Introduction of Zirconia Foam Filter

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Introduction of Zirconia Foam Filter

- Why do you need filter?
- The function of filter
- How to implement ?
- Capacity of filter?
- Pore size chose?

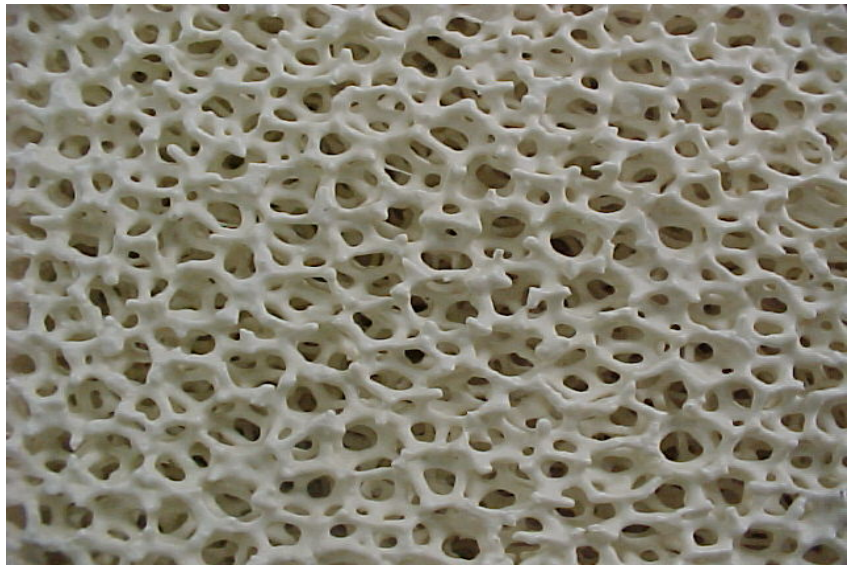
Why do you need filter?

- **Clean Castings**
  - Reduced Scrap
  - Reduced Rework
  - Lower material cost
  - Improved Properties
  - More….

