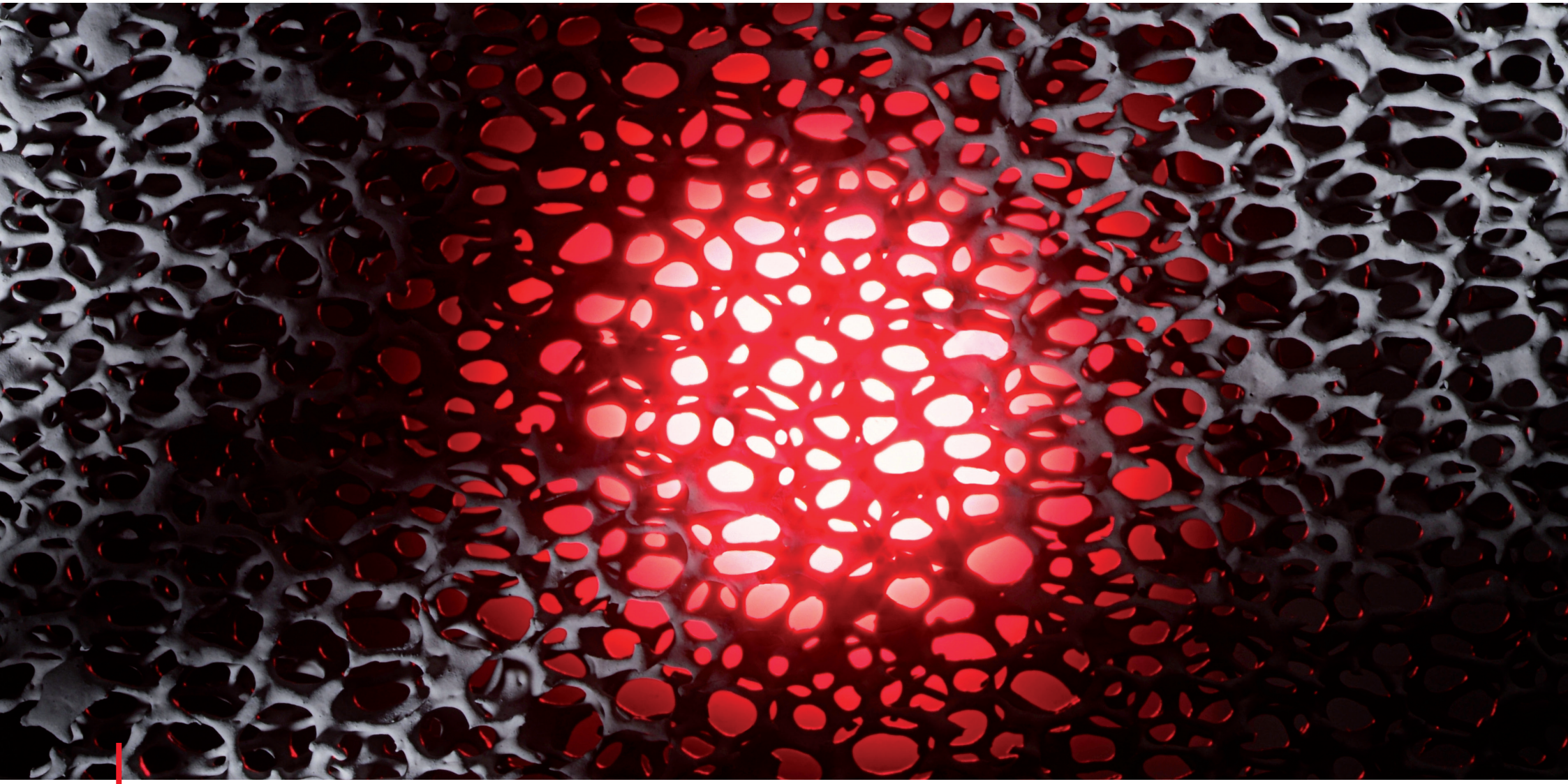


SEDEX

The ceramic foam filter for iron castings

VESUVIUS

FOSECO

SEDEX foundry filters

Proven technology a billion times over

Trusted performance

SEDEX foundry filters have been used by the foundry industry for more than 25 years. During this time, the filter and its application have been continuously improved in co-operation with leading foundry engineers around the world. The use of SEDEX foundry filters is a guaranteed way to produce quality, cost effective castings. Consequently the use of SEDEX foundry filters has become state-of-the-art in many foundries. As the most commonly used foundry filter in the world, SEDEX foundry filter are proven in its ability to fulfill customer demands.

