

Control of Casting Structure :

(15)

As a general rule, we control ~~sub~~ solidification so that we produce a casting macrostructure containing a large number of small equiaxed grains.

This permits the casting to have isotropic properties and improved strength due to grain size strengthening.

In addition, we wish to make any dendrites as small as possible, which again improves the strength of the casting and refines both micro-shrinkage and gas porosity.

In order to obtain this desired structure, we must first assure that widespread nucleation occurs by using appropriate grain refining or inoculating agents.

Second, we may encourage rapid solidification to assure that the secondary dendrite arm spacing within the grains is very small.

The rate of solidification for any given metal can be influenced by the size of the casting, the mold material, and the casting process.

Thick casting solidify more slowly than thin castings.

Mold materials having a high density, thermal conductivity, and heat capacity produce more rapid solidification.

The casting processes are divided into several groups - sand mold, ceramic molds, and metal molds.

The processes using metal molds tend to give the highest strength castings due to rapid solidification.

Ceramic molds, because they are good insulators, give the slowest cooling and lowest strength castings.