SIVEX* FC

Machineable foam filters

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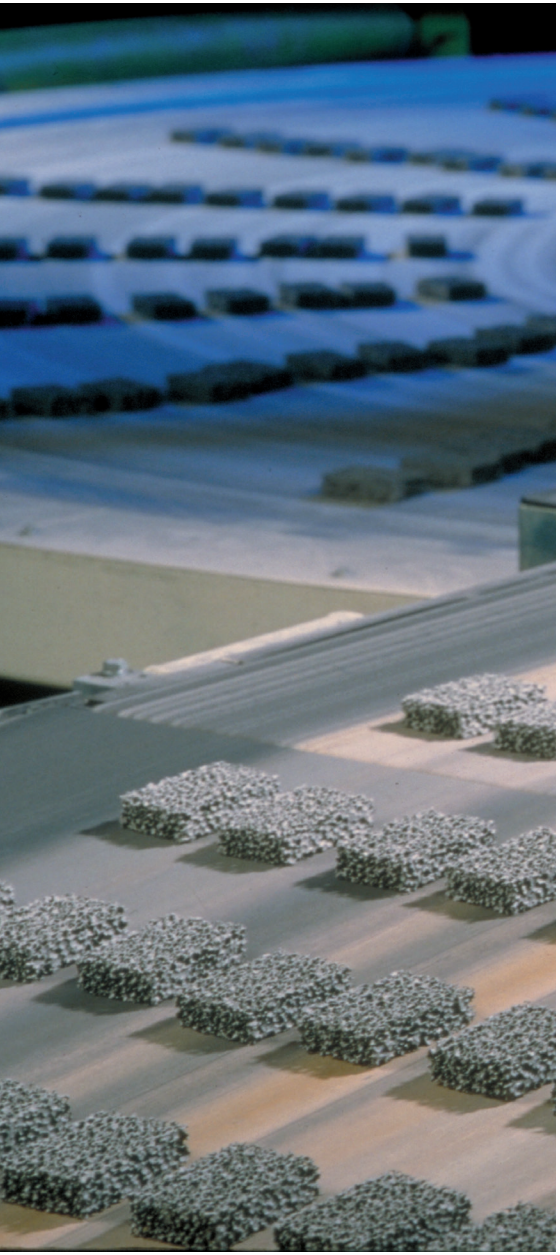


SIVEX FC Filters

Machineable filters with a foam structure

In recent years SIVEX FC filters have proven to be successful in producing high quality sand and die castings.

This applies especially for aluminium castings employed in automotive engineering where weight reduction is of growing importance. Safety critical components, such as aluminium alloy wheels and chassis components, demand a close adherence to high quality standards in terms of mechanical properties.

In this application, open-pored SIVEX FC filters have proven themselves as very effective.

The smoothing and restraining of the metal flow is an important property of the foam structure filter. In addition to this, exogenous and/or endogenous inclusions are removed effectively from the metal stream before entering the mould cavity.

For this purpose, SIVEX FC filters are placed as close as possible to the casting. The running system should be designed as non-pressurised and the choke set before the filter to avoid any additional increase in flow rate.

SIVEX FC filters are specifically designed for aluminium casting:

