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TYPES OF HARDENING METHODS

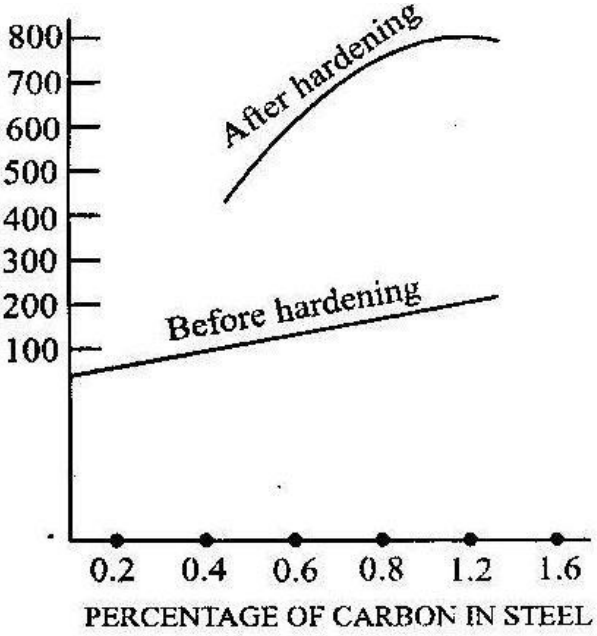
Q.2 Describe different types of hardening methods?

Ans: Hardening:

- Hardening is define as heating the steel to a temperature within or above its critical temperature and held at this temperature for a considerable time to ensure proper penetration of the temperature inside the component and then allowed to cool by quenching in water, oil, or brine solution.
- If the carbon content of steel is known the proper temperature to which the steel should be heated may be obtained by the iron –carbon equilibrium diagram.

Purpose: -

- Improves strength and toughness
- Improves ductility
- To develop hardness and wear resistance properties,
- To developed mechanical properties.
- Process: the steel is heated to a temperature of 790-850°c. the steel is held (soaked) at this temperature 2.5 minutes 25 mm thickness and then is rapidly cooled in water or brine.
- A graph of maximum hardness versus carbon content



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Tempering: -

- The steel obtaining after hardening is brittle and unsuitable for most uses. So another operation knows as tempering is required to be applied in order to reduce hardness brittleness.
- Tempering is define as reheating below the critical temperature (A1) and cooling takes place at room temperature.
- Such reheating permits the trapped marten site to transform and relive the internal stresses. The temperature is determined by the specification of steel and the final hardness and toughness desired.

Purpose:

- To reduce hardness, brittleness and tensile strength.
- To increase ductility and toughness.
- To relive quenching stresses.
- To equalize the hardness in piece as far as possible.
- According to the usefulness of steel the tempering is divided in to three classes.
- Low temperature tempering.
- Medium temperature tempering
- High temperature tempering

Surface hardening: -

Surface hardening is defined as a process for hardening a ferrous material in such a way that the surface layer known as case is substantially harder than remaining material known as core. Surface hardening involves the hardening of the surface without changing the chemical composition at the surface of steel.

Depending upon the method of heating surface hardening is of two types

a) Flame hardening
b) Induction hardening

❖ **(a)Flame hardening:-**

It is the treatment process in which surface of steel is heated rapidly above the transformation temperature by a high temperature flame and quenched to produce marten site. In flame hardening oxyacetylene flame is used which can generate temperature upto 3000°c.

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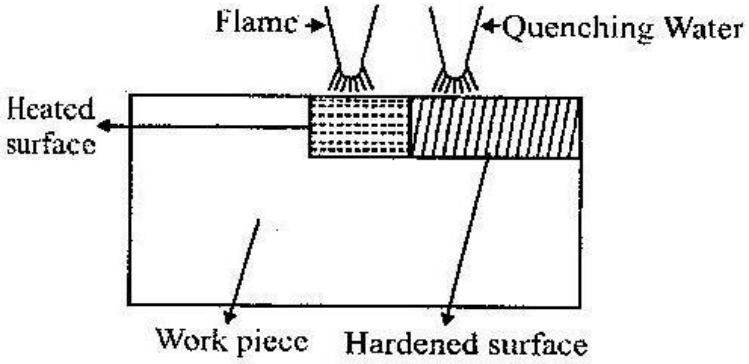
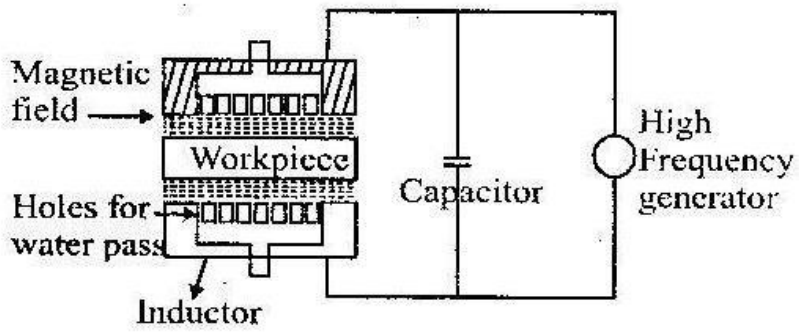


- **(b)Induction hardening:**

  it is defined as heating the medium carbon steel by means of alternating magnetic field to a temperature above transformation range (750°-800°c) followed immediately by quenching.

The work piece can be heated by electromagnetic induction by passing an alternative current

through an inductor, piston rod, pump soft spur gear, crankshaft and hardened by this method.



Age hardening:

When aluminumalloy containing about 4% copper is heated to a temperature and quenched in water,its hardness increase with time on keeping the alloy at room temperature. This phenomenon is called age hardening.

Process:

The two phase at room temperature is greeted to a temperature at which homogeneous single phase solid solution is obtained. The alloy is held at this temperature for homogenization. The holding time vary from 30 minute to several hours.

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After obtaining the homogeneous solid solution the alloy is cooled rapidly by water.

After quenching the alloy is a held at a particular temperature for some time.

Process: the steel is heated to austenizing temperature and it is then quenched in a medium. The particle is held in the both until it reached the temperature of medium is held in the both until it reached the temperature in air. Sometimes cooling takes place in oil austenite I transferred in to marten site during the cooling period at room temperature.