Silencers and Filters

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AMES

Bronfil® Silencers and filters

BRONFIL® filtering elements from AMES are state-of-the-art products, effective in multiple applications. BRONFIL® products feature a cleaning-friendly design, mechanical strength, and resistant to extreme temperatures.

Sintered Metallic Filters

Metallic filters are manufactured by sintering metallic particles of homogeneous dimensions, which are previously classified.

Metals employed in the manufacture of BRONFIL® filters are BRONZE and STAINLESS STEEL. Other alloys are also available for production.

Properties of BRONFIL® filtering elements

Repeatability

A careful classification of raw materials, together with a steady production process allows to obtain large production series of filters having invariable permeability throughout all their points.

Filtering efficiency

BRONFIL® filtering elements are called "depth filters" because of their unique structure. Fluids are obliged to follow a winding way. This allows to retain particles with needle shape that would otherwise pass in the direction of their smaller size.

Easy cleaning

Filtering elements are cleaned by means of solvents or by reverse circulation (using the same fluid or another adequate one) with no need to remove the filtering element. After cleaning, the filter recovers its initial characteristics. This property is maintained even after several washings.

Machining

BRONFIL® filters are ready for any machining process, i.e., turning, milling, drilling, etc.

It is not recommended to machine flow surfaces, as it causes pore blinding.

Welding

Welding conditions are similar to equivalent solid materials, except for the inconveniences caused by a large number of pores.

- BRONZE can be welded by resistance, tin welding o arch welding as required.
- With STAINLESS STEEL, welding can be done under an argon atmosphere.

Easy machining and welding, as well as a self-supporting structure allow to produce composite or large sized filters.

Corrosion resistant

BRONFIL® elements are resistant to most adverse environments, in accordance with their base material.

Temperature resistant

AMES sintered filters are incombustible, having a rated operation range from -250ºC through +200ºC (up to +450ºC under a reducing atmosphere) for BRONZE filters. This range increases to +450ºC (+850ºC under a reducing atmosphere) in the case of STAINLESS STEEL elements.

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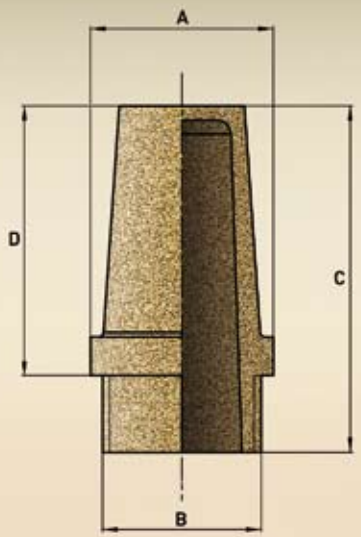
BRONFIL® Silencers

Silencer with thread

Type	A	B	C	D	Working surface in sq.cm	Air flow rate L/min*
1/8"	11	1/8"	24	17.5	3.50	875
1/8" BPC	11	1/8	30	23.5	4.40	1,835
1/4"	14	1/4"	27	18.5	6.00	1,500
1/4"BPC	14	1/4"	38	29.5	9.10	3,410
3/8"	17.5	3/8"	35	25	10.00	2,500
3/8" BPC	17.5	3/8"	46	36	14.80	5,550
1/2"	21	1/2"	44	33	18.00	4,500
1/2" BPC	21	1/2"	58	47	23.66	8,875
3/4"	26.8	3/4"	60	46.6	32.00	8,000
3/4" BPC	26.8	3/4"	69	55.5	37.00	13,875
1"	38	1"	71	56	45.00	15,500

*With these flow rates, the pressure drop in the Silencers will be of 0.5 bar.