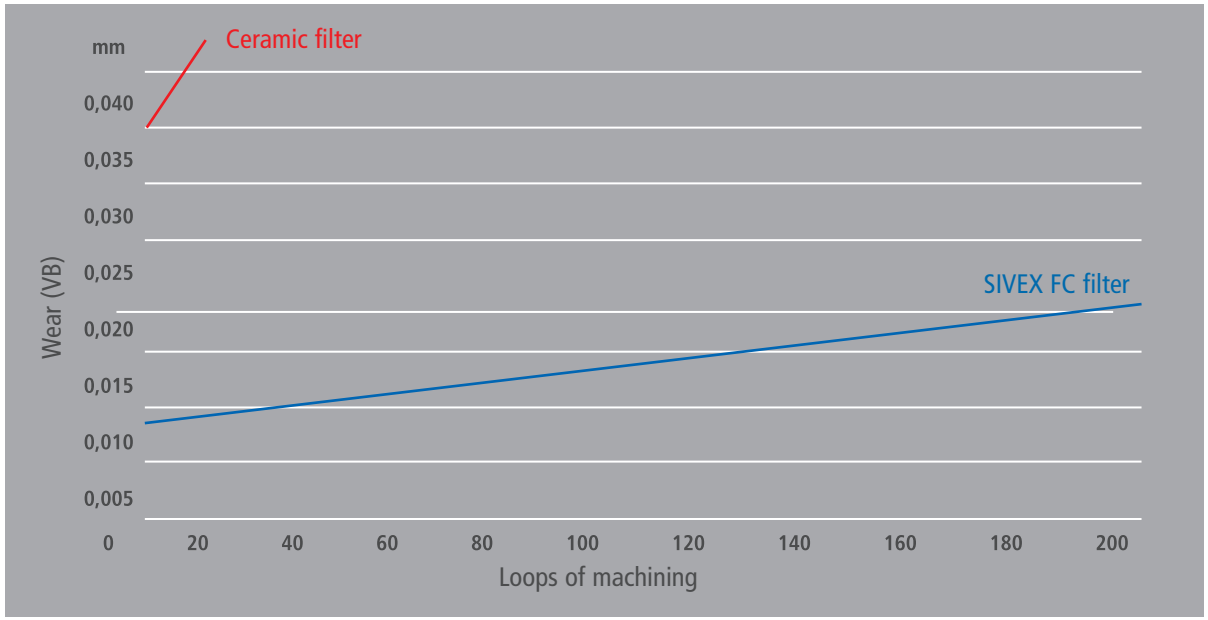
1. SIVEX FC filters can be safely remelted in the return material as no contaminating elements go into solution.
2. SIVEX FC filters can be removed from the melt surface easily due to it's comparable low density.
3. SIVEX FC filters are machineable.

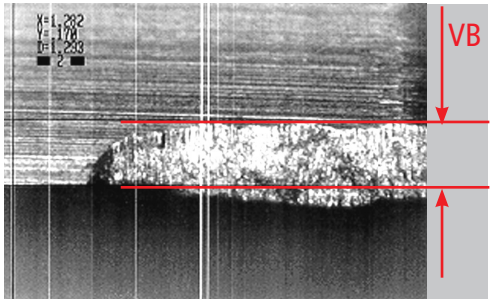
In particular, the machinability of SIVEX FC filters must be emphasised, since inclusions of ceramic filters in machined areas can cause major problems.

Faulty application can effect the machining line causing downtime due to tool damage.

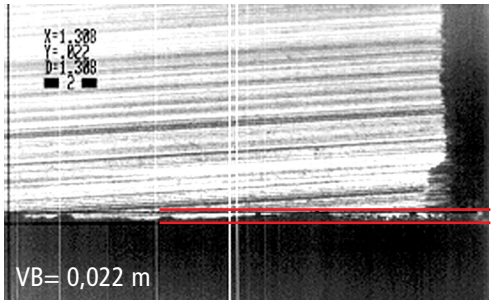
In comparison to other known ceramic filter materials, SIVEX FC filters can be machined without problems. This fact was shown by the following investigation undertaken by the IPT Frauenhofer Institute for Production Technology.

Wear of cutting tool: A comparison of SIVEX FC and a ceramic filter

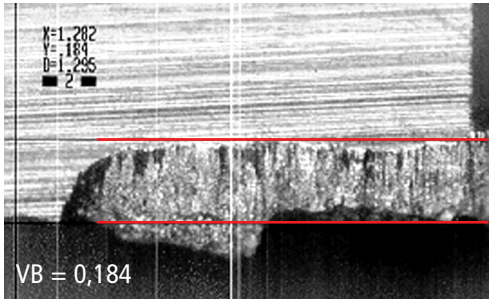




Wear indication width after several cycles



Tooling after 150 cycles (SIVEX FC)



Tooling after 14 cycles (ceramic filter)

A typical filter print for gravity die

SIVEX FC Filters

for high quality aluminium castings

Although capable of removing inclusions from the metal stream, the primary purpose of SIVEX FC filters is to reduce turbulence and ensure quiet, smooth mould filling to minimise the risk of oxidation defects. Best results are achieved when SIVEX FC is positioned as close to the casting as possible.