The application of SEDEX foundry filters in the production of the most demanding castings facilitates achieving optimised mechanical and dynamic properties of the casting alloy. The use of conventional gating systems, even with generously dimensioned runner bars, is not sufficient to retain enough slag and suspended reaction products to meet the high quality standards of today's castings. These demands can be readily and consistently achieved with the help of SEDEX foundry filters.

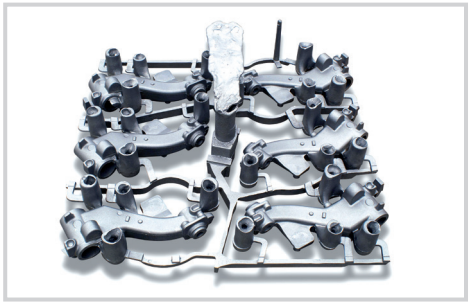
Benefits of SEDEX application

- + Compact, short and direct systems
- + Less returns
- + More free pattern plate area
- + Lower melting costs per poured casting spray
- + Effective retention of non-metallic inclusions including slag and sand
- + Reduced scrap risk
- + Increased process security
- + Improved physical properties of the casting
- + Improved accuracy of scrap diagnosis

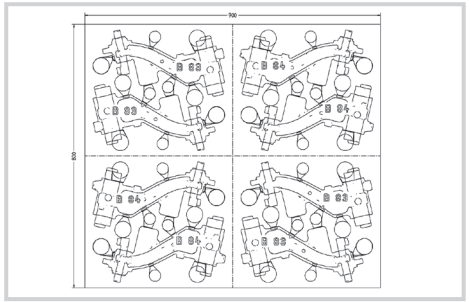
Application technique

Foseco offers high level customer support.

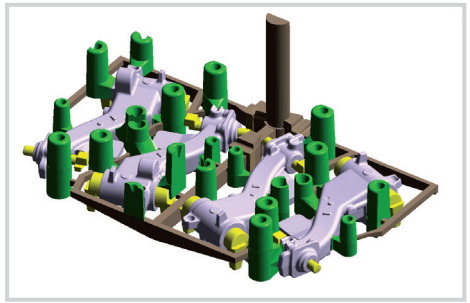
- + Metallurgical investigation of casting defects
- + Optimisation of pattern plate layouts including mould filling and solidification simulation
- + Application support in the foundry