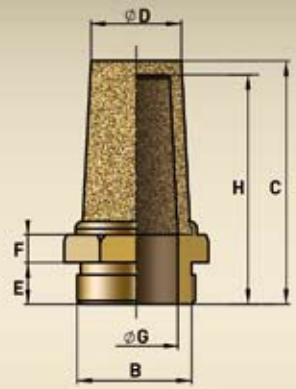


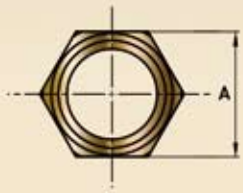
BRONFIL® "RL" Silencers

Silencer with solid brass thread

Type	A	B	C	D	E	F	G	H	Working surface in sq.cm	Air flow rate L/min*
M5	8	M5	19	5.4	4	3	3	17.3	1.50	630
1/8"	12	1/8"	23.5	7.8	5	3.5	5.1	21.5	3.10	1,100
1/8" BPC	12	1/8"	28.9	7.8	5	3.5	5.1	26.9	4.20	2,210
1/4"	15	1/4"	29.6	9.5	6	4,6	7.1	27.3	5.10	2,225
1/4" BPC	15	1/4"	36.4	9.5	6	4.6	7,.1	34.1	6.90	3,040
3/8"	19	3/8"	36.8	12.6	7	5.5	9	34.2	8.60	2,905
3/8" BPC	19	3/8"	45.7	12.6	7	5.5	9	43.1	11.70	4,205
1/2"	23	1/2"	45.6	16	8.5	6.2	13,2	42.6	15.85	4,620
1/2"BPC	23	1/2"	57.1	16	8.5	6.2	13.2	54.1	21.40	7,225
3/4"	29	3/4"	56.3	20.4	10	7	17.6	52.8	26.10	7,075
3/4" BPC	29	3/4"	71.5	20.4	10	7	17.6	68.0	35.20	11,535
1"	36	1"	70	26	12	8	24	66	41.80	16,935

*With these flow rates, the pressure drop in the Silencers will be of 0.5 bar.

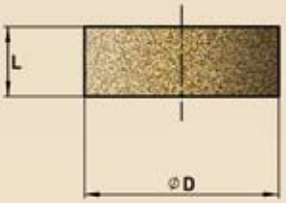




BRONFIL® Filters

Discs

D	L
4	4
6	3
6	6
8	10
10	4
10	10
12	10
12	12
12	15
14	10
16	10
28	3



Characteristics

Production

Mechanical characteristics

Standard filtering grades

Bronze

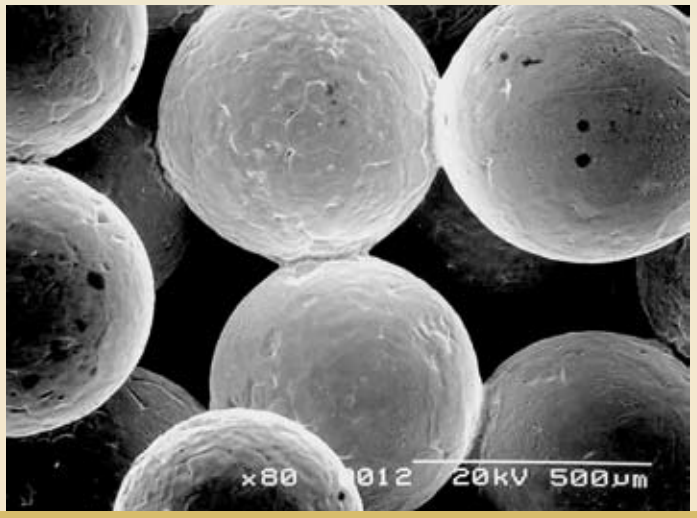
- Composition: 90% Cu, 10% Sn
- Density: 4.5 to 5.5 g/cm^3.
- Porosity at volume: 35 to 50%.

Filters are manufactured by sintering virtually spherical particles.

Different permeabilities required are a function of the sphere sizes.

Tensile resistance at 20ºC	300 to 700 Kg./cm^2 as per granulometry
Elongation	2 to 3%
Lineal thermal expansion (0 to 200ºC)	18 x 10^{-6}

Grade	Average sphere Ø	Mean pitch
FB-8	40	8
FB-12	65	12
FB-24	120	24
FB-40	200	40
FB-60	300	60
FB-85	425	85
FB-110	550	110
FB-150	720	150



