Casting Connection

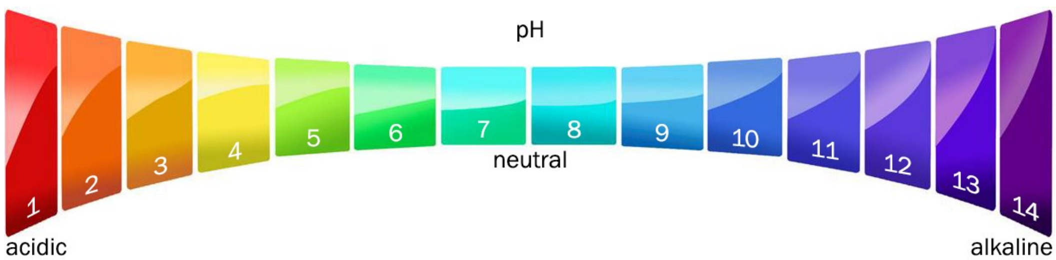
• Your Link to Investment Casting News from Ransom & Randolph •

Inside this Issue:

Understanding Slurry pH

The pH of a slurry is a property that requires monitoring and maintenance. Slurry pH needs to be monitored with a pH meter. Using pH papers does not give accurate results.

Although not always possible, it is best to identify and correct the specific sources of contamination. There are many possible causes for a pH drop in a slurry.



A minimum pH of 9.25 is common to most colloidal silica based systems. The change in pH is as important as the actual pH value. If there is a sudden pH change, it is an indication of slurry declining slurry pH. By identifying the source of declining slurry pH, the appropriate corrective action can be applied.

Source #1
The residues left from soluble wax removal can also affect the pH of the slurry. Residue films that can redissolve in the slurry can lower the pH with the acidic residues being the most potent.

Corrective Action
Improved cleaning and rinsing methods must be implemented in the process. The pH of the rinse water should be

• *continued on page 4* •

Filters Remove Inclusions & Slag

Filtering with Glasweve™ filters is an effective way to remove inclusions and slag from steel, copper-based metal alloys, aluminum, gray, malleable, white, compacted graphite and ductile cast iron.

Able to withstand pouring temperatures up to 3000°F (1650°C), filtration shapes made from GLASWEVE filters help trap inclusions and reduce turbulence during the casting process. They also promote better metal distribution and minimize reoxidation while increasing the effective surface area for metal filtration.

On contact with molten metal, the surface fibers of GLASWEVE filters form

• *continued on page 3* •

R&R DENTSPLY

Investing with Innovation™

New R&R Team Member

Scott Saxton
Application
Manager

R&R is pleased to announce Scott Saxton's appointment as Application Manager. In this role, Scott will be responsible for managing R&R's technical applications team. This encompasses implementing customized solutions and application technologies as well as coordinating problem solving measures on behalf of R&R customers.

Scott graduated magna cum laude, earning his Bachelor of Science in Ceramic Engineering from the Inamori School of Engineering at Alfred University in Alfred, NY. During his time at Alfred, Scott held various co-op, lab and teaching assistant roles.

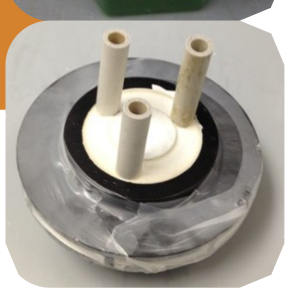
Scott joins the R&R team with experience as a Ceramic Engineer at an aerospace foundry; where he served as the technical owner of the shell room; trialing, testing and implementing products into production.

Please join us in welcoming Scott to the R&R team!

Casting with Core Materials

Photo courtesy of ICI

Photo courtesy of ICI



Investment casting allows foundries to provide customers with intricate castings. However, the more holes and passageways in a final piece, the more creative the demands of the casting design and production process have to be. Foundries must consider modified shell building methods and the use of ceramic cores in order to overcome the challenges of complex geometries.

When used correctly, pourable core materials can be used in challenging areas such as deep slots, small cores and blind holds. They are easy to apply and conform to the shape of the cavity.

Pourable core materials provide the benefits of a preformed core, while eliminating the added cost of expensive tooling or special equipment associated with the leaching process.

Pourable core materials are formulated to contain refractory materials, binders or bonding materials and controlling chemicals. These materials are combined as a powder that is mixed with water. The addition of water allows the materials to become fluid and initiates a bonding reaction. The binders used are typically gypsum or phosphate based.

Gypsum bonded materials are used in non-ferrous castings and are non-exothermic, meaning they can be poured directly against the wax mold.

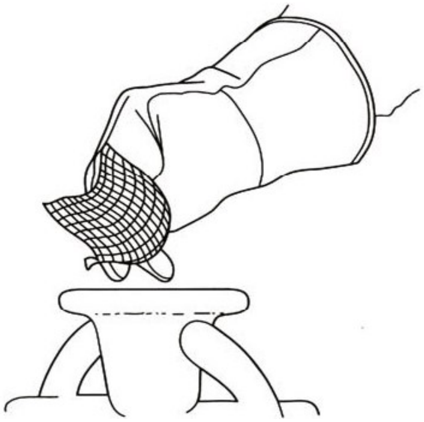
For high temperature alloys, phosphate bonded materials are used and are exothermic, meaning they can distort the wax mold. Because of this, it is typically recommended to use this material after the application of one or two shell coats.