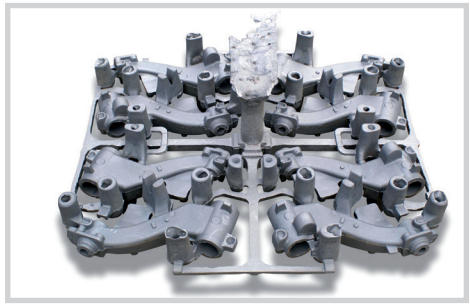
Original layout



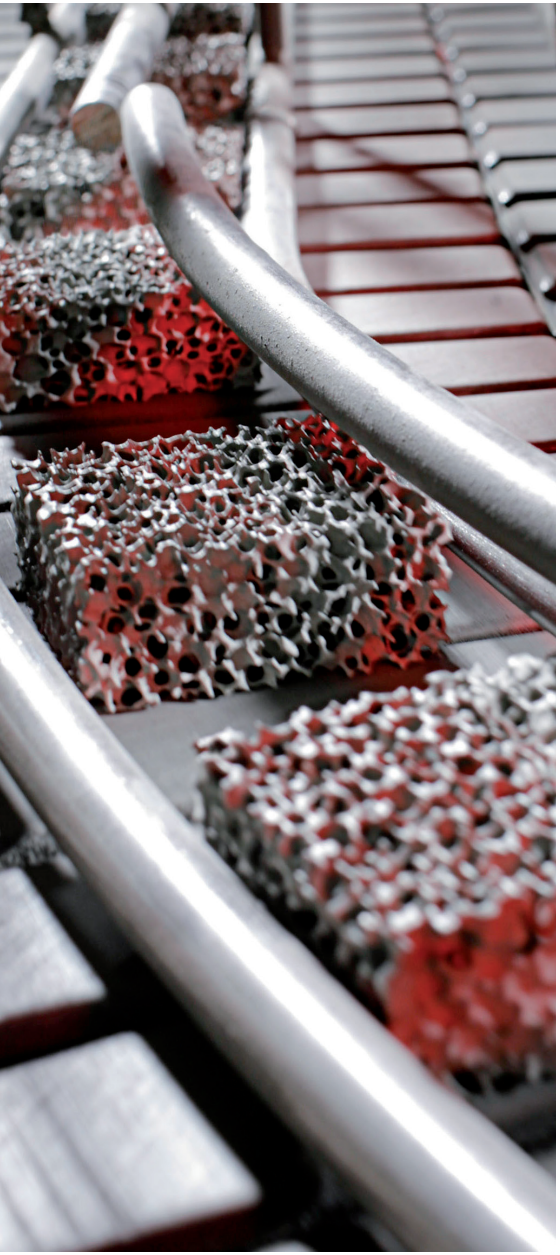
Targeted layout



Simulation and optimisation of the layout



Improved layout



SEDEX foundry filters

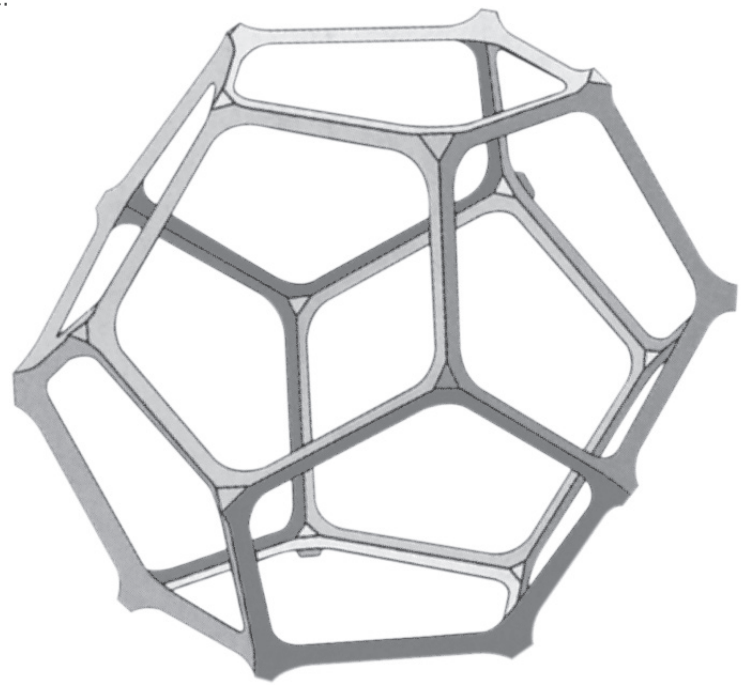
Highest filtration efficiency and smooth mould filling

High filtration efficiency

The acknowledged effectiveness of SEDEX foundry filters is a result of their foam structure. The structure is based on open, interconnected pores providing a plurality of direction and velocity changes in the liquid metal flow. This leads to intensive contact with the filter surface which allows small non-metallic particles to be retained within the foam structure. The inlcusions are not just sieved out on the product entry face.

The inclusion removal mechanism is known as deep bed filtration and is only provided by multi-dimensional structures like the SEDEX ceramic foam filters.

The shape of an individual pore is like a penta-gondodecahedron.



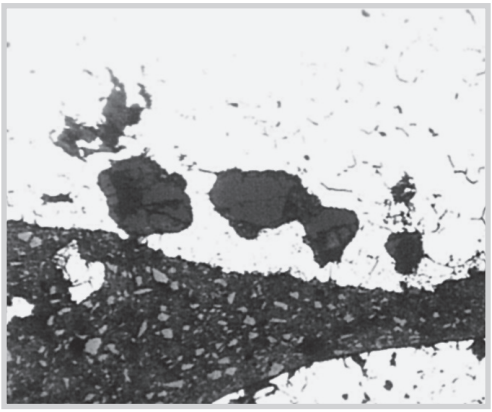
The structure of SEDEX filters efficiently retains sand and slag as well as reaction products from magnesium treatment. An often underestimated, but nevertheless very important, advantage of ceramic foam filters is their ability to reduce the turbulence in the molten metal stream. This helps to ensure an even mould filling and protects the metal from re-oxidation.