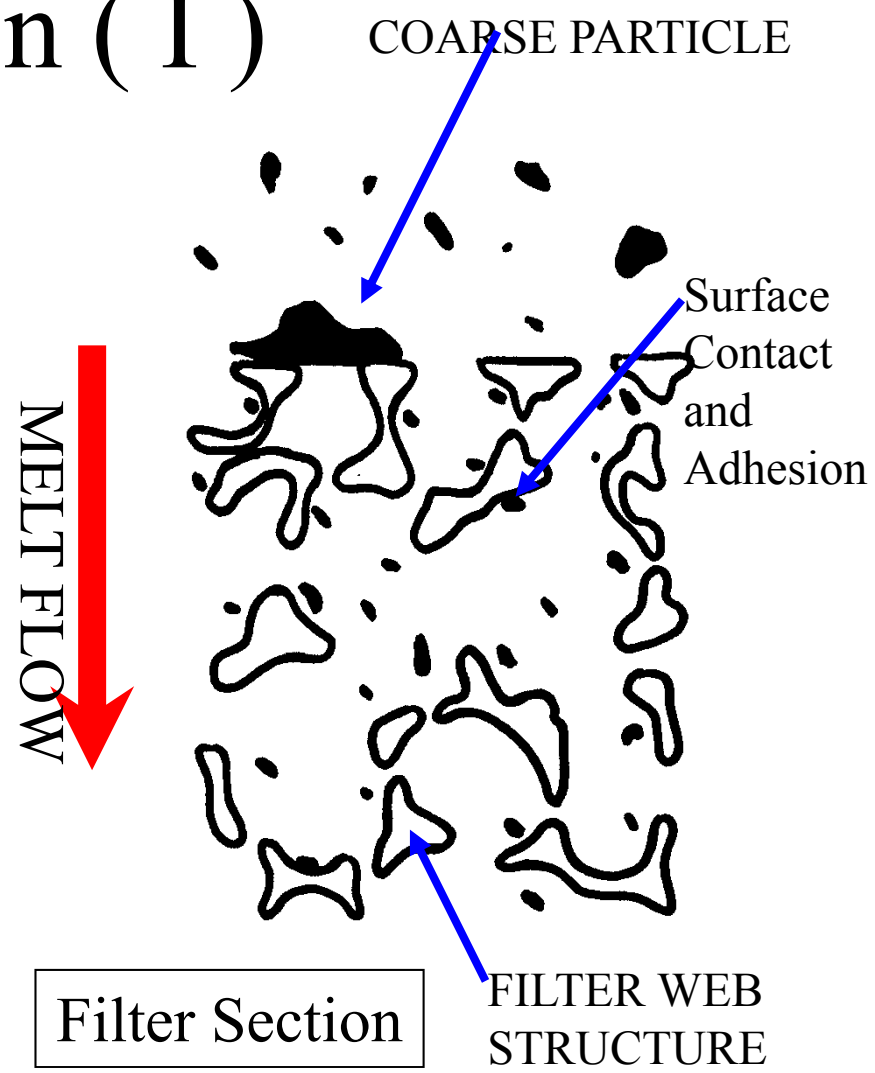
Role of Ceramic Foam Filter

一. CAPTURE OF NON METALLICS

二. FLOW MODIFICATION



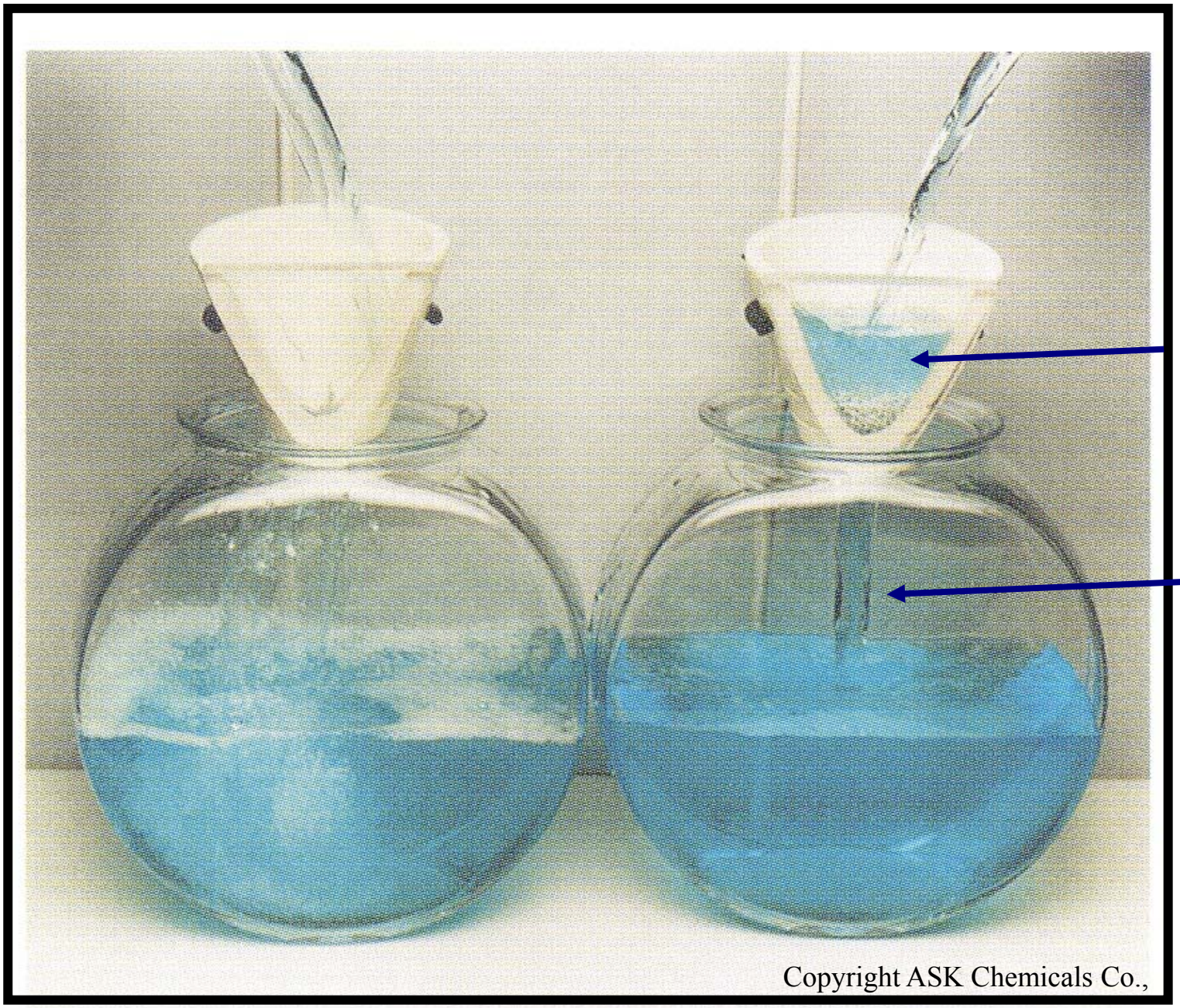
- CAPTURE OF NON METALLICS Function (I)
  - Screening of Coarse/Drossy Particulate
  - Deep Bed Filtration
    - Probability of Contacting Web Surface
      - Surface Area
      - Tortuosity
    - Sticking to Web Surface
      - Thermodynamics (reduction of interfacial energy of the inclusion)
      - Chemical/Physical Characteristics



Function(II)

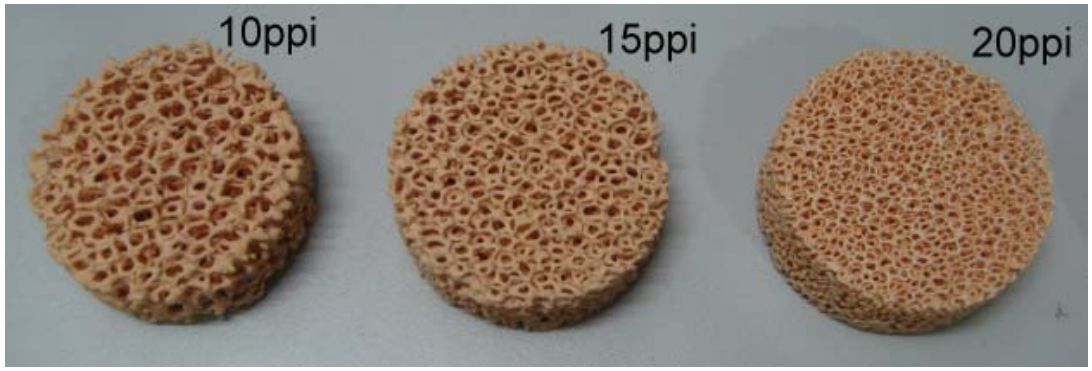
- FLOW MODIFICATION
  - Reduced Turbulence in Runners/Molds
    - Reduces entrapped gas
    - Protects fragile cores from breakage
    - Prevents mold erosion
  - Creates Reservoir of Metal - Allows Secondary Flotation of Oxides

