ISOSTATIC PRESSING

*This type of operation is used for compaction of powders. *The process is similar to pressing using cupped hands for making snow balls.

Cold Isostatic Pressing

*In cold isostatic pressing (CIP) the metal powder is placed in a flexible mould made of rubber or Urethane or PVC.*The assembly is then pressurized

hydrostatically in a chamber usually using water. *Pressures of 400 to 1000MPa are used.



Cold Isostatic Pressing

The powder is enclosed in flexible container around a solid core rod. Pressure is applied isostatically to the assembly inside a high pressure chamber. The powder gets compacted and the green compact is taken out and sintered.

Hot Isostatic Pressing

In Hot Isostatic Pressing (HIP) a metal powder is stressed using inert gas in a metal container. *Pressure of 100MPa at 1000oC is used.*Here a container made of very high melting point metal is used.*An inert gas is used as the pressuring media.The main advantage of HIP is its ability to produce compacts with essentially 100% density, good

metallurgical bonding among the particles with good mechanical properties*HIP process is relatively expensive

and is used for making super alloy components for aerospace industry.

*It is regularly used for the densification of WC cutting tools and PM tool steels.

HIP is also used to close the internal porosity and improve properties in superalloy and Ti alloy castings for the aerospace industry. The main advantage of isostatic pressing is the absence of wall friction as pressure is being applied from all directions. It produces compacts of practically uniform grain structure and density irrespective of shape.



Hot Isostatic Pressing

Figure shows the details of producing PM component.Here a mold is used into which metal powder is filled.This is then surrounded by a secondary pressing media.Then vacuum is applied.The entire assembly is kept in an autoclave Chamber and subjected to HIP.Necessary pressure is applied through the chamber and temperature is maintained at a known value. As a result the compacted metal

powder gets sintered Finally the component is taken out of the system to get the finished part.



 It is the heating of the compacted metal powders to a temperature above their recrystallisation temperature but below their melting point.



Sintering or consolidation at high temperatures

Sintering

Sintering is a process wherein the compressed metal powder is heated in a controlled atmosphere using a furnace. The temperature of the furnace will be slightly below melting point of the metal powder but above the RCT.

After sintering, the strength of the metal compact will be very high.

Sintering mechanisms are highly complex in nature & depends on the composition of the metal powder and the processing parameters.

Normally at high temperatures the particles begins to form a strong solid state bonding by diffusion. This results in high strength, high density, high ductility and other properties. During sintering the component undergoes shrinkage as in castings. This needs to be taken care of.



The sintered component is taken and necessary grinding/finishing of the component is carried out, such that the final dimensional accuracy is achieved. For this, a variety of machining operations will be carried out.

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