The pictures below have been generated by real time x-ray investigations and illustrate the metal flow into the mould cavity when different filter types are used.

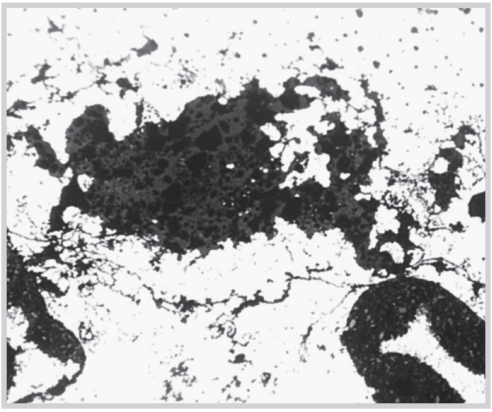
Metal flow into the mould cavity without a filter

Metal flow into the mould cavity through an extruded filter

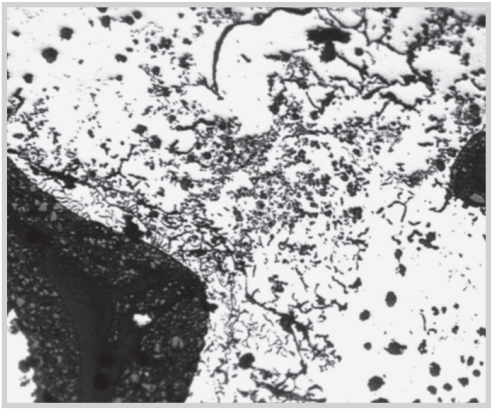
Metal flow into the mould cavity through a ceramic foam filter



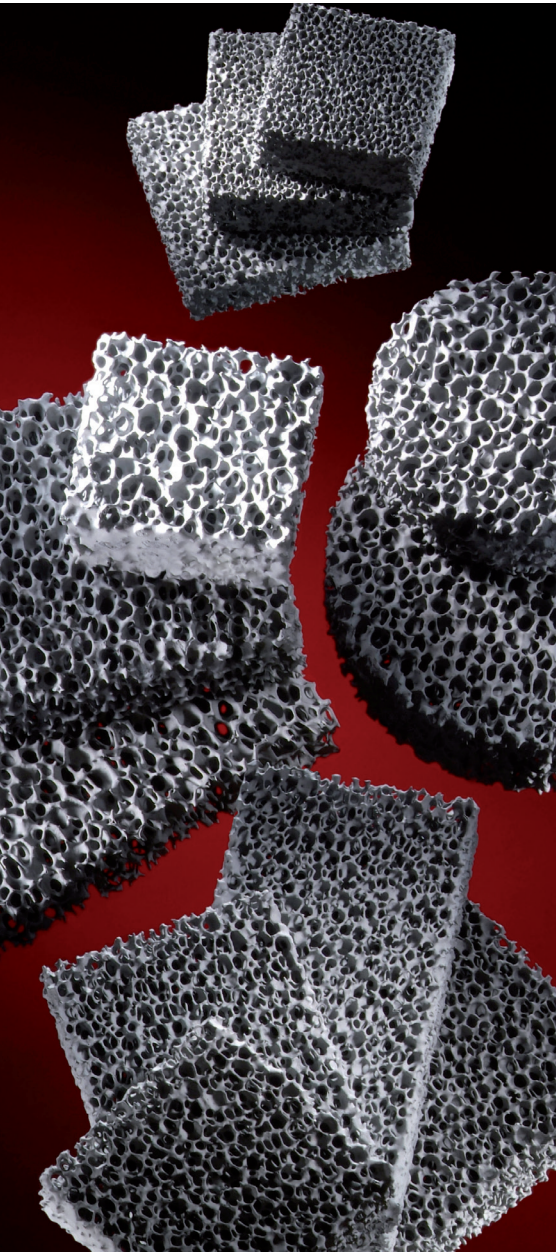
Retention of sand by the filter structure



Retention of silicate slag by the filter structure



Retention of magnesium sulphide by the filter structure



SEDEX foundry filters

Calculation of choke and filter area

The application of SEDEX foundry filters is performed in three steps:

Step 1
Calculation of gating systems with filters

The mould filling speed and filling pattern is determined by the dimensions and design of the gating system. The time to complete the pouring sequence is determined by the smallest cross-section in the system.