Filter Effect on Reducing Turbulence



Filter Selection

Pore size

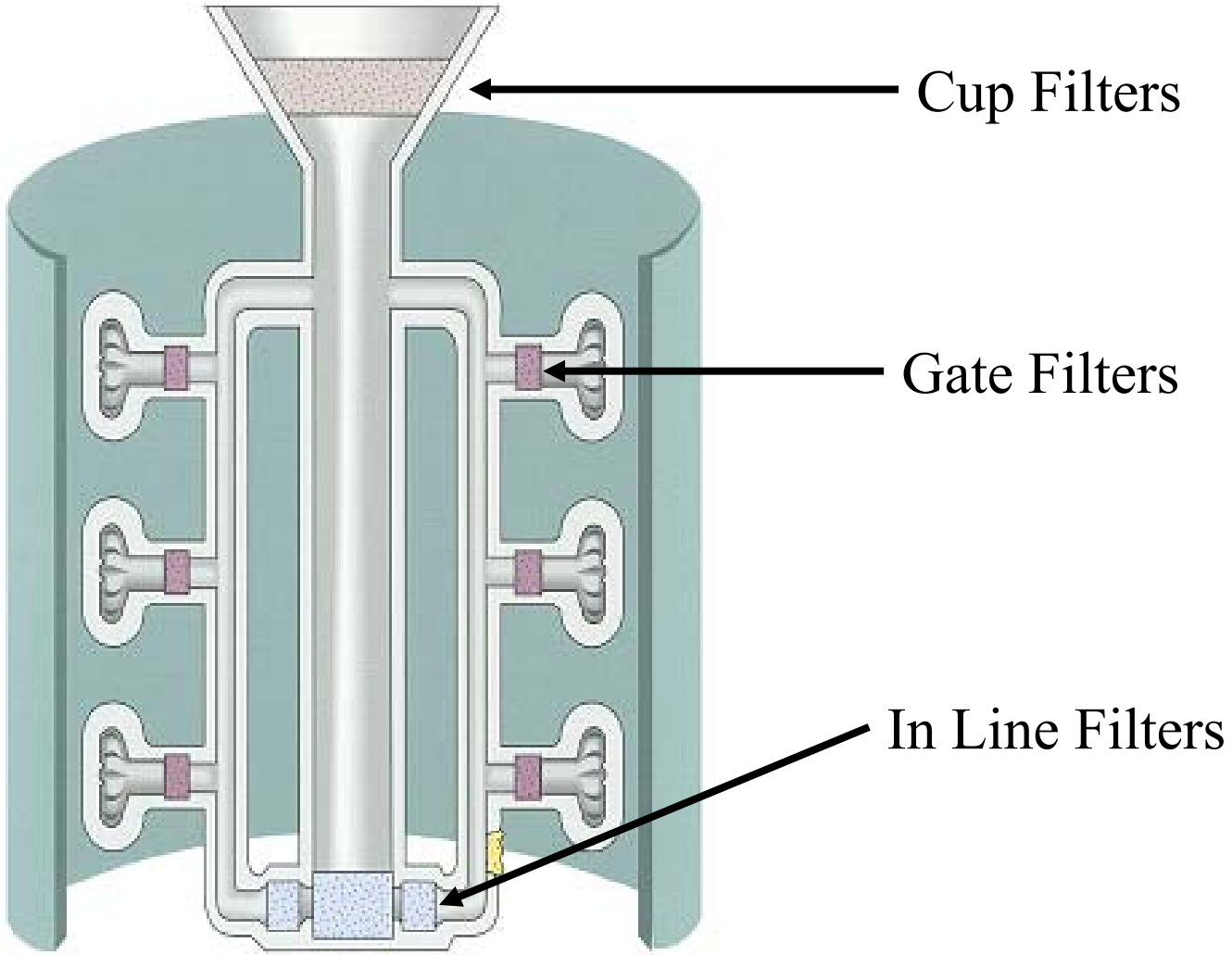


- ppi - Pores per inch (qualitative)
- ppi - Determined by foam supplier. Replication process.
- ppi - Distribution of pores.
- ppi - Typically selected by visual retainers
- ppi - Start most open, move finer based on results and application

Filter Selection
Placement

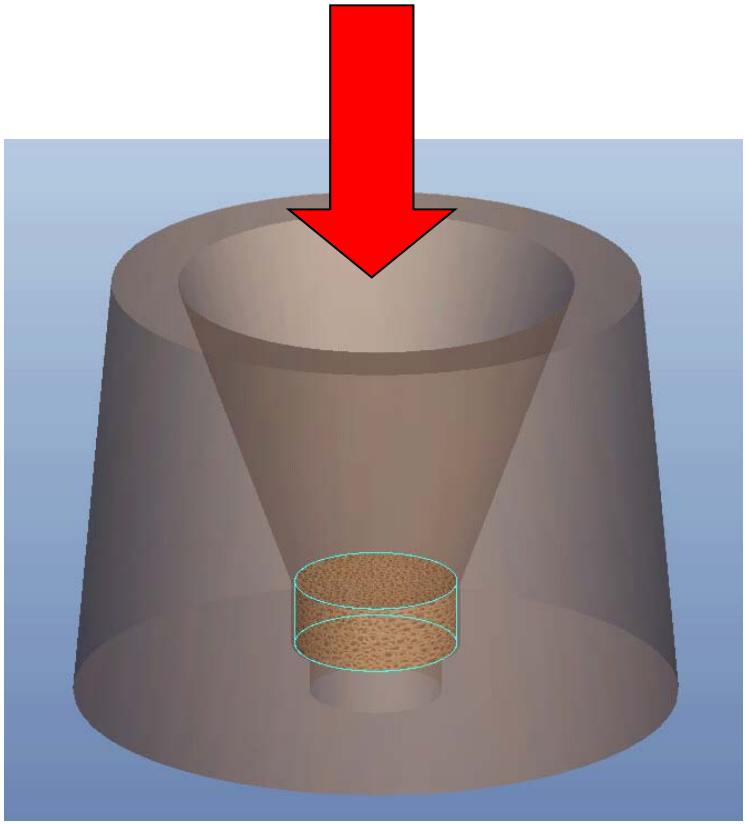
- Cup - Easiest, quickest to test, lowest cost to test and implement. 10,15,20ppi Tapered or Straight Wall
- Inline - Closer is better, finer ppi possible due to greater static metal head. Mold design needed.
- Gate - Finest ppi, closest to casting. 30,45ppi.