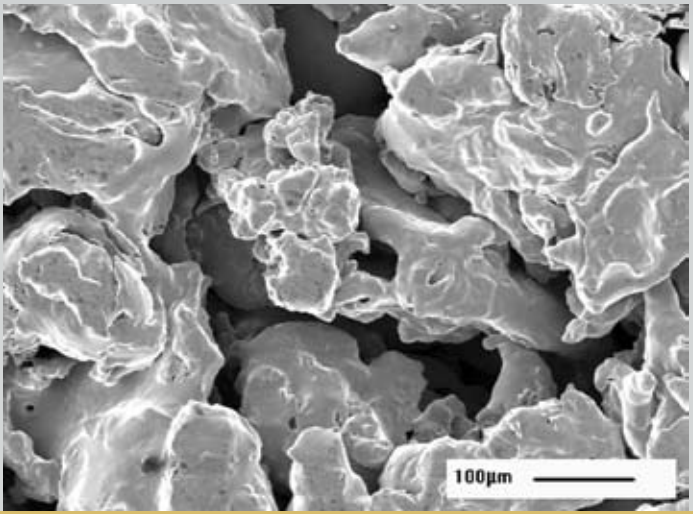
Stainless Steel

- Composition: 316L stainless.
- Density: 4.3 to 5.5 g/ cm^3.
- Porosity at volume: 30 to 45%.

They are manufactured by compacting and sintering irregular stainless steel particles of controlled granulometry.

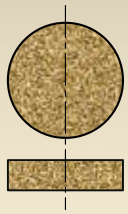
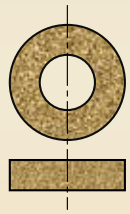
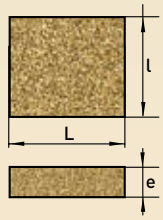
Tensile resistance at 20ºC	400 to 1,000 Kg./cm^2 as per granulometry
Elongation	0.7 to 1%
Lineal thermal expansion (0 to 200ºC)	17 x 10^{-6}

Grade	Average dimension of the particles	Mean pitch
S-1	60	2
S-2	111	6
S-3	225	10
S-4	445	16

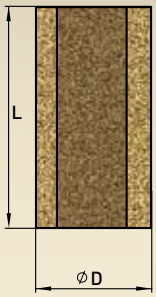
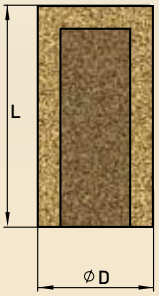


Standard manufacturing shapes

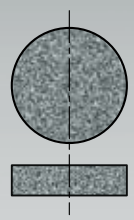
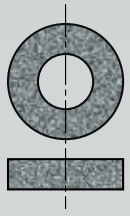
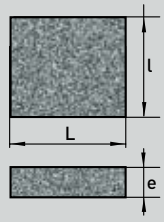
Flat shaped types

discs		Ø up to 350 mm.
washers		outer Ø up to 350 mm.
plates		L x l x e 1,500 x 330 x 15 mm.

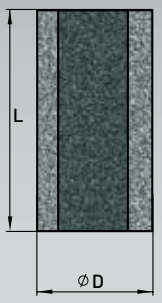
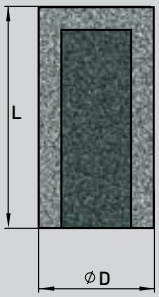
Cylindrical types

	D up to 200 mm. L up to 400 mm.
	D up to 200 mm. L up to 400 mm.

Flat shaped types

discs		Ø up to 350 mm.
washers		Ø outer Ø up to 300 mm.
plates		L x l x e 150 x 150 x 10 mm.

Cylindrical types

	D up to 150 mm. L up to 150 mm.
	D up to 150 mm. L up to 150 mm.

◀ **Data needed to calculate filters inside**

Requirements for filter calculation

Material

Materials are selected according to the fluid to be filtered, operation conditions (temperature, corrosion, etc.).

Grade

The grade is defined by the not retained particle maximum diameter, as per the standard types in the table above (standard filtering grades).

Thickness

In order to provide an efficient filtering of particles, particles must follow a winding way. Therefore, the filter must have a minimum thickness in accordance with the grade.

Should the chosen thickness be too thin, the mechanical strength would also be reduced.

When thickness is excessive, pressure drops would be too large, with no increase in the filtering performance.

Sizing

Graphs on the right show load losses (ΔP) in g/cm^2 or in cm water column (wc):

- for different standardised grades
- as a function of flow in l/min
- for 1 cm^2 of filtering surface
- for a 1 mm thickness
- on a laminar flow
- for 2 fluids having viscosities as air and water at 20°C.

