SHELL PROCESS PROPER DEGREE OF CURE

SILICA SAND

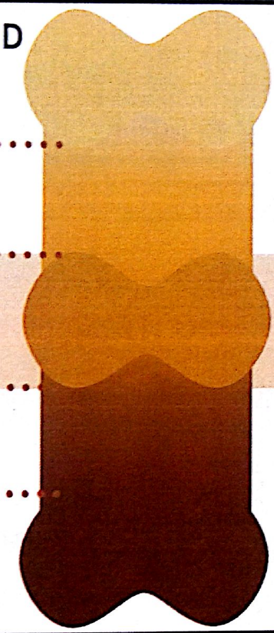
SIGNIFICANTLY UNDER CURED

UNDER CURED

IDEAL CURE

OVER CURED

SIGNIFICANTLY OVER CURED



LAKE SAND

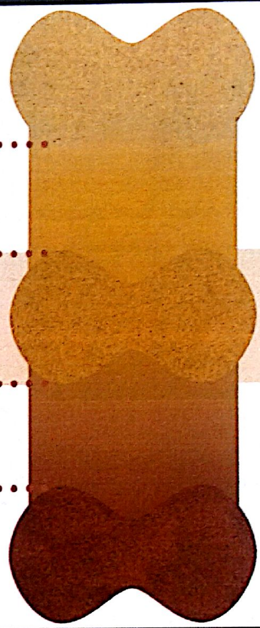
SIGNIFICANTLY UNDER CURED

UNDER CURED

IDEAL CURE

OVER CURED

SIGNIFICANTLY OVER CURED



ZIRCON SAND

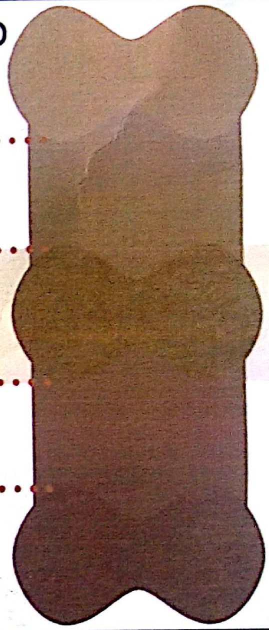
SIGNIFICANTLY UNDER CURED

UNDER CURED

IDEAL CURE

OVER CURED

SIGNIFICANTLY OVER CURED



TROUBLE SHOOTING THE SHELL PROCESS

CASTING RELATED ISSUES

METAL PENETRATION

- **Low core density** – *Increase blow pressure*
- **Surface of core or mold too brittle** – *Decrease cure cycle or reduce mold or pattern temperature to prevent overcuring*
- **Sand too coarse** – *Switch to a finer base sand; use wash; add fines – Iron oxide, clay*

CASTING POROSITY

- **Undercured mold or core surface** – *Lengthen cure time*
- **Excessive gas generated at metal/sand interface** – *Decrease resin and/or hexa level*
- **Permeability of base sand is too low** – *Use a coarser base sand*
- **Inadequate venting of cores or molds** – *Add vents where needed*
- **Need for a gas scavenger** – *Add iron oxide to the mix*

VEINING & THERMAL SHOCK

- **Pouring temperatures too high** – *Monitor temperatures*
- **Stress areas in cores or molds** – *Check ejection system; check uniformity of cooling.*
- **Cores or molds are overcured** – *Shorten cure cycle*
- **Cores or molds are excessively brittle** – *Use a plasticized resin; reduce hexa content*
- **Cores too strong** – *Reduce resin content*
- **Base sand does not allow for enough expansion** – *Try alternate base sand*
- **Uneven mold bonding** – *Check to see if locators are lining up properly*
- **Cores or molds are too cold** – *Review storage conditions*
- **Core or mold weights are too low** – *Increase weights by lengthening invest cycle; possibly sand is cold*
- **Cores or molds have thin walled spots** – *Check for peel back or lamination; maintain an even depth of cure*

CORE MAKING ISSUES

PEEL BACK

- **Hot or cold spots in core box or on pattern** – *Hot spots–rearrange heaters; Cold spots–add beryllium copper inserts*
- **Entire core box is too hot or cold** – *Adjust temperature*
- **Low melt point sand** – *Contact your HAI Sales Representative*
- **Core air pressure too high or low** – *Adjust air pressure settings; use pulsating blow; change blow angle*
- **Moisture in sand** – *Adjust blower air line moisture traps*
- **Cold sand** – *Do not store in extremely cold area*
- **Dirty patterns or core boxes** – *Clean to improve heat transfer*
- **Improper core density** – *Maintain full head of sand in magazine or dump box*

WEAK CORES OR MOLDS

- **Low resin content** – *Check resin content and LOI of sand; increase resin level of sand*
- **Low hexa content** – *Check hexa content, increase hexa level*
- **Cores or mold over or under cured** – *Check cure cycle and pattern temperatures*

STICKING

- **Core or mold is over cured** – *Decrease cure cycle, decrease temperature*
- **Release build-up in the core box or on the pattern** – *Clean the core box or pattern; spray release less often*
- **Scored core box or pattern** – *Repair damaged boxes or patterns; minimize damage*
- **Insufficient release agent in sand** – *Add more release*
- **Dusty resin coated sand** – *Monitor sand handling practices, minimize sand abrasion potential*

POOR FLOWABILITY OR BLOWABILITY

- **Plugged vents** – *Check vents regularly; change type of vents*
- **Not enough vents** – *Change type or number of vents*
- **Pattern or core box too hot** – *Lower temperature*
- **Low coated sand melt point** – *Contact HAI*
- **Moisture in air line** – *Check moisture traps on a periodic basis*
- **Insufficient amount of release agent in sand** – *Add more release*
- **Sand magazine partially filled** – *Maintain a full magazine or dump box*

EXCESSIVE BUILD-UP

- **Too hot a pattern or core box** – *Lower temperature*
- **Melt point of sand is too low** – *Contact HAI*
- **Cores not draining properly** – *Vibrate during drain*
- **Too long an invest cycle** – *Decrease invest cycle*

UNEVEN BUILD-UP

- **Poor heat distribution** – *Check arrangement of heaters*
- **Cores drain poorly** – *Vibrate during drain*
- **Dirty patterns or core boxes** – *Clean patterns and boxes regularly*
- **Poor blow pattern** – *Check location of vents and blow holes*
- **Plugged vents** – *Check boxes periodically; try other types of vents*

LACK OF BUILD-UP

- **Cool box or pattern** – *Raise box or pattern temperature*
- **Melt point of sand is too high** – *Contact HAI*
- **Cold sand** – *Increase invest cycle and review sand storage conditions*
- **Too short an invest cycle** – *Increase invest cycle*

ODOR

- **Lack of deodorizer in the coated sand** – *Use deodorized sand*
- **Eliminate vinsol** – *Use non-vinsol plasticized sand if required*

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