

The main drive in the aluminium foundry industry is in two major directions.

- To produce better quality casting, for instance, lower scrap rates.
- To improve the productivity of the casting being poured.

The first route can be achieved by controlling certain parameters to ensure metal quality. Good foundry practice of furnace lining, metal treatment and rotary degassing ensure minimum melt contamination. This is followed by an efficient ladle transfer allowing clean metal to reach the mould with minimal temperature losses.

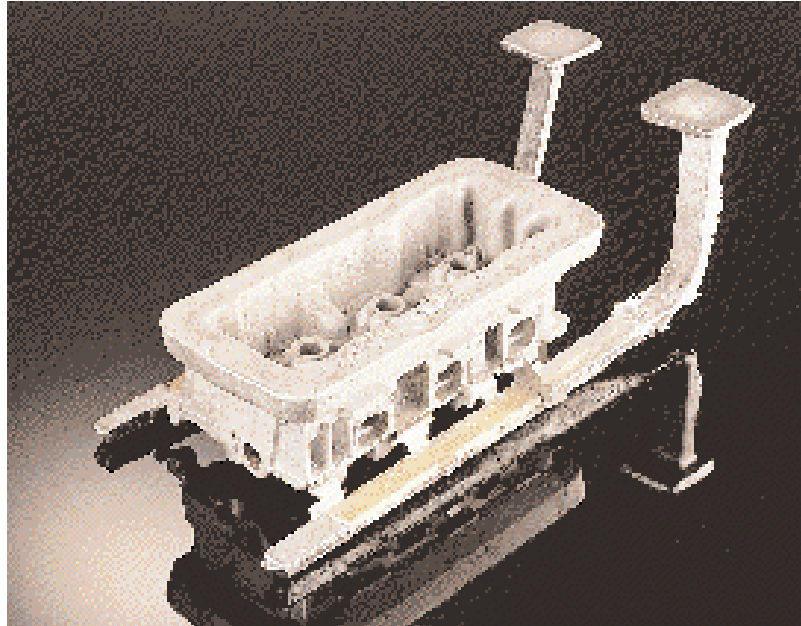
The second route requires expertise. It is no longer acceptable to place an over sized riser on an aluminium casting to feed the part or pour the metal through a complex runner and gating system. The two approaches reduce the yield for a castings typically below 50 per cent. The requirements in a competitive industry dictate that a casting must be made with the minimum of metal being poured. For this to be accurately controlled a method of determining whether smaller correctly placed feeders will produce sound castings and the most efficient method of delivering the metal from the ladle to the cavity is required. It is in this area where Foseco is actively involved by utilising the latest predictive software.

For a number of years Foseco has lead the foundry world with innovative methods of filtering and feeding metal to produce high quality cast parts. Foseco is now using this knowledge combined with results simulated with predictive fluid flow software to supply the foundry with a complete package indicating the most efficient practice for casting aluminium.

The simplest option for increasing the castings yield is to minimise the size of the running system. This can be easily achieved with the use of a direct pour application by applying either a KALPUR unit or SIVEX-FCX filter. The KALPUR unit incorporates a SIVEX-F or FC foam filter placed at the base of an insulating sleeve and as its name suggests allows the foundry to pour directly into the cavity mould, which eliminates the need for a running system. This method is primarily used in the gravity die and sand casting aluminium market segments.



Aluminium casting productivity increases with predictive techniques



The use of a KALPUR unit offers the foundry a number of added advantages other than that of significantly increasing the castings yield.

These include:

- **Controlled filling** – by incorporating a filter in the base of the sleeve the metal entering the cavity and the metal velocity is effectively controlled. These factors promote controlled filling of the mould cavity.
- **Directional solidification** – the KALPUR unit is usually situated at the top of the mould, a position normally occupied by a feeder, thus metal enters the cavity flows around the mould to reach the lowest point then back fills. This filling action creates a temperature gradient with cooler metal at the cavity floor and hotter metal in the top of the mould. Therefore solidification occurs directionally from the bottom of the casting upwards. This promotes efficient feeding characteristics.
- **Reduction in riser size** – a second benefit associated with pouring into the top of the die is that of the feeders. These are last to be filled and are then charged with hot metal. Therefore hot metal is in the ideal position to feed any shrinkage. This compares with a traditionally methoded bottom gated running system where the metal entering the feeder has usually travelled through the die cavity resulting in a substantial loss of heat. Charging the feeders with hot metal creates a more effective feeding system. It is then possible to optimise the feeders required and increase the yield of the casting. In many cases it is possible that the use of a KALPUR unit removes the need for numerous feeders due to the improved efficiency associated with the added insulation of the KALPUR unit.

It is important to determine exactly:

- **Metal flow patterns**
- **Turbulence**
- **Heat loss**

It is now possible to simulate these effects utilising physics based predictive fluid flow software. Using this software it is possible to show how the cavity fills during normal casting conditions. The use of predictive fluid flow software within the foundry industry is growing as a direct result of the pressures being applied to it to become a more efficient business. The simulated results allow the foundry to achieve near 'right first time' results before committing itself to the expense of pattern or die modification/manufacture.

This software allows Foseco to demonstrate to the customer flow conditions created by the current running system that lead to subsequent defect formation. It also allows Foseco to optimise the positioning of the KALPUR unit to give a controlled non-turbulent fill. Using the fluid flow program an optimum pouring temperature can be found. This affects productivity as control is ensured on:-

- **Optimum pouring temperatures**
- **Minimum solidification times**
- **Faster cycle times**

Foseco is unique in its use of leading edge technology. This combined with its strong technical knowledge and product portfolio improve further the profitability in aluminium foundries.

