

Preformed Spout Selection, Installation, and Operational Guidelines.

SELEE® Advanced Ceramics™ Technical Service

“Preformed spouts reduce casting defects and impurities caused by hand made plastic ram spouts.”

Preformed Spouts:

1. Benefits

- Consistent top caps and melt streams.
- Shorter furnace cure-out.
- Elimination of spalled refractory.
- Cleaner castings since the preformed material is chemically purer than wet rams.

2. Material Selection

- Preformed spouts should try to approximate that of the crucible.
- The exception would be for high alumina or spinel due to thermal shock, in that case a 90% Alumina should be used due to its chemical compatibility with most common alloys and good thermal shock resistance.

3. Installation

- Refer to Crucible Installation for Induction Melting, SELEE® Advanced Ceramics™ Technical Service Guide IM2, for crucible installation procedures.
- Inspect spout for damage sustained in shipping or storage.
 - Tap spout to make sure it has a bell-like ring.
 - Make sure spout is dry, heat spout slowly if necessary to dry it.
- After installing the dry ram within 2” from the top of the crucible.
 - Use an ~85 to 90% alumina soft plastic ram to form a bed for the spout to be set in.
 - Make the bed so the entire bottom of the spout is supported when put in place.
 - Place a layer of soft plastic ram on the top rim of the crucible where the spout will sit in order to seal the spout to the crucible.
 - Carefully place spout on top of the crucible and bed.
 - Press down on the spout to firmly set it in place.
 - Remove any excess ram between the spout and crucible that might have squeezed out after setting.

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- Install Wet cap around crucible
 - Excess moisture in the wet cap material can cause excessive shrinkage and cracking during curing.
 - Test the cap material by taking a sample and balling it up, if the ball leaves an excess of fine powder on your hands the material is too wet.
 - Work the initial layer of cap material into the dry backup to avoid laminations.
 - Smooth cap using very little water, since it that lead to cracking, spalling, and blistering during cure out.
 - Poke several holes in the top cap and spout for moisture escape during curing.
 - Apply a heat source to speed moisture removal make sure all moisture is removed in the wet ram material around the crucible and under the spout.

4. Operational Guidelines

- Thermal Cycling
 - Limit the thermal cycling as much as possible by arranging for consecutive heats to maintain a hot crucible and spout.
 - When cycling is a must, raise and lower the refractory temperature gradually.
 - When cooling a crucible and spout to room temperature always use a refractory blanket on top of the unit to slow the cooling rate.
 - Allowing a spout to cool down to room temperature between heats will decrease its life.
 - Stress due to thermal gradients upon cooling causes a spout to crack.
- Mechanical Abuse
 - Never install a spout that has visible cracks.
 - Always treat the spout with care.
 - Ceramics are brittle and once damaged will degrade rapidly and fail.
 - Minimize mechanical abuse when handling and cleaning the spout.
- Moisture
 - Store spouts in a dry place.
 - If a spout gets wet dry it slowly in a dryer or oven.
 - Gas lances can be used to dry spouts but care must be taken in order to heat evenly and slowly.

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