HEAT TREATMENT INPLAIN CARBON STEEL

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INTRODUCTION

- Carbon steel (plain carbon steel) is steel which contain main alloying element is carbon. Here we find maximum up to 1.5% carbon and other alloying elements like copper, manganese, silicon. Most of the steel produced now-a-days is plain carbon steel. It is divided into the following types depending upon the carbon content.
- 1. Dead or mild steel (up to 0.15% carbon)
- 2. Low carbon steel (0.15%-0.45% carbon)
- 3. Medium carbon steel(0.45%-0.8% carbon)
- 4. High carbon steel (0.8%-1.5% carbon)
- Steel with low carbon content has properties similar to iron. As the carbon content increases the metal becomes harder and stronger but less ductile and more difficult to weld. Higher carbon content lowers the melting point and its temperature resistance carbon content cannot alter yield strength of material.

HEAT TREATMENT

- The process of heat treatment is carried out first by heating the material and then cooling it in the brine, water and oil. The purpose of heat treatment is to soften the metal, to change the grain size, to modify the structure of the material and to relieve the stress set up in the material after hot and cold working.
- The various heat treatment processes commonly employed in engineering
- practice as follows:-
- 2.2.1. ANNEALING:-
- Spherodizing:-
- Spherodite forms when carbon steel is heated to approximately 700 for over 30 hours. The purpose is to soften higher carbon steel and allow more

formability. This is the softest and most ductile form of steel. Here cementite is present.

- Full annealing:-

  Carbon steel is heated to approximately above the upper critical temperature (550-650) for 1 hour. Here all the ferrite transforms into austenite. The steel must then cooled in the realm of 38 per hour. This results in a coarse pearlite structure. Full annealed steel is soft and ductile with no internal stress.

- Process annealing:-
- The steel is heated to a temperature below or close to the lower critical temperature (550-650), held at this temperature for some time and then cooled slowly. The purpose is to relive stress in a cold worked carbon steel with less than 0.3%wt c.

- 2.2.2.NORMALISING:-
- The process of normalizing consist of heating the metal to a temperature of 30 to 50 c above the upper critical temperature for hypo-eutectoid steels and by the same temperature above the lower critical temperature for hyper-eutectoid steel.
- It is held at this temperature for a considerable time and then quenched in suitable cooling medium. The purpose of normalizing is to refine grain structure, improve machinability and improve tensile strength, to remove strain and to remove dislocation.
- 2.2.3.HARDENING:-
- The process of hardening consist of heating the metal to a temperature of 30-50c above the upper critical point for hypo-eutectoid steels and by the same temperature above the lower critical temperature for hyper-eutectoid steels. It is held this temperature for some time and then quenched. The purposes of hardening are to increase the hardness of the metal and to make suitable cutting tools.

- 2.2.5.MARTEMPERING:-

This process is also known as steeped quenching or interrupted quenching. It consists of heating steel above the upper critical temperature and quenching it in a **salt bath kept** at a suitable temperature.

- 2.2.6.TEMPERING:-

This process consists of reheating the hardened steel to some temperature below the lower critical temperature, followed by any desired rate of cooling. The purpose is to relive internal stress, to reduce brittleness and to make steel tough to resist shock and fatigue.

- 2.3. SURFACE HARDENING:-

In many engineering applications, it is desirable that steel being used should have a hardened surface to resist wear and tear. At this time, it should have soft

and tough interior or core so that it can absorb any shocks. Case hardening is the process of hardening the surface of metal, often a low carbon steel by infusing elements into the metal surface forming a hard, wear resistance skin but preserving a tough and ductile interior. This type of treatment is applied to gears, ball bearings, railway wheels.