



Troubleshooting Conventional Burnout Phosphate Bonded Investments

Phosphate investments are affected by many variables, but the following generalizations can be made:

- Thorough mixing insures complete reaction of powder with liquid.
- Longer and/or faster mixing accelerates setting time.
- Increasing the temperature of the room, liquid temperature, or powder temperature accelerates setting time.
- Higher mold temperature during setting expands the pattern and may result in larger castings.
- Compensation for the shrinkage of different alloys may be obtained with the same investment. Maximum expansion is obtained using the special liquid at full strength; expansion may be reduced by diluting the special liquid with distilled water.
- The high expansion and density of the investment requires a slow rate of burnout. (conventional burnout)
- Visually inspect packaging. Packages which are leaking, flat or appear damaged should be set aside. Call technical support for further instructions.
- Higher expansion can be achieved by using Special Liquid Concentrate Plus

Investment Sets Too Quickly

Cause	Solution
Inaccurate liquid/powder ratio.	Check suggested amounts and measuring equipment.
Spatulation too long.	Reduce spatulation time. Check recommended time
Elevated temperature of room, investment and liquid (above 80°F/27°C).	Rinse mixing bowl in cool water before use and/or store investment & liquid in cooler location.
Contamination: presence of set material in mixing bowl water.	Clean bowl well or replace bowl. (Use distilled water if necessary.)
Mixing large amounts of investment (150 grams) or at high speed (above 1000 RPM) generates heat	Use slower mixing speed or smaller mix size.
Aged investment powder.	Discard outdated or improperly stored material.

Investment Sets Too Slowly

Cause	Solution
Temperature of room, investment and/or liquid too low (below 65°F/18°C).	Avoid cold room temperature. Use warmed liquid and powder.
Insufficient spatulation.	Increase spatulation time.
Contamination of mix.	Avoid contaminants such as alcohols or detergents. Use distilled water.



Mix Is Thick Or Thin

Cause	Solution
Incorrect liquid/powder ratio.	Check instructions for recommended ratio. Check accuracy of measurements.
Aged investment powder.	Discard outdated or improperly stored material.
Investment container left open in humid environment.	Check storage procedure; discard material.

Rough Casting Surfaces

Cause	Solution
Insufficient spatulation.	Spatulate as recommended in instructions to thoroughly complete all setting reactions. Replace worn bowl and paddle -- New equipment improves mixing action.
Rate of burnout too rapid.	Decrease heating rate or try two-stage procedure per instructions.
Overheating alloy	Review alloy manufacturer's directions.
Contaminated or defective pattern and/or pattern material.	Use only high quality pattern materials. Avoid wax contamination. If using plastic sprues, use either two stage burnout and/or hollow sprues or coat sprues with thin layer of wax to prevent pattern boiling in mold causing mold erosion or fracture.
Wet pattern.	Dry pattern thoroughly after application of debubbler (SMOOTHX).

Investment Breakdown- *Indicated by presence of rough casting and pits*

Cause	Solution
Burnout too rapid.	Follow burnout procedure as recommended in investment instructions.
Bench set too long	Material left past the recommended bench set time should not use a rapid fire technique
Non-Uniform heating	Make sure all heating elements in oven are working and that rings are centered in the furnace and not overcrowded
Investment not uniformly or thoroughly set.	Spatulate longer, use warmer liquid and bench set in a warm environment.
Overheated Mold	Check furnace for temperature calibration. Do not heat past investment manufacturer's instructions



Insufficient bench setting time.	Lengthen the time of bench set before mold is placed in oven.
Use of uncoated, solid plastic sprues and runner bars.	A light coating of wax will allow pattern wax to drain and space for plastic to expand.
Use of preheated oven	Use of a preheated oven is not recommended

Pits And Nodules On Castings

Cause	Solution
Impurities in wax or plastic.	Be sure that pattern material is free of foreign matter.
Air bubble entrapped.	Use wetting agent (SMOOTHX); dry thoroughly. Take care during investing to avoid entrapping air.
Insufficient vacuum during spatulation.	A good vacuum of 26-29" Hg (660-740 mm) is recommended for mixing.
Insufficient spatulation.	Increase spatulation time by 15-20 seconds. Check recommended time first
Entrapment of loose investment particles.	Remove loose investment from sprue hole before burnout. Avoid sharp edges in sprue system or at pattern attachments.

Mold Cracking/Fins on Casting

Cause	Solution
Too early and/or rapid burnout.	Lengthen the time of bench setting before mold is placed in oven, 60 minutes minimum. Use standard burnout
Plastic pattern or sprue materials with high melting point may plug sprue hole during early burnout.	Select pattern and sprue materials that melt easily and burn out without difficulty; coat plastic with wax. Hollow sprues are preferred.
Too many patterns in one plane or over crowded.	Avoid placing too many patterns in either a horizontal or vertical plan or insufficient spacing.
Patterns placed close to ring wall or the ring end.	Spacing is very important. Use an appropriate sized ring. Space patterns 6-8 mm from mold wall and end.
Mold is not porous enough for gases to escape.	Scrape the end of the mold to remove glazed surface before burnout.
Use of excessive casting pressure.	Reduce casting pressure (number of turns). Be careful of newly installed casting springs.
Liner flush with ring end.	Leave adequate space (2-3 mm) at both ends of the ring to lock in investment.
Air bubbles in set mold.	Avoid air entrapment when investing.



Incomplete Castings

Cause	Solution
Incomplete elimination of pattern materials.	Heat soak longer at the recommended temperature. Clean furnace outlet, recalibrate furnace.
Insufficient heating of the alloy.	Ensure proper fuel pressure and properly adjusted flame. Ensure correct temperature setting for induction machines.
Excessive cooling of mold before casting.	Transfer mold to casting machine quickly and cast immediately. Reheat mold if necessary prior to casting.
Casting machine operated with insufficient pressure or too few turns.	Increase casting pressure; use more turns. Check for weak spring.
Misalignment of crucible and sprue hole.	Position mold with sprue hole aligned with crucible.

Inaccurate Casting Fit

Cause	Solution
Improper special liquid concentration.	To increase expansion, increase special liquid concentration and to decrease expansion, decrease liquid concentration. See Instructions or call technical support
Improper liquid/powder ratio.	Check liquid/powder ratio and accuracy of measurements. See instructions
Liquid/Powder mix and room temperatures affect casting dimension	High liquid/powder, room and mix temperatures give larger castings and vice versa. Normal range 70-80°F (21°C-26°C).
Dry/Paper liner inhibits expansion.	Use liner that readily absorbs water (RING-MATE) or consider soaking "water resistant" types in solution containing a surface tension reducing agent (SMOOTHX).
Spatulation Time	Follow manufacture's recommendations, changes will affect fit
Liner thickness.	Thicker liner or double liner produces larger casting.
Pattern materials.	Pattern material with lower melting point produces larger castings and high melting pattern material results in smaller castings. Call technical support for further instruction
Pattern deformation.	Handle wax pattern with extreme care.



Porosity in Casting

Cause	Solution
Incorrect sprueing.	Review sprueing techniques and appropriate ring size.
Incomplete burnout.	Use correct burnout time and temperature for the investment and alloy.
Entrapment of loose investment particles.	Remove loose investment from sprue hole before burnout. Make sure burnout is complete
Alloy that absorbs gas when melted and releases gas upon solidification, especially when alloy is overheated.	Use fresh alloy or change method of melting. Adjust gas mixture. Check directions for melting of alloy.