In the case of conventional gating systems, this choke, or controlling section, is the total area of the ingates.

In gating systems for use with SEDEX foundry filters, the cross-section of the downsprue becomes the smallest or controlling section for the system.

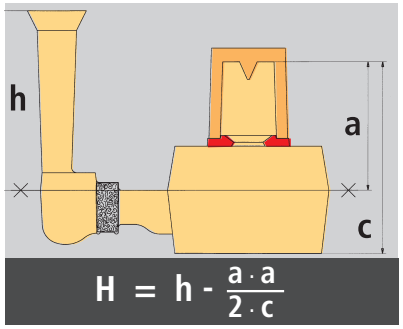
In the case of moulding lines where a standardised downsprue is used, the controlling section must be placed in the runner bar directly behind the downsprue.

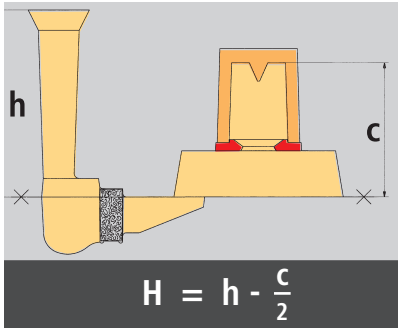
To ensure an even filling process within the mould all runner bars should be located in the drag and all ingates in the cope.

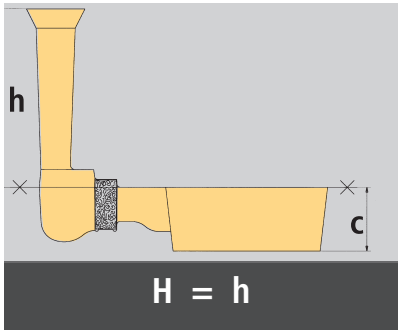
$$D_A = \frac{22{,}6 \cdot G}{\rho \cdot t \cdot \xi \cdot \sqrt{H}}$$

D_A	Downsprue area [cm²]
22,6	Constant
G	Poured weight [kg]
ρ	Density [g/cm³]
t	Pouring time [s]
ξ	Friction factor
H	Effective pouring height [cm]

Calculation of effective pouring height







The following relationship between the gating system components has proven very successful in practice:

downsprue		runner		ingate(s)
1.0	:	1.1	:	1.2

This gating system ratio with a progressive increase in cross-section encourages quiet, low turbulence mould filling. The resulting cross-sectional areas have to be allocated according to the pattern layout. The runner area is divided by the number of runner bars and the ingate area by the number of ingates required.

Step 2
Determination of the SEDEX filter size, type and porosity

The required filter area will be influenced by the following factors:

- The smallest cross-section in the gating system
- Filter capacity (kg/cm²)
- Poured weight
- Metal treatment process
- Level of metallurgical contamination

The filter area can either be applied as a single filter. In the case of larger castings, several filters can be used. The filters should be positioned as close as possible to the mould cavity so that the maximum amount of inclusion material can be removed.

Filtration capacity is influenced by many process variables, therefore the following values should only be regarded as guidelines.

Iron alloy	Filter capacity kg/cm²
Grey and malleable iron	2.0 - 4.0
Ductile and compacted graphite iron	1.0 - 2.0
Alloyed and inmould treated ductile iron	0.5 - 1.0

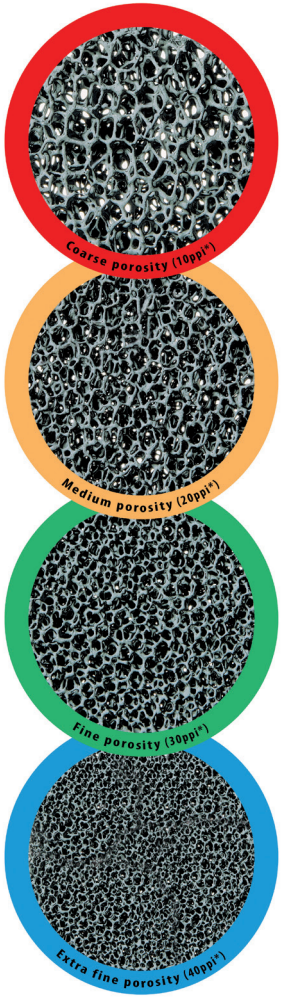
Based on application experience the following ratio of downsprue and filter area is receommended:

