

27/07/15
SE-T-6

powder conditioning

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Introduction: To make the metal powders or Ceramic powders suitable for consolidation they need to be conditioned properly by the following treatments:

(I) Heat Treatment $\frac{\circ}{\rightarrow}$

(I) In order to eliminate the traces of oxides on the powder, metal powder is ~~heated~~ purified by heating in a reducing atmosphere. As we know the presence of oxide content in powders will be adverse effects on P/M product.

(II) There is work hardening effect during the process of manufacturing powders of metal & alloys. In order to restore the compressibility

properties of the powder,
softening of powder particles
through annealing in a protective
or reducing atmosphere is done
in a furnace at a certain temp.

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(ii) pre alloyed powders can be obtained
directly by atomization process.

- Alloying can also be achieved by
mixing metal powders and by solid state
diffusion process at a certain temp.

- Instead of full alloying, a partial
alloying is done preferably to restore
the compressibility property of the
powder, because full annealing
leads to hardening and thus we
get poor compressibility.

- For partial alloying we can have
the fine particles of the alloying

elements just remaining attached to the particles of the parent metal powder by diffusional bonding at the contact points, thus assuring a homogeneous composition of the alloy throughout the consolidation process and we achieve full alloying during the process of sintering.

Note:- The annealing temp should not be very high in order to avoid much sintering in the powder mass. It needs only mild pulverization with the help of a wire-brush to avoid work hardening again.

(11) Mechanical Treatment: Mechanical

treatment is given by blending or mixing of the powdered metals or

Ceramics

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Blending: It refers to intermingling of the same kind of powder obtained from different sources or from different batches having different sizes or shapes.

Mixing: Mixing is done for obtaining homogeneous alloy products by the addition of powders of alloying elements having different densities. During this operation solid lubricant powder and binder powder are added to the powder charge of the base metal with or without the addition of the powders of the alloying elements and all of them are put in a suitable type of mixer.

- Good homogeneous mixing is very important regarding the quality of the final P/M products and the consistency of their properties.

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- Excessive blending or mixing results in the following problems:-

(1) Modification of apparent density and flow rate of the powder take place due to too much dusting by fracturing of sharp corners at edges of the particles.
Excessive fines formation lowers the apparent density as well as the flow rate of the powder.

(2) Compressibility may also be reduced due to work hardening effect as a result of inter particle sliding & collisions.

(3) Due to the frictional heat generated by rubbing of particles the lubricant gets softened and may cause some agglomeration in the powder bed and thus changing the apparent density & flow rate.

(4) In case of large difference in density of powder there may be segregation in the dry powder mixture, which leads to nonuniform density from compact to compact.

(5) The cost of production in create due to unnecessary in create in mixing time. CVD