

# Filtration for diecasters

High quality castings begin with the molten metal and good filtration is all part of the process, writes Dr David V Neff of Metallux Systems.

The growth in the aluminium diecasting industry has been spearheaded by the increasing application into automotive and other engineered castings. High performance castings require high cast product quality, which begins with the molten metal.

Inclusions in castings must be avoided and removed by whatever means possible, including careful selection of charge materials, molten metal treatment, and finally by filtration. Metallux Systems, headquartered in Solon, Ohio, USA, has become the recognised worldwide leader in supplying unique and especially suitable filtering products to the aluminium pressure and gravity diecasting industry to achieve this goal.

## Diecasting filtration

Unlike sandcasting and gravity diecasting moulds which often permit in-the-mould, single use filters to be employed, the pressure diecasting process must rely on filtration applied upstream in the process since it is not possible to filter directly within the shot sleeve. Filters are thus installed into remelt furnaces, and directly into many casting furnaces from which the metal is withdrawn to feed the shot sleeve or pouring basin.

Filtering the diecast alloy immediately prior to making a casting has several well proven benefits:

- increased metal fluidity for better mould fill and reduced filling defects
- improved mechanical properties of the casting
- reduction or elimination of hardspots during machining
- reduction or elimination of microporosity and 'leaker' castings
- better surface finish
- reduction in scrap castings

## Bonded particle filters

Metallux Systems has pioneered the development and utilisation of the bonded particle filter, which has several distinctive advantages for diecasting applications. Constructed from a controlled, discrete particle size distribution of silicon carbide, the bonded particle filter possesses:

- superior strength and durability at molten aluminium temperatures, permitting better handling and cleaning ability in situ
- full chemical compatibility – no reactivity or degradation – in all common casting alloys
- high thermal conductivity (silicon carbide)

resulting in minimal thermal gradients upstream/downstream of filter placement

- enhanced filtration efficiency through complexity of internal filter structure, ie tortuosity of metal flow path.

The principle configurations of the bonded particle filter which apply to diecasters include the Vertical Gate Filter (VGF) and the Metallux Box Filter (MBF).

## Vertical gate filter



Figure 1: (a) A vertical gate filter (VGF) being installed into a reverberatory furnace dipwell.

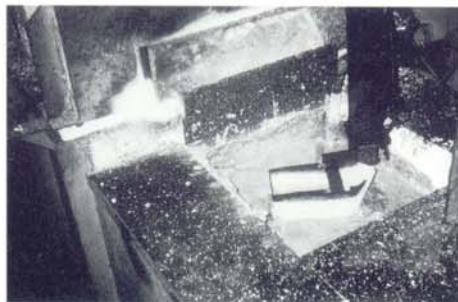


Figure 1: (b) Popular for use both in remelt furnaces and in casting furnaces, here a vertical gate filter (VGF) is seen in use in a casting furnace dipwell with automatic ladle.

The vertical gate filter serves as a baffle or separating wall dividing the hearth or heating zone from the dipout well in a reverberatory furnace. This installation is popular both in remelt furnaces and in casting furnaces. Figure 1 illustrates a filter (a) being installed into a reverberatory furnace dipwell, and (b) used in a casting furnace dipwell served by an automatic ladle. Full well widths up to 890 mm are possible with a single filter, and with a two-piece filter assembly greater widths are possible.

While new furnaces or rebuilds are often constructed with slots to accommodate the VGF, many diecasters simply utilise a compressible ceramic fibre gasket on the filter

perimeter to install a filter into an existing furnace without refractory modification. Furthermore, filters may be installed without draining the furnace! Filter preheat is accomplished prior to installation by merely placing the new filter on the furnace sill for about one hour, as a preheat temperature of only 250-300°C is required. The new filter may be installed and then the spent filter removed to provide full continuity of filtered metal being available.

## Metallux box filter

The second principle configuration is shown in Figure 2, the Metallux Box Filter (MBF). This all-media filtering vessel allows pour-ins and dip-out from a single-chamber furnace vessel, such as a crucible furnace, providing filtration as the metal is withdrawn from the box interior by either manual or automatic ladling. Further, the all-media construction allows for greater filtering surface area and subsequent utilisation of finer filter grades to be employed.

Many diecasting foundries have achieved significant success with either or both of these filtering configurations in their melting and casting furnaces. Substantial reductions in casting scrap, machining difficulties, microporosity, and improved properties have resulted.

Filter life averages one to three months for the VGF and two to four months for the MBF, making the application extremely cost effective in relation to the volume of castings produced from that casting unit during that time period.

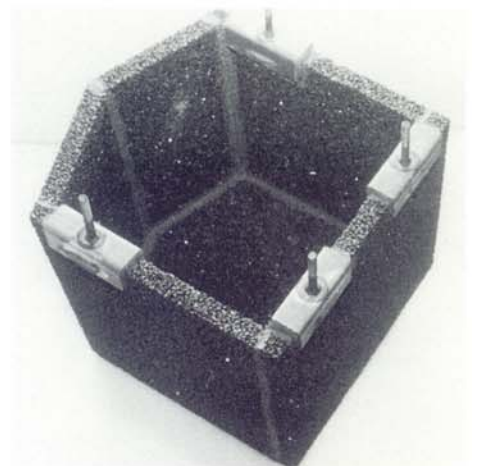


Figure 2: The Metallux Box Filter (MBF) all-media filtering vessel allows pour-ins and dip-out from a single-chamber furnace vessel.

Many sizes and shapes of VGF (rectangles, squares, trapezoids) and MBF sizes and shapes are available to suit specific furnace designs and customer requirements, including ladle sizes. Custom designs are available with a one time tooling charge.

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