Grey and malleable iron	1:2
Ductile iron and compacted graphite	1:3
Alloyed and inmould treated ductile iron	1:4

These ratios ensure the pouring rate can be maintained during the complete mould filling process. The mould filling rate should not be controlled by the filter. This is the function of the downsprue.

SEDEX foundry filters

Selection of porosity and filter position



In the introductory phase, it is recommended that the filter area should be generously dimensioned. The resulting filter sizes can be optimised once sufficient application experience has been acquired in a given foundry environment.

Filter porosity is generally determined by the alloy to be poured.

On ductile iron and special alloy types Ni-resist and SiMo containing high levels of reaction products and the coarse 10 ppi SEDEX filter is normally applied. Process improvements giving a lower level of reaction products have allowed some foundries to work with the finer 20 ppi SEDEX filter.

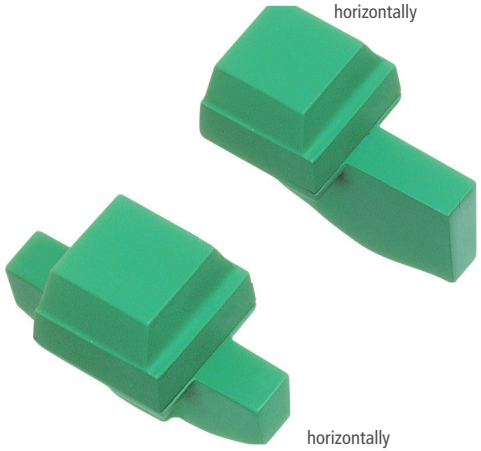
Grey iron which contains lower levels of reaction products is normally filtered using 20 ppi SEDEX filter. 30 ppi products may be applied if the molten metal is clean and fluid.

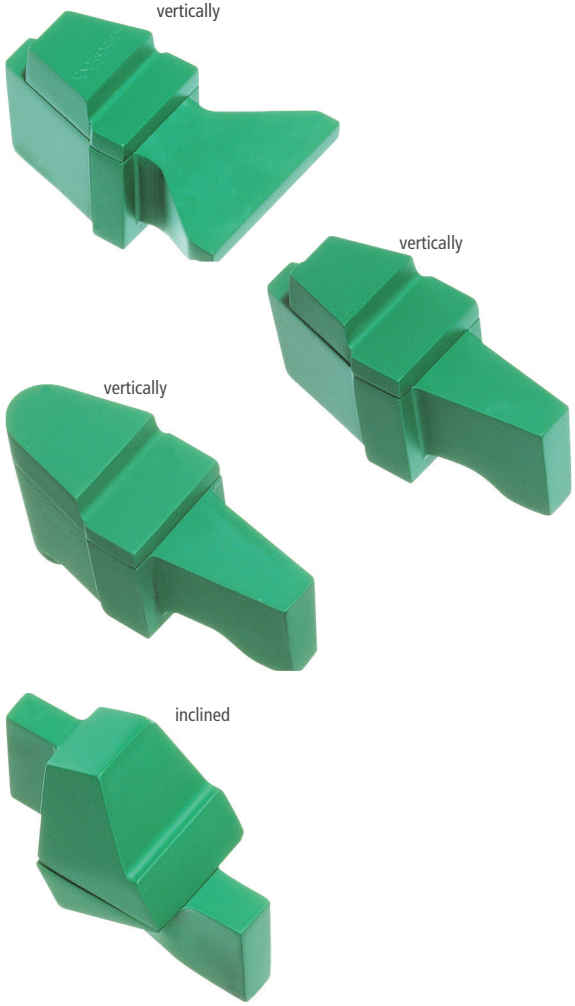
Malleable iron with the lowest level of metallurgical contamination and high pouring temperatures has good pouring characteristics. Consequently, the fine 30 ppi SEDEX filter can be applied.

