

ask the expert...

MATERIALS, PRODUCTS AND PROCESSING ASPECTS EXPLORED



*Dennis Sanders,
foundry project/
product engineer*

METAL TRANSFER LADLES

Most foundries utilise some type of large ladle to transport metal in some part of their process. We see many different styles, many different materials and many different processes. In today's competitive market, even an operation as simple as transferring metal should be reviewed and optimised. Pyrotek's technical authority in this product area, **Dennis Sanders***, foundry project/product engineer Pyrotek Inc. Trenton, Tennessee, describes the materials, products and process applications for effective metal transfer using ladles and responds to a range of questions commonly asked by customers.

Q: What is the best way to transfer metal from my melter to the holder where it is used?

A: A heated launder trough is probably the best way to transfer metal in a situation where the demands, and alloy, are fixed, steady and long term. In cases where multiple alloys are required and production capacity varies, a transfer ladle is still the best way to move metal from one place to another. Ladle delivery can offer the most flexibility in a changing product environment.

Q: What factors should be considered when selecting a ladle for transfer?

A: The obvious factors are distance, quantity and frequency of the transfer.

Other concerns should be oxide pickup in the filling of the ladle and during the pour. Heat loss during the transfer can be another concern. Other factors that are often not studied well enough are the preheating and maintenance of the ladles. All of these factors must be tailored to the specific needs of the foundry to achieve the best metal quality and the lowest cost of the transfer.

Q: What is the typical refractory system for a transfer ladle?

A: The refractory system for the transfer ladle should be based on the specific application. In many applications, the transfer ladles are all of "similar" size, shape and age and have been in use for many years. Because they vary, the foundry has to employ someone that periodically cleans out and repairs the shell, places a form for the inside shape and pours a thick wall of dense refractory. In most cases the shell has refractory anchors welded to the inside wall, so that the refractory is retained, even when it cracks and little or no insulation is used. Because the shells vary, and drawings may not be accurate or even exist at all, this process continues.



Q: What is the best refractory system for a transfer ladle?

A: In most cases today, foundries need to make castings and not spend time working on the ladles. A precast and fired liner of a material matched to the customer application can offer a better solution. The liner material and wall thickness is selected based on the specific requirements of the application. Sometimes a material is selected based on the lack of an effective or uniform ladle preheat system. Sometimes the preheat system is uniform and well controlled and the material can be selected to optimise the life or cost of the liner. In many cases, a small amount of insulating material can be used between the precast liner and the steel shell and dramatically change the heat loss of the ladle. If the heat loss is reduced, the amount of superheat may also be reduced and the overall metal quality and operating costs are improved by the change to the transfer ladle.

Q: How can a precast shape be fitted to an existing steel shell that has some variation?

A: In some cases, the existing steel shells are not suitable for use, but many can be used. If the variation in the shell is not too great, the variation will be absorbed in the added insulation layer. One of the materials that is used for the insulation layer is Pyrotek's Wollite 30ST. This is a two-part, pourable, refractory that expands to fill the space left between the liner and the shell.

Q: How long does it take to refurbish a

Ask the Expert*Continued from page 1***Q: How long does it take to refurbish a ladle with a precast liner system?**

A: In many cases, the ladle can be cleared of the old liner and relined in as little as one shift. Depending on the materials specified and the preheat requirements, the ladle can be back into service in one day or less. This can mean real savings to the foundry.

Q: What costs are impacted with a transfer ladle system?

A: The cost to the foundry can be much larger than at first realised. The cost of the lining and manpower to reline are sometimes all that is seen, but other costs can be higher. The cost due to the higher operating temperatures, hydrogen pickup and oxide generation in poor pouring practices can have a great impact on the bottom line. The

system should be designed to offer the lowest velocity-pouring stream by minimizing both the pour height and pour rate during transfer. In some cases a degassing operation or filtration step can be added to the transfer operation and reduce scrap and costs even more. Today, every stage of the foundry operation must be carefully studied and optimised.

Q: What is the best preheat system?

A: The best preheat regime is a trade-off between the need to heat quickly for production and the need to heat carefully for optimum life of the refractory. Most dried refractory can be heated pretty rapidly, but it will crack if the heat is not applied uniformly. If the customer has a gas-fired preheat

system that is well matched to the ladle size, shape and heat-up rate, a much longer refractory life can be expected. Manual preheat with a gas torch can do the job, but this can also overheat a small area and cause a crack in the liner system. Any part of the refractory liner is damaged if it has been overheated or is visibly hotter than the rest of the liner. It is also important to control the maximum preheat temperature. Occasionally, a ladle will have more time than normal in the preheat station and without proper controls it will continue to heat. If the ladle liner is preheated to a temperature higher than the aluminum with which it will be filled, it is much more likely to crack than if not preheated up to the full temperature.