.



CHROME STEEL

Contains 0.5 to 2.0 % chromium

Contains 0.1 to 1.5 % carbon

Chrome steel with **14 to 18 % chromium** produces a variety of **stainless steels**

Forms various **carbides of chromium** which are very hard

The steel is more ductile than the a steel made by increasing the carbon content

Refines the grain structure; increases toughness and hardness

Increases the critical range of temperature and raises the strength at high temperature

Uses:

High grade balls, rollers



VANADIUM STEEL

Contains < 0.20 % vanadium (**tendency to produce carbide**)

Addition of vanadium increases the ***tensile strength, toughness and elasticity***

Ductility is lost

Comparable to low and medium carbon steel

It increases the life of tool, springs and other members used under ***high temperature***



CHROME VANADIUM STEEL

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Shaping
Empower

Contains 0.5 to 1.5 % chromium

Contains 0.15 to 0.30 vanadium

Contains 0.15 to 1.10 % carbon

Uses:

Gears

Springs

Shafts

Pins



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TUNGSTEN STEEL

Contains 3 to 18 % tungsten

Contains 0.2 to 1.5 % carbon

Very hard and wear resistant

Uses:

Dies

High speed cutting tools



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SOFT CENTRE STEEL

Three layers of steel

Outer layers hard steel

Inner layer soft steel

Hard outer surface is without brittleness

Uses:

Mould Boards of ploughs