The extra fine 40 ppi porosity is used mainly for grey iron castings produced on vertically parted moulding lines.

Step 3
Selection of the appropriate SEDEX filter print

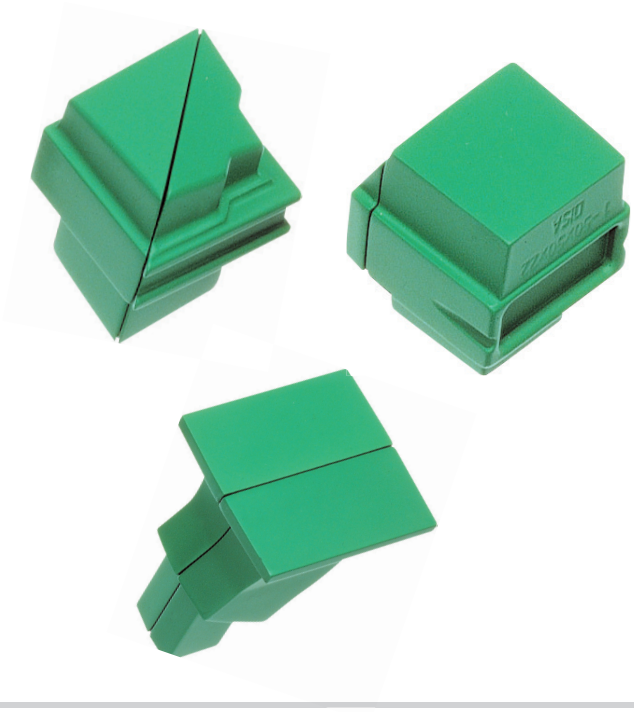
Filtration effectiveness is greatly dependent upon the correct application of the filter. To assist foundries in this operation Foseco has developed a range of filter prints. It is strongly recommended that foundries take advantage of their availability. The use of the SEDEX filter prints will help to ensure correct position, entry face area and exit face support for the selected filter type. In many cases the position of the filter and suitable filter print is defined by the layout of the pattern plate.





Specially designed filter prints are also available for use with vertically parted moulds such as DISAMATIC moulding machines. There are two types of different application options:

1. Positioning of the filter by hand in a pouring bush
2. Positioning of the filter lower in the mould; this requires the availability of a coresetter to mechanically place the filter in the open mould half in the short time available and with the necessary accuracy



SEDEX foundry filters

Application in vertically parted moulds

Advantages of using SEDEX filters in vertically parted moulds:

+ Simplified gating systems
+ Improved mould filling
+ Reduced metal filling velocity
+ Reduced turbulence and erosion
+ Fewer surface and gas defects
+ Improved machinability

In the case of vertically parted moulds there are some additional aspects which need to be taken into consideration when calculating and designing the gating system.

Moulds can be divided into three basic categories:

1. Single cavity
2. Two or more cavities at the same level
3. Two or more levels of cavities

As well as these three types of moulds, the position of the ingate(s) must be taken into account. The lower the cavity in the mould, the smaller the ingates should be in order to ensure even filling of the complete spray. To assist in achieving this, the position of the controlling section or choke also needs to be considered. Each of the three cavity types can be ingated in one of three ways, giving a total of nine gating system variations.

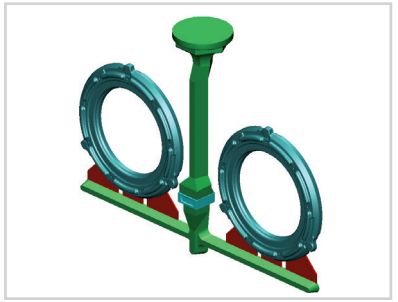
a] Bottom gated:
A downsprue controlled system can be applied, the cross-section of runner(s) and ingate(s) can each be increased by 10%.

b] Side gated:
The controlling section should be located just in front of the ingate(s). The latter section can be increased by 10%.

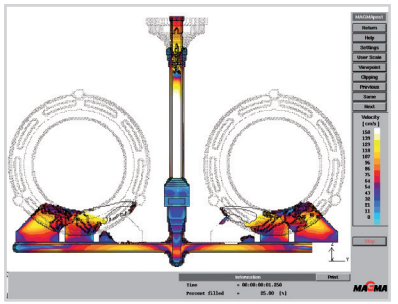
c] Top gated:
When gating through a feeder or KALPUR unit the controlling section must be positioned at the ingate(s). Any runner or downsprue sections should be larger than the ingate(s).