These abacuses are valid for other viscosity values (in centipoises or micropoises), surface and wall thickness. Proper corrections should be introduced, bearing in mind that flows are as follows:

- directly proportional to surfaces.
- inversely proportional to viscosities and wall thickness.

These graphs are based on considering a laminar flow, in which the flows follow the Poiseulle's law.

In high flow velocities, the flow rate tends to become sinuous and the flow is not exactly proportional to ΔP. Nevertheless, it could be admitted that, within wide limits, as a first approximation, the proportionality law is applicable.

$$Q = K \frac{S \times \Delta P}{\eta \times e}$$

Q = flow in l/min.
K = specific filter coefficient
S = filtering surface in sq.cm
ΔP = pressure drop in gr/sq.cm
η = dynamic viscosity in centipoises
e = thickness in mm.

The curves define the theoretical flows with a clean filter, consequently affecting the calculated surface with a use coefficient of 1.5 is recommended. This coefficient is linked to the percentage of impurities the fluid contains and the frequency of cleaning.

Lowest recommended thickness

Grade	Thickness
FB-8	1.5 mm
FB-12	1.5 mm
FB-24	2 mm
FB-40	2 mm
FB-60	2.5 mm
FB-85	2.5 mm
FB-110	3 mm
FB-150	3 mm

Lowest recommended thickness

Grade	Thickness
S-1	2 mm
S-2	2 mm
S-3	2.5 mm
S-4	3 mm

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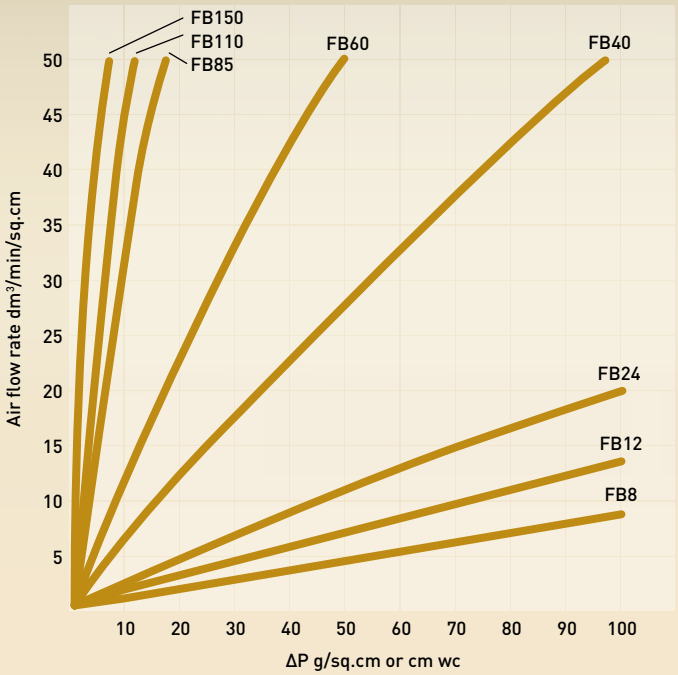
Bronze