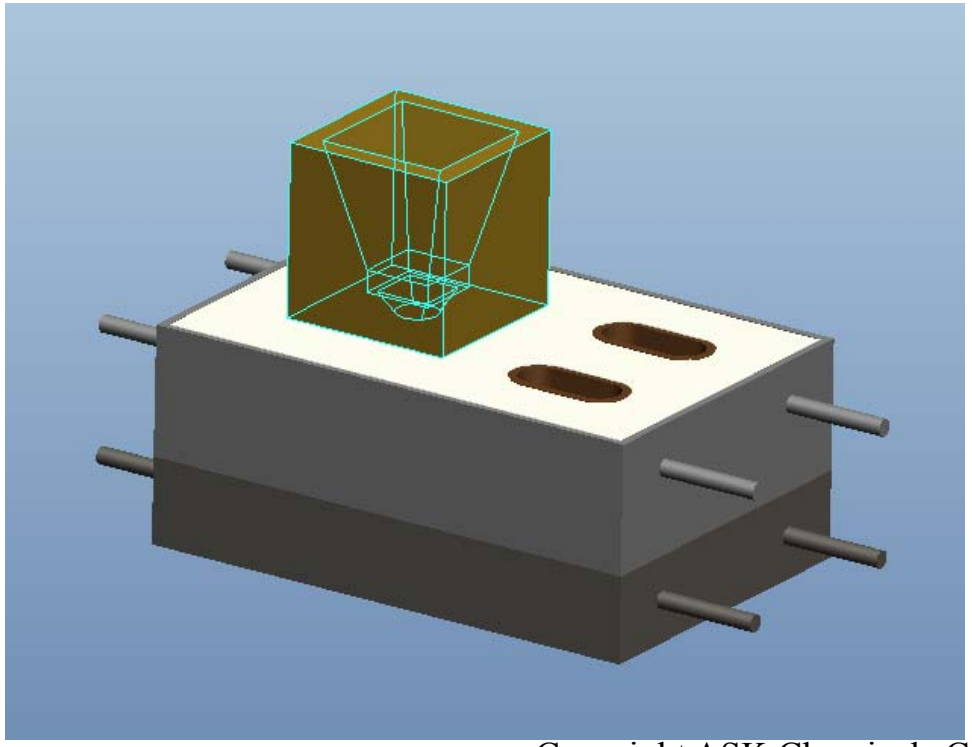
Investment casting Application



Filter placement

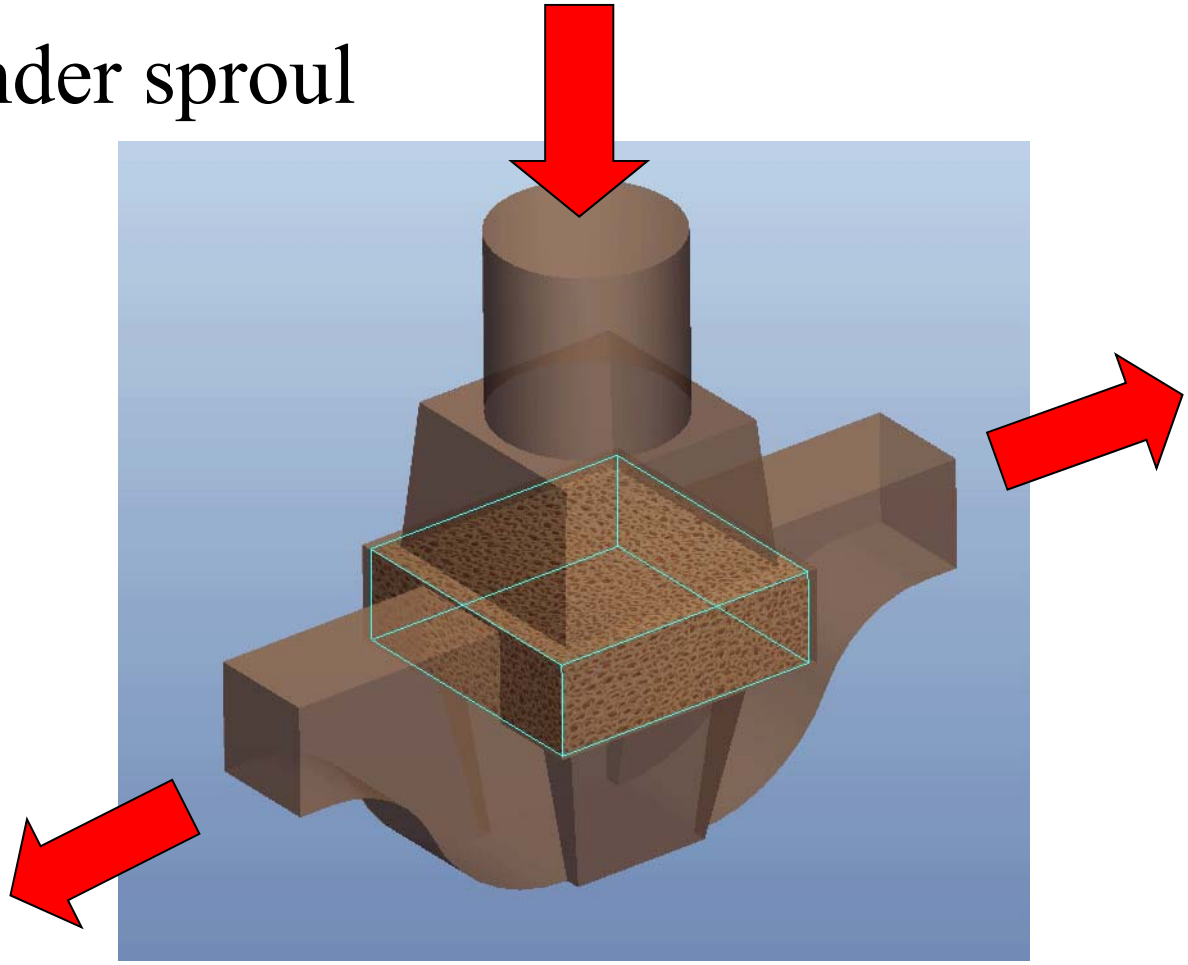
- Filter with pouring cup



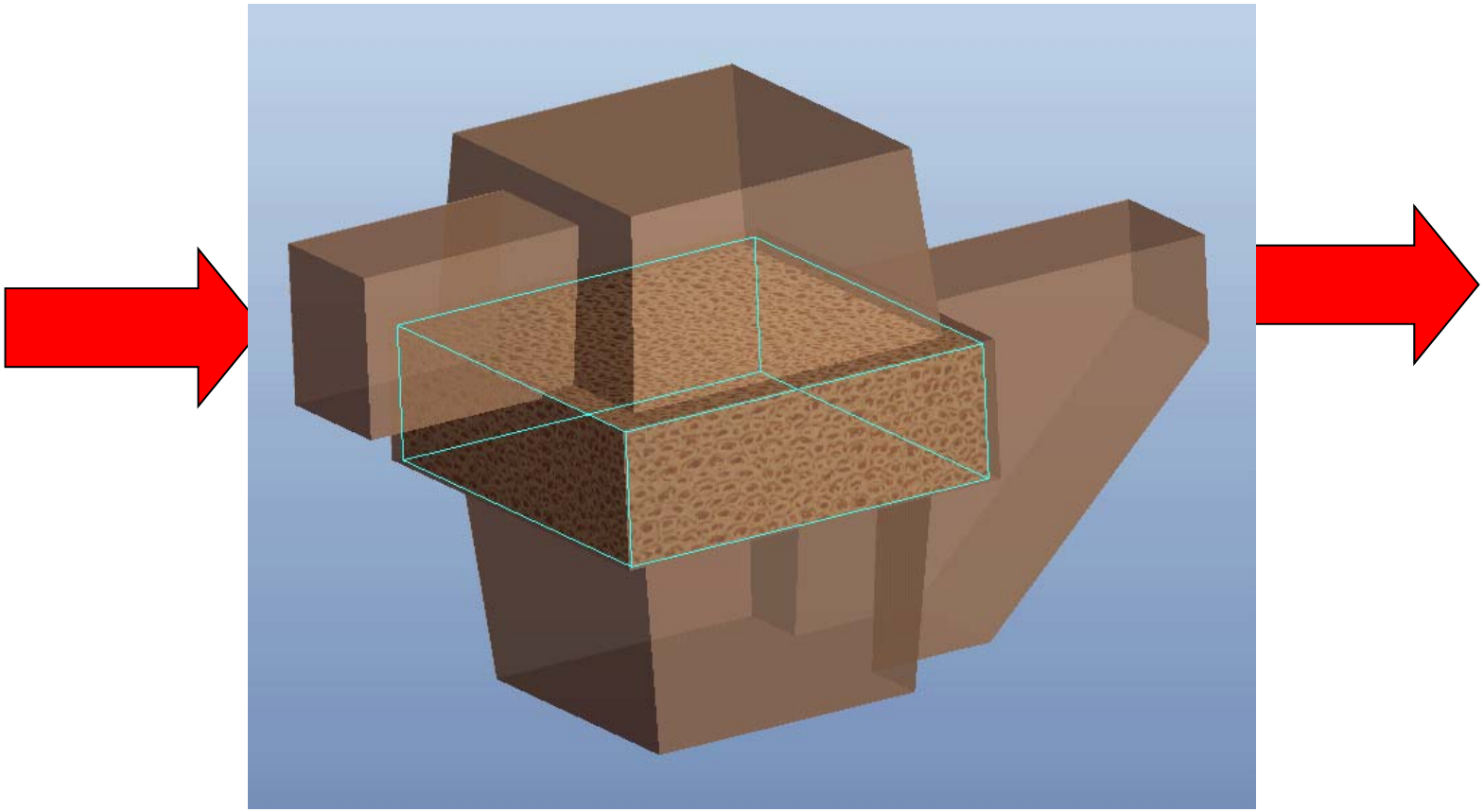


Filter placement

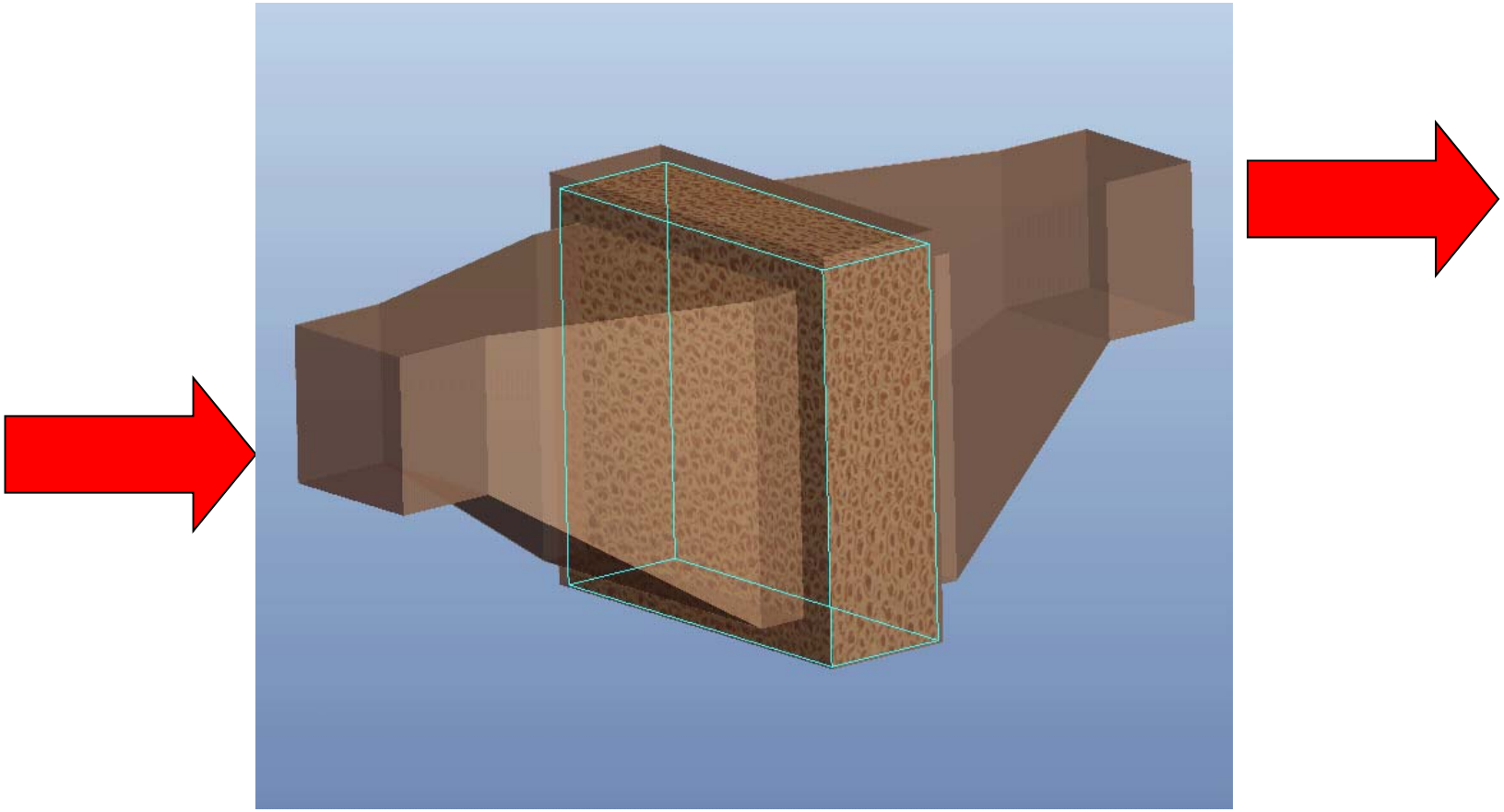
- Under sproul

