Scabing Defect

Remedies

- Increase bentonite content in the molding sand
- Use bentonite with a higher specific binding power
- Reduce proportion of fine quartz in molding sand
- Reduce recirculation of dust; if necessary use bentonite with higher montmorillonite content
- Use coarser molding sand
- Improve conditioning of bentonite; prolong mixing times; pre-wet used sand
- If practical, reduce amount of new sand to increase the degree of chamottization
- Improve water quality; switch from well water to public supplies; perform partial desalination

Moulding plant

- Reduce compaction; reduce compacting pressure
- Ensure even distribution of sand and more uniform compaction of the mould

Gating and pouring practice

- Improve gates to avoid local overheating through excessive amounts of metal
- Aim for shorter pouring times and therefore shorter exposure to radiated heat

Background information

Scabs are typically found on castings from bentonite-bonded sand moulds. The inflowing metal heats the upper surface of a mould. The evaporating water is condensed in underlying layers and weakens the bond in over-wetted regions. At the same time, the compressive stress in the heated sand layers increases through expansion of the quartz. Surface crusts separate.

The tendency for such defects to occur intensifies with in-creasing compressive stress and declines with increased wet tensile strength.1 Reference 2 deals with compressive stress and methods of its measurement.

It is known that compressive stress increases with higher packing density of the quartz grains. A dramatic increase takes place when the proportion of fine quartz in the molding sand is increased.

Wet tensile strength is described in publications 3 and 4 as a parameter for determining susceptibility to scabbing.

The influence of various molding sand admixtures on the formation of the sand crust has been studied. In general, the risk is reduced by the use of all materials that increase wet tensile strength and lower compressive stress.

Publication 1 examines calcium-type and activated bentonite, wood flour, powdered peat, inert fines and starches as well as carbon dust. Here it was clearly ascertained that the use of soda-activated bentonite markedly reduces susceptibility to scabbing. Another publication 5 emphasizes the impressive reduction in sand crust formation resulting from the addition of carbon carriers with low softening points, which reduce the compressive stresses. Publication 6 reports on the effects of various coal dusts on expansion pressure and wet tensile strength. The study determined an intensified increase in compressive stress when using pit coals with 10 – 35 % volatiles. The stress is reduced by coal mixtures which contain additional carbon carriers with low softening points.

The risk of scab formation when using bentonite-bonded molding sands can be reduced by increasing the bentonite content, reducing the fine quartz content and using coarser sand. When such defects occur, the degree of mulling of the sand should also be checked. Likewise, too much salt in the water can result in scabbing. In certain cases, such defects could have been avoided by using a partial desalination plant.

Where there is a very high packing density in the mould, a small increase in Compactibility may counteract the formation of defects.

Likewise, the formation of sand crusts can be avoided by modifying the gating system.