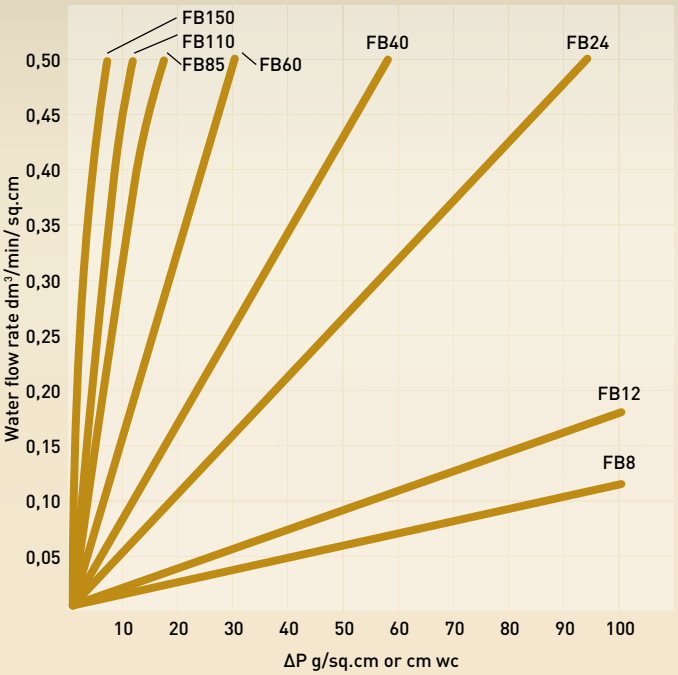
Air

Bronze wall 1 mm — Air viscosity 183 micropoises at 20° C



Water

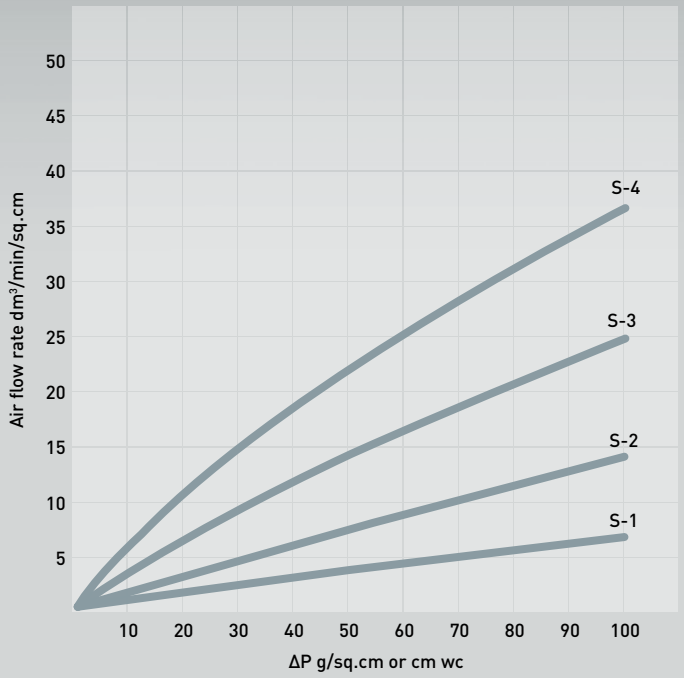
Bronze wall 1 mm — Viscosity 1 centipoise at 20° C