SIVEX FC filters ensure that the running systems and downsprues fill smoothly and remain full, reducing the risk of gas bubbles entering the mould cavity. The simplified gating system allows the foundry to reduce mould sizes or increase castings per mould.

The use of SIVEX FC filters ensure greater consistency in casting cleanliness, leading to a reduction in the variability of metal flow. This results in increased casting consistency, improved mechanical properties due to greater metallurgical consistency and increased fluidity of the metal, offering improved casting surface finish and appearance.

Smooth and regular flow during the pouring process is the major contributor to a good casting result. However, within a vertical gating system, the molten metal reaches, in free fall, a speed much in excess of the critical value of 0.5 m/s, even when a low pouring height is used. In co-operation with the University of Birmingham, a test programme of insitu x-ray investigations was carried out examining the flow characteristics of a flowing aluminium melt.

Figure 1 shows the flow characteristics in the running system of a simple mould. A pouring height of only 220 mm already causes a significant turbulent flow. During filling, the runner bar remains only partly full, even when the metal has begun to fill the mould cavity. This trapped air will later flow into the mould cavity giving rise to oxide defects. In a fountain, the melt shoots up into the cavity, hitting the top of the mould creating new oxides.

In figure 2 a 10 ppi SIVEX FC filter is employed in the runner bar. Flow is controlled, an efficient back pressure is built up and the runner bar begins to fill evenly. The metal enters the ingate with reduced energy remaining together in a single stream. Fewer oxides will be produced.

Figure 3 shows a SIVEX FC 30 ppi filter. The runner is completely full before metal enters the ingate. There is no opportunity for turbulence and the mould fills in a quick and regular manner. The metal enters the ingate in a very calm flow. This means the surface oxide skin is not broken. No new oxide is created compared to figure 1.

Knowledge from such investigations can help the foundry to apply SIVEX FC filters in their optimum position. Particularly when it comes to the point of restraining the metal stream from a relative high speed, supplying the mould efficiently and filling the cavity as evenly as possible, SIVEX FC foam filters have proven themselves as very effective. The positions of the SIVEX FC filters are marked on the displayed casting by rectangles.

