Improved molten metal quality with inert gas blanketing for induction and crucible furnaces

With Air Products' inert gas blanketing technologies for induction furnaces, steel and non-ferrous foundries can improve casting quality and increase yields, while reducing overall operating costs. These technologies, which use significantly less gas than competitive technologies for molten metal blanketing[1], prevent oxidation and gas pickup into molten metals by displacing the atmospheric oxygen and water vapour with a dry and inert atmosphere composed of argon or nitrogen.

Below: Blanketing with inert gas produces an oxygen deficient atmosphere above the surface of the metal, while allowing easy access to the molten metal.

Left: A uniform amount of inert, liquefied gas is sprayed into the induction furnace, resulting in a two-phase gas blanket over the entire bath surface.

Benefits of Air Products' MMB technologies

Air Products offers two technologies for molten metal blanketing which use slightly different approaches to deliver similar benefits. Both have been proven to reduce oxygen concentrations at the metal surface to extremely low levels (<1.0 volume%), depending on furnace conditions. As a result of reduced oxidation, a number of benefits can be realised. For example, the loss of high-cost alloy agents, which are needed to achieve proper melt chemistries, can be minimised. In addition, slag or dross levels can be reduced by up to 50%, minimising diposal costs. Metal fluidity also can be improved due to lower oxide inclusions in the metals, increasing casting yields.

Other benefits of Air Products' MMB technologies include:

- increased overall yield
- reduced inclusions and porosity, better surface finish and improved machinability of castings
- improved furnace lining life
- reduced alloying costs
- more consistent heat chemistries.

How they work

Air Products' MMB technologies have been designed to suit a variety of foundry equipment and operational procedures. They use the expansion characteristics of nitrogen or argon to keep the atmospheric air away from the molten metal surface and to provide a uniform, inert gas atmosphere on the metal surface.

[1]Based on published results

Liquid spray

This approach uses a swirl-spraying device to produce a layer of liquefied inert gas over the metal surface. The sprayer delivers an even amount of fine, liquid droplets across the furnace. This results in a uniform two-phase gas blanket over the entire bath surface and eliminates excessive liquid phase accumulation on the molten metal. This method has been proven safe and is efficient from a gas consumption standpoint.

Gas blanketing

This approach flows inert gas through a ceramic swirl cone at a certain predetermined flow rate, causing the gas to expand and swirl just above the bath surface. Gas blanketing enables the furnace to remain open at all times, allowing unobstructed access to the molten metal.

The "swirl" approach requires a refractory extension to the crucible that Air Products are able to size and produce.

Which MMB method selected depends largely on the size of the furnace and charging practice. Experienced Air Products engineers who fully understand your operation will work with you to determine the most effective approach to suit your particular operation.

Air Products offers more

Experience	Evaluation and demonstration	Start-up and training
• Over 50 years of hands-on experience with the steel/ nonferrous industries • A full staff of experienced process engineers, equipment engineers and technicians	• Assistance in evaluating process economics • "In-plant" demonstrations	• Complete system design and fabrication • Start-up assistance • Operator training, including maintenance and safety procedures • Ongoing technical assistance

Additional information

For more information on MMB technologies available from Air Products, contact the company at one of the following locations:

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