Stainless Steel

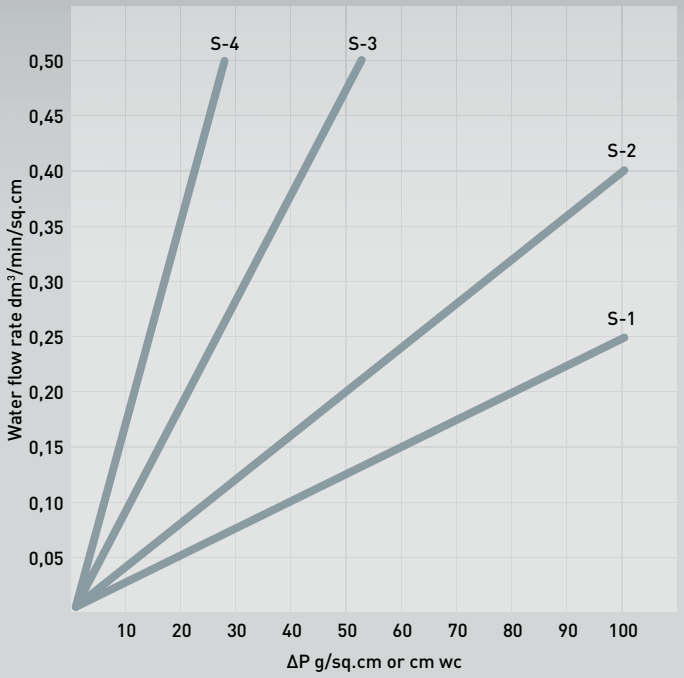
Air

Stainless steel wall 1 mm — Air viscosity 183 micropoises at 20° C



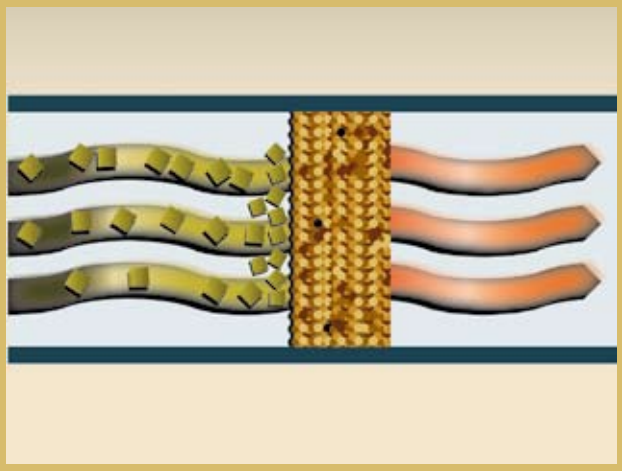
Water

Stainless steel wall 1 mm — Viscosity 1 centipoise at 20° C



Applications

Gas and fluid filtering



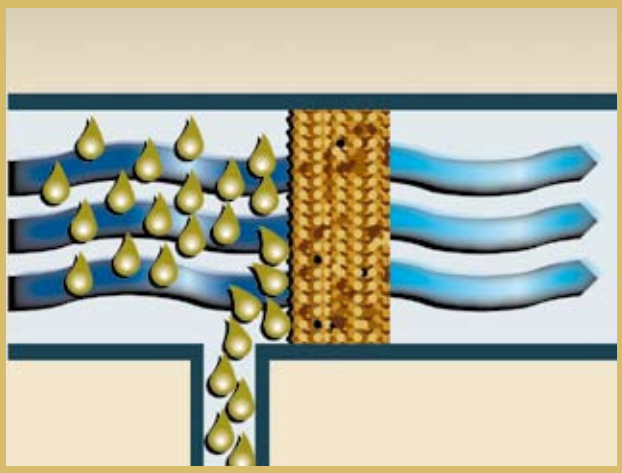
AMES filtering elements provide a pitch range (from 2µm to 150µm), and a high corrosion resistance to considerable pressure and temperature variations, which allow to:

- filter corrosive fluids.
- filter at very low or high temperatures.
- filter at very high pressure.

Examples:

- Removal of foreign matter in fuel-oil lines between tank and pump (injector protection).
- Gas-oil and fuel-oil filtering in marine engines.
- Heating acceleration pumps.
- Removal of impurities in hydraulic elements.
- Filtering of heavy water at nuclear reactors for radioactive particle removal.
- Filtering high-pressure and high-temperature fluids in artificial fibre textile production.
- Filtering aviation fuels.

Separation



Separation of suspended fluids in a gas, or of 2 fluids and gases, upon contact with a sintered porous metallic element, due to the differential in surface tension.

Examples:

- Compressed air piping drain (removal of water and oil from the compressor).
- Vehicle (lorries and trains) braking circuit filtering.
- Filtering of pneumatic measuring devices.
- Pneumatic logical systems (fluidics).

Diffusion

A uniform porosity as well as an extensive capillary network in BRONFIL filters ensure an homogeneous distribution of a gas under pressure in a fluid.

Examples:

- Mineral water regassing.
- Water ionisation.
- Wine nitrogenation.
- Aquarium areation.
- Exhaust silencing in pneumatic facilities, dampening noise levels from 100 db to 40 dB.

Capillary effect

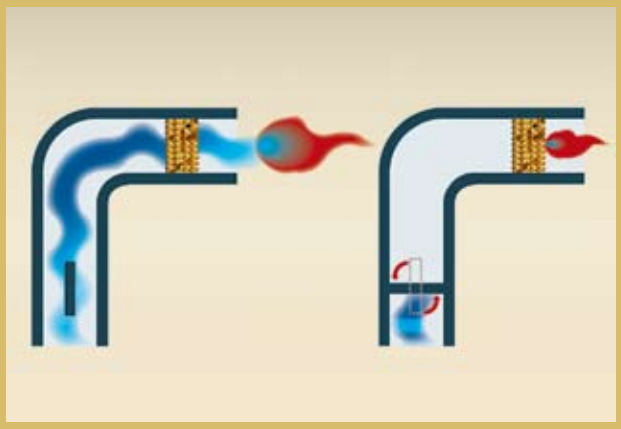
BRONFIL filters feature a high extension and regularity in their capillary network. Together with a well-defined pressure drop, BRONFIL filters are perfect for a number of applications.