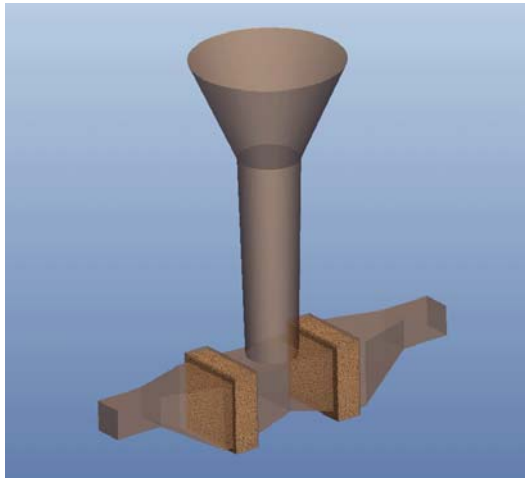


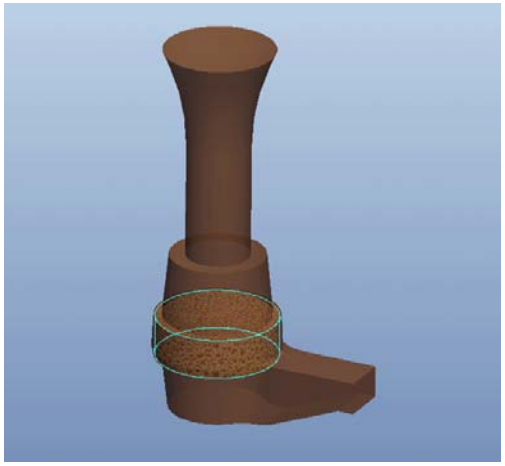
Horizontal placement

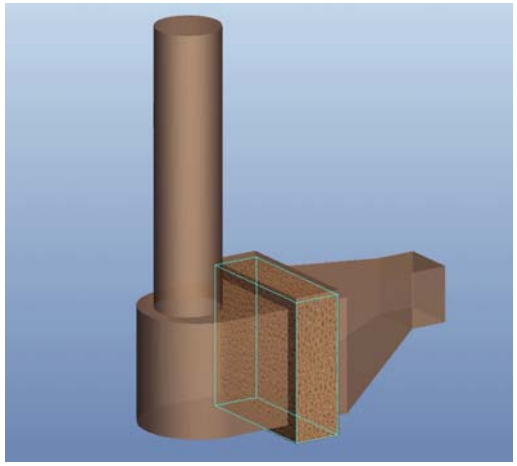


Vertical placement

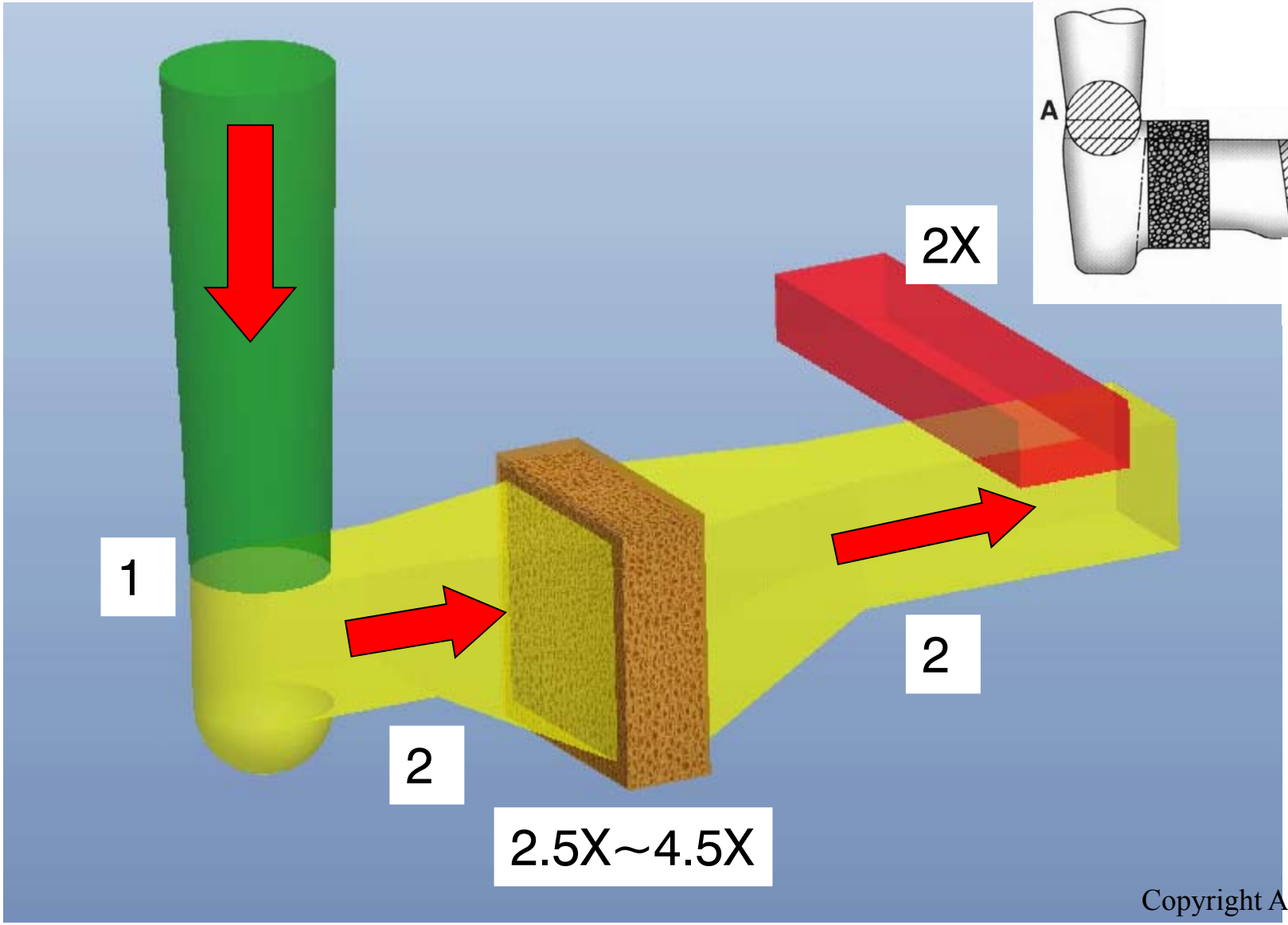


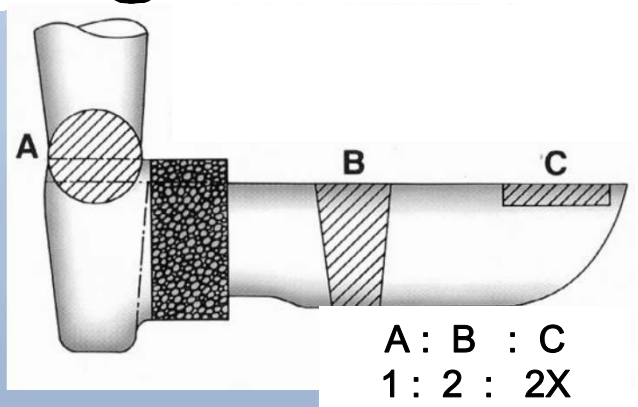


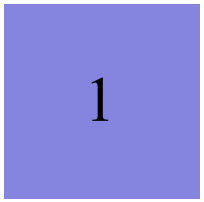