By utilizing pourable core materials and removing pattern geometry challenges, foundries are able to reduce scrap and rework, cut in-process time and cast extremely intricate pieces.

Check our next issue for ceramic core materials application tips & tricks!

Filters Remove Inclusions & Slag

• *continued from page 1* •



a sticky layer of fayalite. This allows the fabric to remove even micron-sized inclusions from the beginning of the pour to the end.

GLASWEVE filters are particularly effective at extracting dross, slag, refractory particles and nonmetallic inclusions.

The most common application of GLASWEVE filters in the investment casting industry is the preformed cup. The pre-formed GLASWEVE filters fit into the pouring cups positioned at the top of the tree mold.

Investment casters have also placed GLASWEVE filters in the wax mold gating system to filter metal at pattern entry. This assists in minimizing reoxidation.

GLASWEVE filter Applications

- Filtering ferrous and non-ferrous molten metals.
- Filtering specialty metals including tool and die steel.

GLASWEVE filter Advantages

- Low cost.
- Improves fluidity and metal distribution.
- Removes micron sized inclusions and impurities.
- Can be used with existing pattern equipment.
- Reduces turbulence.
- Eliminates inclusions created by ceramic chips.
- Non-chilling.
- Reduces scrap.

Filtering Tips for Specific Alloys

Brass & Bronze

- GLASWEVE filters work well with copper alloys; however they are not recommend for use with pure copper.
- GLASWEVE filters effectively separate the thin slag in leaded bronze. The smaller the hole size, the better the filtration results.

Steel

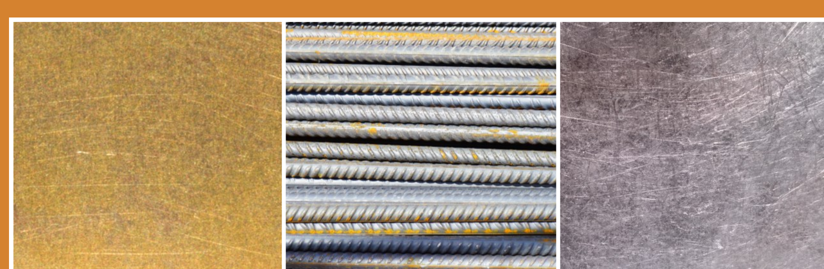
- GLASWEVE filters are rated at 3000°F (1650°C); however, many stainless steel castings have been poured at 3100°F (1704°C). Success with the high-range temperatures is dependent upon the volume of the metal to be cast. The smaller the volume, the greater the chance of success. The majority of steel castings are poured under 2950°F (1621°C).
- For stainless steel, the #31 mesh (1 mm) is typically suitable.
- For carbon steel, we recommend trialing with the #31 mesh and increasing the hole size based on the initial trial results.

Gray Iron

- The #31 mesh (1 mm) material is recommended as gray iron has thin, hard-to-separate slag.

Ductile Iron

- Due to its reduced flow and typically larger inclusions or particles, a #27 mesh (2 mm) material is recommended for initial trials. If the #27 material is effective, you may wish to reduce the hole size to determine if you receive more effective filtration with a #28 filter.



Kiln Korner

Burning Out the SLA/RP Pattern

Some foundries try to use an autoclave to remove the wax gates and runners from the pattern, but this may not create enough heat and may also cause cracking while removing the investment casting SLA/RP pattern, which needs the higher temperatures associated with FlashFire dewax systems.

Guide for FlashFiring the SLA/RP

Furnace preheat to 1500°F (815°C)

- Load the shells with pour cup down on the FlashFire drain cups
- Enter the shells into the preheated FlashFire furnace

Start the SLA/RP pattern temperature recipe in the main temperature controller:

Profile

- Hold 1500°F – 10 minutes
- Ramp to 2000°F – 40 minutes
- Hold 2000°F – 10 minutes
- Ramp to 1500°F – 20 minutes
- Hold to 1500°F – 10 minutes
- Remove the shells from the FlashFire furnace
- Repeat

Tips

- Maintain a minimum of 10% oxygen content in the furnace
- Strategically placed vents on the SLA/RP pattern will help properly burnout the pattern material
- Some SLA/RP patterns successfully burnout at lower temperatures

Source: Pacific Kiln & Insulations, Degrees° Newsletter, December 2015, Vol. 17 No. 3

Understanding Slurry pH

• *continued from page 1* •

maintained above 7 with ammonium hydroxide so any acid residue is neutralized.

Source #2

Many types of bacteria and algae can grow in colloidal silica. As either bacteria or algae grow, they change their environment as well and can be a cause of pH change.

Corrective Action

Small quantities of bactericide and/or algaecide can be added to the slurry to kill contaminants.

Source #3

The use of zircon in a slurry tends to depress the pH over time. There are many types of zircon on the market including: raw, acid washed and calcined. The organics left in the raw zircon can be leached out of the powder and affect the pH, as can the acid residue from acid washed zircon . Calcined is best for use in slurries, as the organics are burned and no acid is used in processing.

Corrective Action

When using zircon, some pH drop may still occur.

As noted, it is not always possible to identify the specific cause of pH decline. If the source of slurry pH drop cannot be identified or eliminated, when making adjustments for evaporation a 0.5% -1.0% ammonium hydroxide (by weight) solution should be used instead of deionized or distilled water. This will help to stabilize and control the slurry pH.