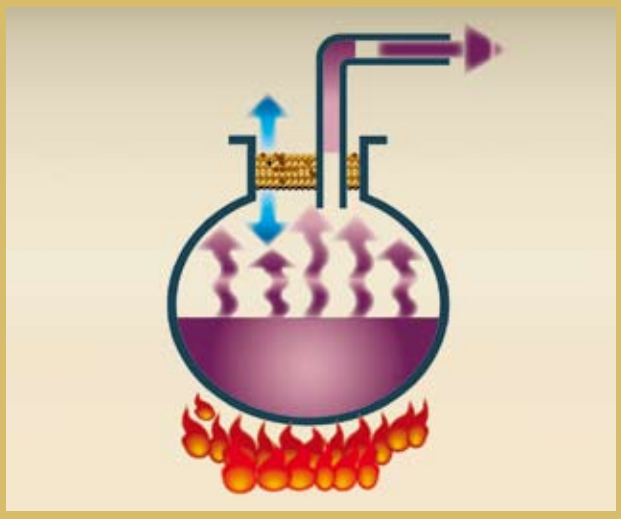
Examples:

- As flame protection system, avoiding accidental ignited gas return.
- In oxy-acetylene welding flame check-valves (need stainless elements).
- As flow and pressure control. Used in oxygen bottles for respiratory equipment (parachuting, aviators, scuba diving, medical applications, etc.).
- Small butane gas bottles and gas burners.
- Pressure gauge and other instrument protection against pressure surges.
- Breathing orifices, allowing to balance pressure with atmosphere (pressure equalizer preventing foreign matter ingress).

Applied in:

- Geared motors, gear boxes
- Electric motor oil pans (also acts as a flame protection)
- Hydraulic reservoirs, fuel tanks (gasoline, gas-oil in cars and lorries)
- Single-action cylinders (pneumatic and hydraulic)
- Foam moulds (polystyrene and other).



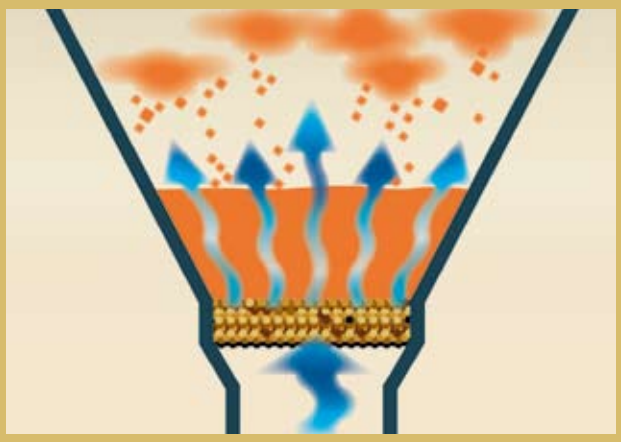


Fluidisation

Handling of powder products by means of pneumatic systems. Air introduced into a container for powder substances is distributed through a porous surface at the same pressure on all its points (preventing arch formation).

Applications:

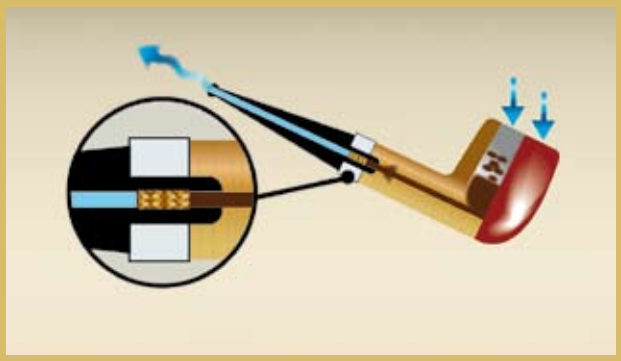
- Cement, flour, alumina, ash, etc. handling. Bulk transport lorries, silos, air-conveyors. Moulding sand treatments.
- Fluidified bed metallic object plastification pans.
- Powder substance dispersion drying.



Other applications

Due to their characteristics and properties, BRONFIL elements are suitable for a variety of applications, providing designers with a tool for solving a number of problems. A few examples:

- Microphone manufacture protective capsules.
- Smoking pipe filters
- In glass and rubber handling.
- Catalysers.



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