Figure 1

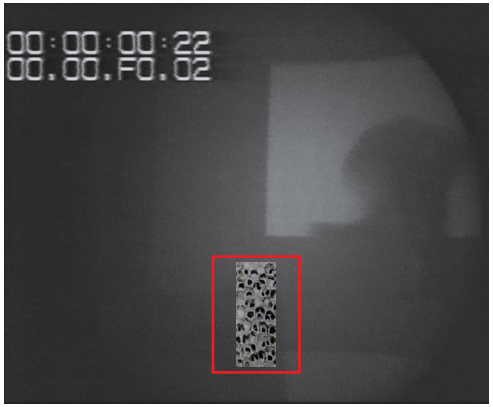


Figure 2

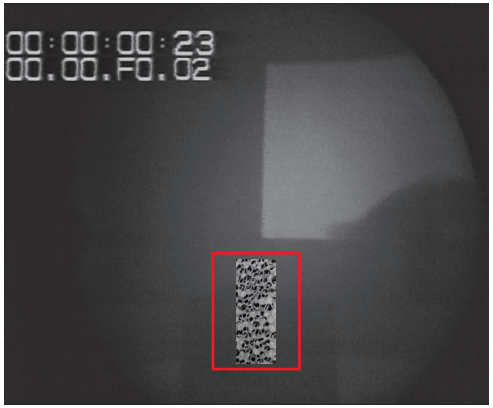
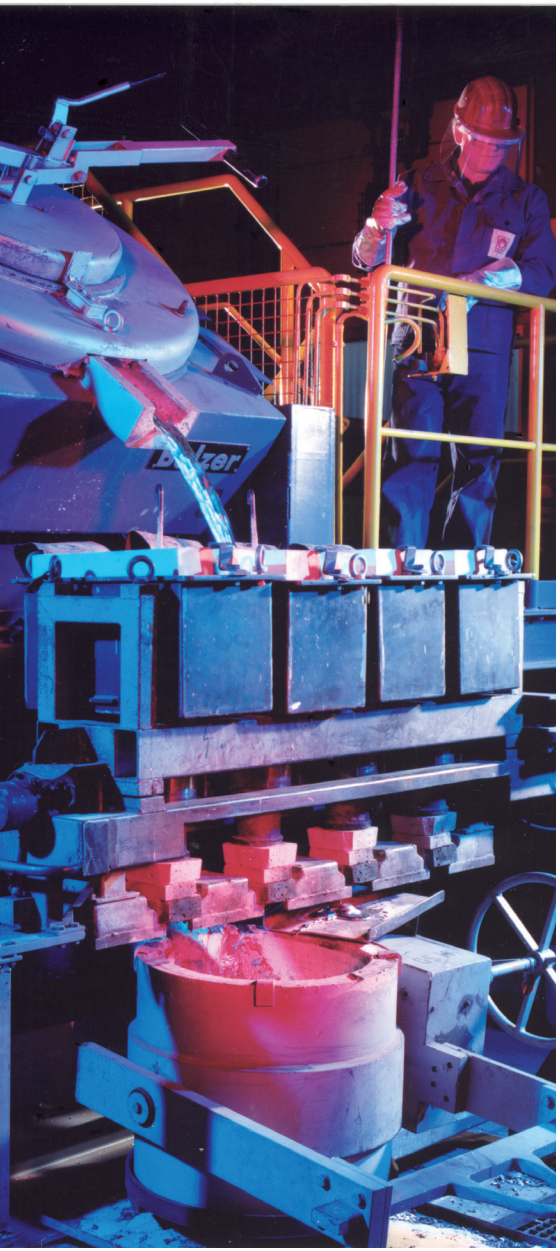


Figure 3



SIVEX FC Filters

Quality and service

SIVEX FC foam filters are produced in our modern, state-of-the-art production facility in accordance with DIN ISO 9001:2000 and VDA 6.1.

Direct impingement test

Samples of SIVEX FC foam filters are subjected to a direct impingement test to verify thermal stability.

Aluminium is poured from a height of 450 mm directly on to the SIVEX FC filter face. This is a much tougher environment than that experienced in normal foundry application and therefore ensures the filters are capable of performing well in the field.

In addition to this, dimensional accuracy, pore size distribution and weight control is also checked against specification.

Application expertise

To fully exploit the filtration and flow control ability of SIVEX FC, correct filter placement and printing is essential. The filter should be located as closely to the casting as possible and held within a secure filter print. To avoid any metal by-pass it is important that a ledge of at least 5 mm in width is provided on the exit side of the filter. Once pouring begins, the filter is held against the ledge forming a positive seal. Drawings of recommended filter prints for sand, gravity and low-pressure die casting are available on request.

Our Application Engineers have extensive process knowledge and many years of experience, and are well placed to offer customers advice on running and gating system design, as well as optimum filter selection and placement.

Simulation services

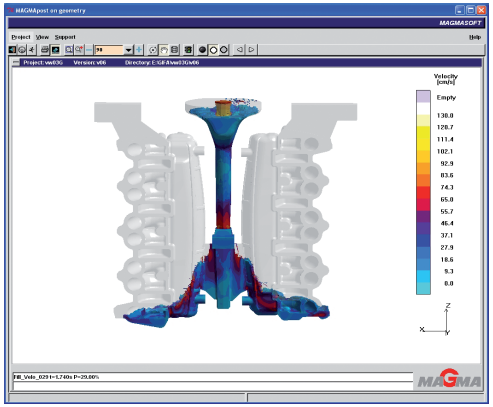
For more complicated, high-volume casting applications, MAGMASOFT® simulation of mould-filling and solidification may also be offered. On the basis of this, an optimum design for running systems can be recommended and transferred to the production tooling without the need for extensive trials in the manufacturing process.

The example shows a manifold casting made by the DISAMATIC® process where the running system which has been optimised based upon mould filling and solidification simulation.

