

# SIVEX APPLICATION GUIDELINES

## FOR SIVEX CERAMIC FOAM FILTRATION SYSTEMS



### AIMS

This document aims to provide the reader with a basic understanding of the practical and theoretical consideration when selecting a ceramic foam filter.

### BACKGROUND

Increasing demands on metal quality and ongoing improvements in the application of SIVEX® ceramic foam filters have secured their use to treat molten aluminium. They now offer a simple, reliable and cost effective method to remove inclusions.

### APPLICATIONS

Ceramic foam filters are normally applied by placing them into a filter bowl. A complete range of filter bowls is available to complement SIVEX filters.

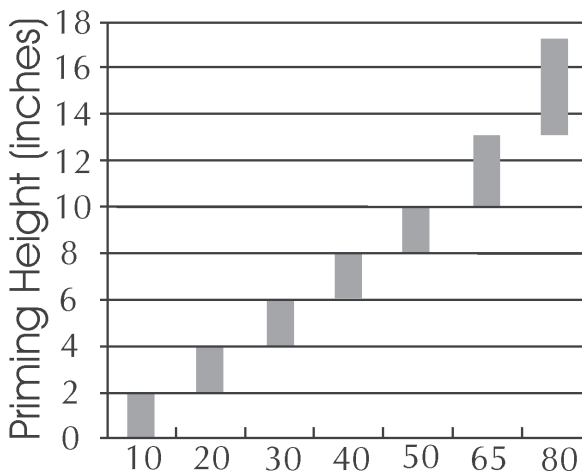
### PRE-HEAT

It is important to pre-heat both filter and bowl before use. During pre-heat, care must be taken to control both heat up rate and temperature distribution. This minimizes thermal shock and stresses in the filters and filter bowl refractory.

### PRIMING

Before a filter can be used, it must be completely wetted by liquid metal. This happens during the start-up of the casting operation. The amount of metallostatic pressure (or priming head) required to wet filters depends on alloy, metal temperature, pre-heat uniformity, pre-heat temperature, incoming metal quality, pre-filter treatments and on the cell size of the filter.

The graph gives an experience-based guide to priming height as a function of filter grade.



### THEORY OF FILTRATION

The basic theory of filtration teaches that, the probability of capturing inclusions increases, the longer the metal remains in the filter. This can be expressed by the following equation:

$$\text{efficiency} = 1 - e^{-\frac{K_o \cdot L}{V_m}}$$

where:

$V_m$  = velocity of metal in the filter

$K_o$  = constant related to cell size of filter

$L$  = thickness of filter (50 mm)

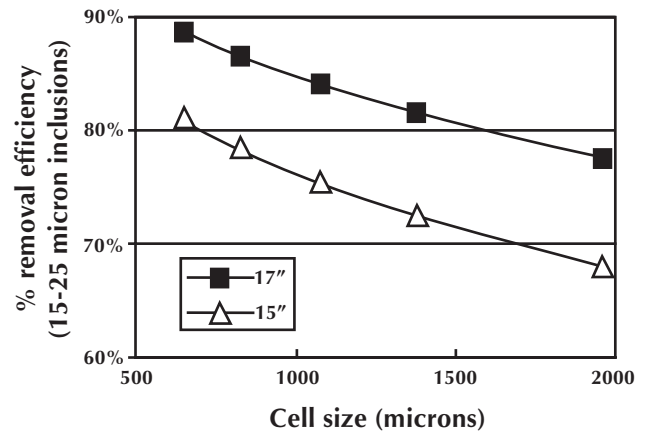
The constant  $K_o$  is a function of the cell size of the filter. Filters with smaller cell sizes remove a larger proportion of finer inclusions, and provide a more consistent filtration performance.

The table below shows the cell sizes for each of the filter grades.

FILTER GRADE	MIN CELL SIZE (microns)	MAX CELL SIZE (microns)
10	3800	5100
20	2300	2900
30	1640	2170
40	1250	1470
50	900	1120
65	710	860
80	600	700

**FILTER PERFORMANCE**

Pyrotek is committed to continuously improving the understanding of filtration performance. The graph shows the effect of cell size on filtration efficiency for two different sizes of filter at a casting rate of 10 tonnes/hr. The results were obtained by LiMCA II and are for the 15–25 micron inclusion range.



**SELECTING A FILTER**

The table below shows the recommended filter size for various flow rates and applications.

		METAL FLOW RATE													
		tons/hr	2.5	5	10	15	20	25	30	35	40	45	50	55	60
		kg/min	42	83	167	250	333	417	500	583	667	750	833	917	1000
		lb/hr	5500	11000	22000	33000	44000	55000	66000	77000	88000	99000	110000	121000	132000
		lb/min	92	183	367	550	733	917	1100	1283	1467	1650	1833	2017	2200
Commercial Ingot & Extrusion Billet (inch)	Grade 10	7	7	12	15	17	20	20	23	23	26	26	26	26	
	Grade 20	7	7	12	15	17	20	20	23	23	26	26	26	26	
	Grade 30	7	9	15	15	17	20	23	23	26	26	26	2x23	2x23	
	Grade 40	9	9	15	17	17	20	23	23	26	26	26	2x23	2x23	
Aerospace Extrusion Quality & High Quality Ingot (litho, foil, can stock) (inch)	Grade 30	9	9	15	17	20	23	26	26	26	2x23	2x23	2x23	2x23	
	Grade 40	9	9	15	17	20	23	26	26	26	2x23	2x23	2x23	2x23	
	Grade 50	9	9	15	17	20	23	26	26	26	2x23	2x23	2x23	2x23	
	Grade 65	9	12	17	20	23	23	26	26	2x23	2x23	2x23	2x23	2x26	
	Grade 80	9	12	17	20	23	23	26	26	2x23	2x23	2x23	2x23	2x26	

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Note: The physical and chemical properties listed represent typical, average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice.

Product Type: 131

Commodity Code: 05002

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