Gating System Design



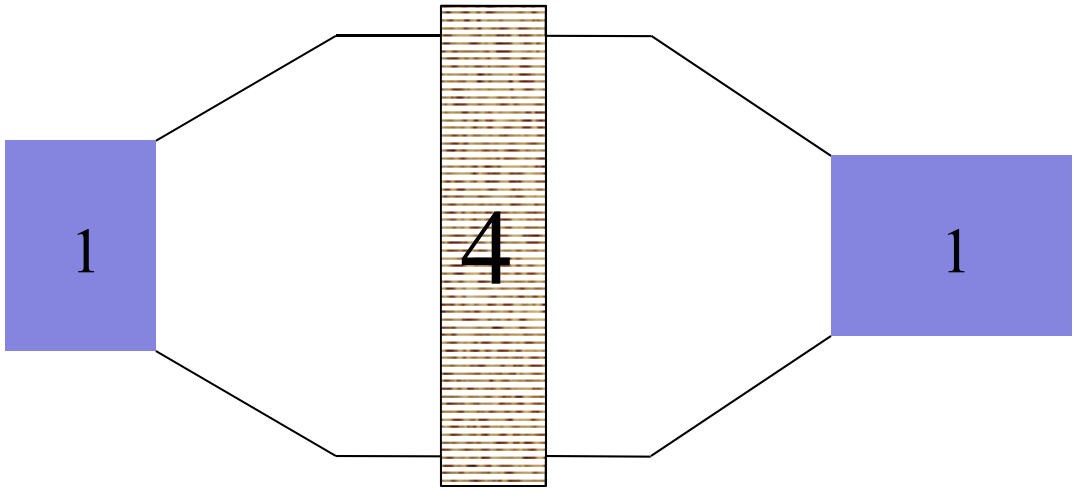


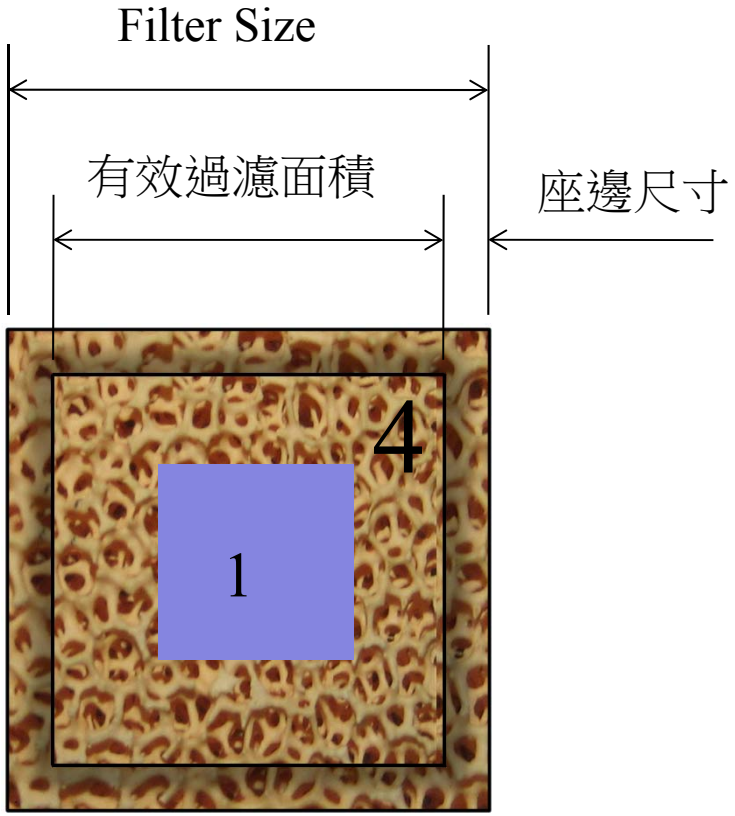


900 x4 = 3600mm2

30mmx30mm = 900mm^2

$\sqrt{3600}$ = 60mm x 60mm





Filter Sizing

- Filter size = Capacity
- Filter block➔ increase size, remove slag.
- Considerations
  - No. & Size of Non-metallic Particles
  - Alloy Fluidity
  - Preheat
  - Pour Temperature
  - Metal Static Head
  - Filter Placement

Flow rate and flow capacities 10ppi

Filter size Inch	mm	Ledge mm (filter support)	Direct pouring Kg	In-direct pouring (With Ladle) Kg
2”∅ x0.75”	50,8∅	5	30- 50	20- 40
2”x2“x0.75”	50,8²	5	40- 70	30- 50
3”∅ x1”	76,2∅	10	90-120	60- 90
3”x3”x1”	76,2	10	120-150	80-110
4”∅x1”	101,6∅	10	150-200	110-140
4”x4”x1”	101,6²	10	180-250	120-150
5”x5”x1.25”	127²	15	250-350	150-200
6x6”x1.25”	152,4²	15	350-450	200-250

End