Benefits of simulation

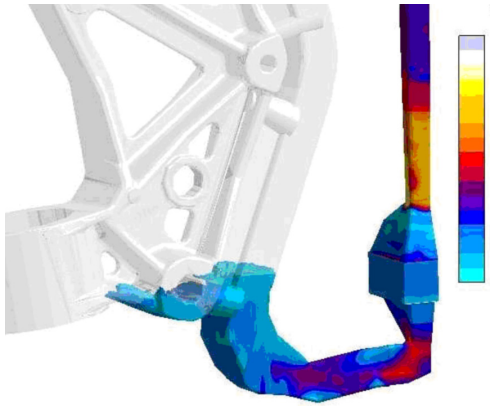
+ Shorter development time
+ Reduced sampling
+ Optimum filter application
+ Improved process security
+ Increased customer confidence
+ Improved yield
+ Right first-time

MAGMASOFT® study

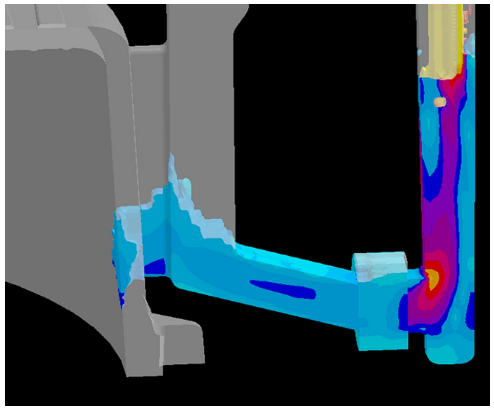


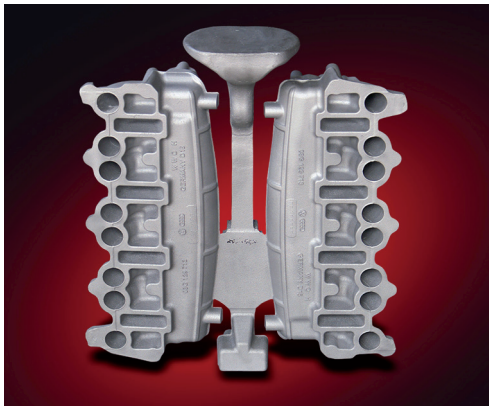
MAGMASOFT® simulation

MAGMA simulation showing reduction in metal velocity



Velocity control





DISAMATIC® manifold casting

KALPUR* AL

Filter and sleeve combined for the pouring of aluminium castings

The task of most running and gating systems in non-ferrous sand and die casting, is to secure a turbulence-free filling of the mould cavity with the liquid alloy, but at a speed which ensures complete filling. Quite often this can only be achieved by the use of a large running system in which the alloy enters the mould cavity at the lowest point. However, this contradicts the requirements of controlled, directional solidification. The use of large complicated running systems also entails expensive sawing and cleaning operations as well as increasing the amount of alloy which has to be melted.

KALPUR direct pour technology, developed by Foseco, consists of a combination of a highly insulating feeder material and a foam filter. The metal is poured directly into the mould through the KALPUR, where this " gating" system also performs as a feeder. The SIVEX FC (aluminium) or SEDEX* (copper base) filter smoothes the metal stream, controlling the filling, and the insulating feeder material of the KALPUR helps to increase the feeding efficiency.

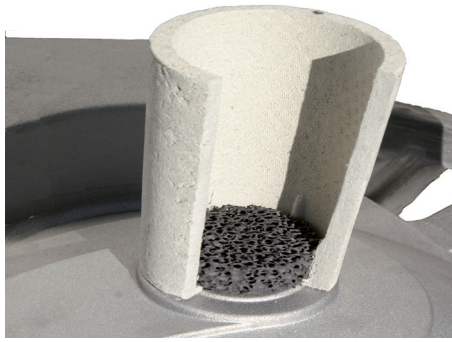


Figure 1 shows a sction through a KALPUR unit

Figure 2 shows a 31.5 kg sand casting with a yield of 75% poured through a KALPUR unit

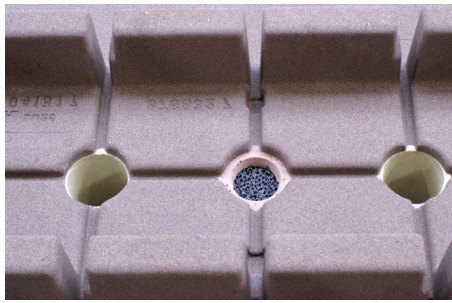


Figure 3 shows a view of the KALPUR unit in the top mould

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