



IIT ROORKEE



NPTEL ONLINE
CERTIFICATION COURSE

SPECIAL SAND MOLDING PROCESSES

Processes based on inorganic binders

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INTRODUCTION

- In recent time, special molding processes have been developed which require less skill and effort, saves time, produce better quality molds and cores and hence improves productivity.
- Generally they eliminate the need for drying or baking of the mold and core and hardening takes place due to chemical reaction.
- They can be processes based on inorganic binders/organic binders/special processes.

Processes based on sodium silicate binder

- Use of sodium silicate as binder has increased considerably in recent years.
- Mold and cores do not need drying or baking and in some cases, not even ramming.
- Different types of hardener and catalysts may be used.
- Process can be used for ferrous as well as non-ferrous castings.

Carbon dioxide process

- Carbon dioxide gas is passed through sand mix containing sodium silicate as binder.
- Immediate hardening takes place because of reaction between sodium silicate and carbon dioxide.
- Mass ratio and specific gravity of sodium silicate should be controlled.
- Silica gel is responsible for giving strength.

- Sand mix: sand + 3-5% sodium silicate(Specific Gravity-1.55 to 1.71) + additives
- Additives are generally dextrin, sea coal, corn flour, iron oxide, invert sugar
- Invert sugar is also used as break down agent with some proprietary compound.
- Carbon dioxide is passed for predetermined length of time.
- For 1 Kg sodium silicate, 0.5-0.75 kg of gas required.
- Advantages of the process :saving in labour, withdrawal of pattern easy, less molding skill, good accuracy and finish etc.

Ferro-silicon process

- Sand is hardened and bonded with reaction product obtained by exothermic reaction between sodium silicate and ferro-silicon powder.
- Sodium silicate : ferro-silicon powder = 2.25:1
- Reaction continues till Silicon and water are present (with excess of water, all the water is dispelled by decomposition and evaporation)

- With increase in temperature, reaction rate increases and a hard spongy mass is formed. No baking is necessary.
- Sand + 2% Fe-Si (80% Si) powdered 2-3 micron size + 5% sodium silicate (Specific gravity: 1.3-1.35)
- Additives can be added to impart specific properties like collapsibility and bench life.
- Foaming agents used to increase flowability of the slurry.
- Short bench life

Dicalcium Silicate Process

- Also known as fluid sand process
- Dicalcium silicate (obtained from slag of some melting/reduction processes) is a good hardening agent with sodium silicate as binder.
- Rate of hardening depends on grain fineness of silicate (to be less than 200 mesh) and temperature of sand.

- Sand mix: sand + 2-3% dicalcium silicate + 5% sodium silicate + suitable foaming chemicals
- Mixing time: 3-5 minutes
- Short bench life (25-30 minutes)
- Sodium silicate used should have high mass ratio (1:2.3 to 1:2.8) and specific gravity ~1.50.
- Process used for medium and heavy ferrous castings

Cement Molding Process

- Portland cement used as binder
- Efficiency increased with use of sodium silicate
- Sand mix: 2% cement + 4-5% sodium silicate + 1% pitch or molasses
- Bench life : 15-20 minutes
- Use of foaming chemicals reduce ramming requirement
- Used for large sized molds with good shake out properties

Chamotte Process

- Burnt fire clay (fine mesh size) is used as hardener with sodium silicate as binder.
- High silica sand + 4-5% sodium silicate + 2% chamotte
- Used for producing heavy castings at low cost, free from defects like sand fusion, hot tears etc.



THANKS

