

Ladle Liner Selection, Installation, and Use

SELEE® Advanced Ceramics™ Technical Service

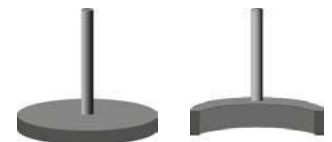
“Proper selection and use of ladle liners can reduce slag impurities in castings.”

1. Ladle Liner Selection

- Material Selection
 - ◆ 90% Alumina
 - Provides minimal reaction across a wide array of metals.
 - Less slag generation in the ladle due to chemical compatibility.
 - Due to its high thermal expansion, alumina must be rammed into a steel shell.
 - ◆ Fused Silica
 - Provides cost savings versus 90% Alumina.
 - More reactive with metals due to high silica levels increasing slag formation in the ladle.
 - Low thermal expansion allows fused silica to be used free standing.
- Design Selection
 - ◆ Open faced ladles
 - Allow for quick pouring due to open face design.
 - Open faced ladles are available with or without a pour lip depending on the desired pour stream.
 - Open face makes it easy to de-slag ladle before pouring, and makes it easy to add degas additives.
 - ◆ Bottom Pour Ladles
 - Bottom pour ladles come in many different baffles and pour lips depending on desired pour stream and rate.
 - Bottom pour ladles reduce slag impurities by pouring from the bottom of the ladle while slag is kept on top of the metal.

2. Ladle Liner Installation

- Ramming Tools
 - Use a rod connected to a flat piece of steel for the base ramming tool.
 - Use a rod connected to a curved flat piece of steel so that it conforms to the outside curve of the crucible for the side wall ramming tool.
 - These are the best design for optimal packing because their large surface areas will compact the ram.
- Base Ram
 - Use a silica ram in order to insulate the ladle and metal during pour.
 - Add at least 1” of dry ram material to the bottom of the steel backup shell.
 - Ram tight and even with a ramming foot.
 - Ram to a firm pack.
 - Level the base ram with a straight edge and remove any excess material.



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- Ladle
 - Center the ladle in the shell and level it.
 - Firmly seat the ladle using a twisting motion and check for level again.
- Ram Sides
 - Add 1-2” of dry ram.
 - Pack the ram with a footed tool to consistent densities.
 - Scratch the rammed surfaces to promote knitting between layers.
 - Continue these steps until the height of the ram is within 0.5” from the top of the ladle.
 - Into the remaining space place wet cap material to act as retaining cap.
 - Poke holes in the retaining cap to assist in drying.
 - Dry the retaining cap and preheat the ladle to 1800 to 2000°F prior to filling with molten metal.

3. Ladle Liner Use

- Ladles should be preheated with a gas lance to 1800 to 2000°F
 - Preheating ladles reduces the chance of thermal shock cracks that can cause dangerous spills.
- Minimize the height from which the ladles are filled
 - Pouring height of metal increases ladle erosion and increases turbulence, which traps air in the metal.
- Pour immediately from ladle to casting
 - Reduces slag build up by reducing reaction time.
 - Reduces chilling of metal while in the ladle.
- Remove ladle from service once there is a large build up of slag
 - Ladles are usually removed from service due to build up in slag rather than being worn out.
 - Excessive slag buildup clogs bottom pour ladles and reduces their effectiveness.

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