In all cases the choke section must be located behind the filter. This will ensure the filter is fully primed with liquid metal for the whole pouring operation. It is important that the filter is located in a correctly designed and dimensioned filter print. The filter print must ensure that the filter is secured in place and cannot move or fall out as the mould is blown out or moved. It is essential that the print provides the required exit face support during pouring.

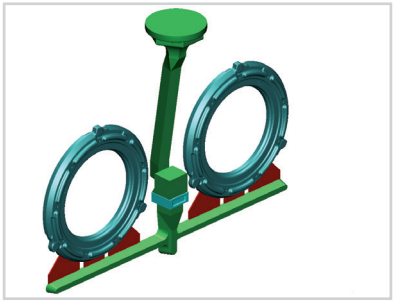
The introduction of additional resistance to a gating system for vertical parted moulding lines (such as an inclined downsprue or sprue cross over) reduces the velocity and makes the mould filling more even. An example is shown on the right. Specific application issues can be addressed by contacting one of our product managers.



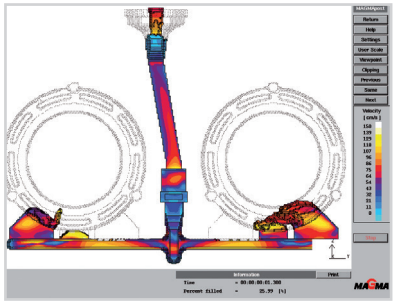
Gating system with filter



Turbulent mould filling, the metal impacts directly against the mould cod



Gating system with inclined downsprue, cross over and filter



More even and less turbulent mould filling

SEDEX quality is assured

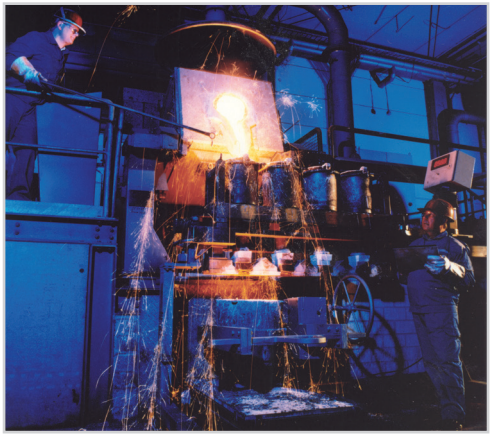
Quality management

The Foseco quality management system is certified against DIN ISO 9001 and ISO 14001. All relevant product quality features of SEDEX filters are controlled and recorded according to these quality standards.

Important product attributes monitored in this way include:

- Filter dimensions
- Bulk density
- Cold compression strength
- Porosity
- Thermal shock resistance (impingement test)

Thermal shock and erosion resistance to the liquid metal stream are important product attributes. These properties are evaluated regularly using liquid cast iron. The impingement test has been specifically developed for this purpose. Extensive use of this test has enabled Foseco to continuously improve the quality and consistency of the SEDEX filter.



Impingement testing unit

Dimensional inspection

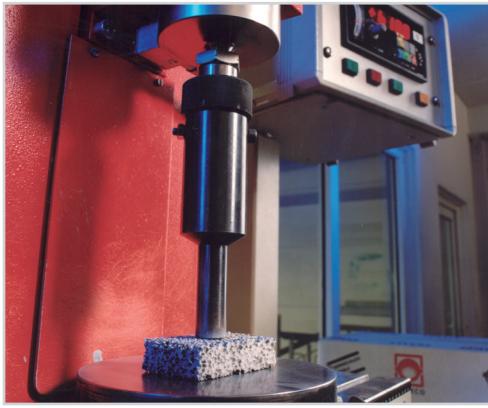


IMAGE to be replaced Testing cold compression

10/2018 · re 500 e

FOSECO

FOSECO. YOUR PARTNER TO BUILD ON.

Foseco International Limited
Drayton Manor Business Park,
Tamworth, Staffordshire,
England B78 3TL
Phone: +44 1827 262021
Fax: +44 1827 283725
www.foseco.com
Please contact your local Foseco company