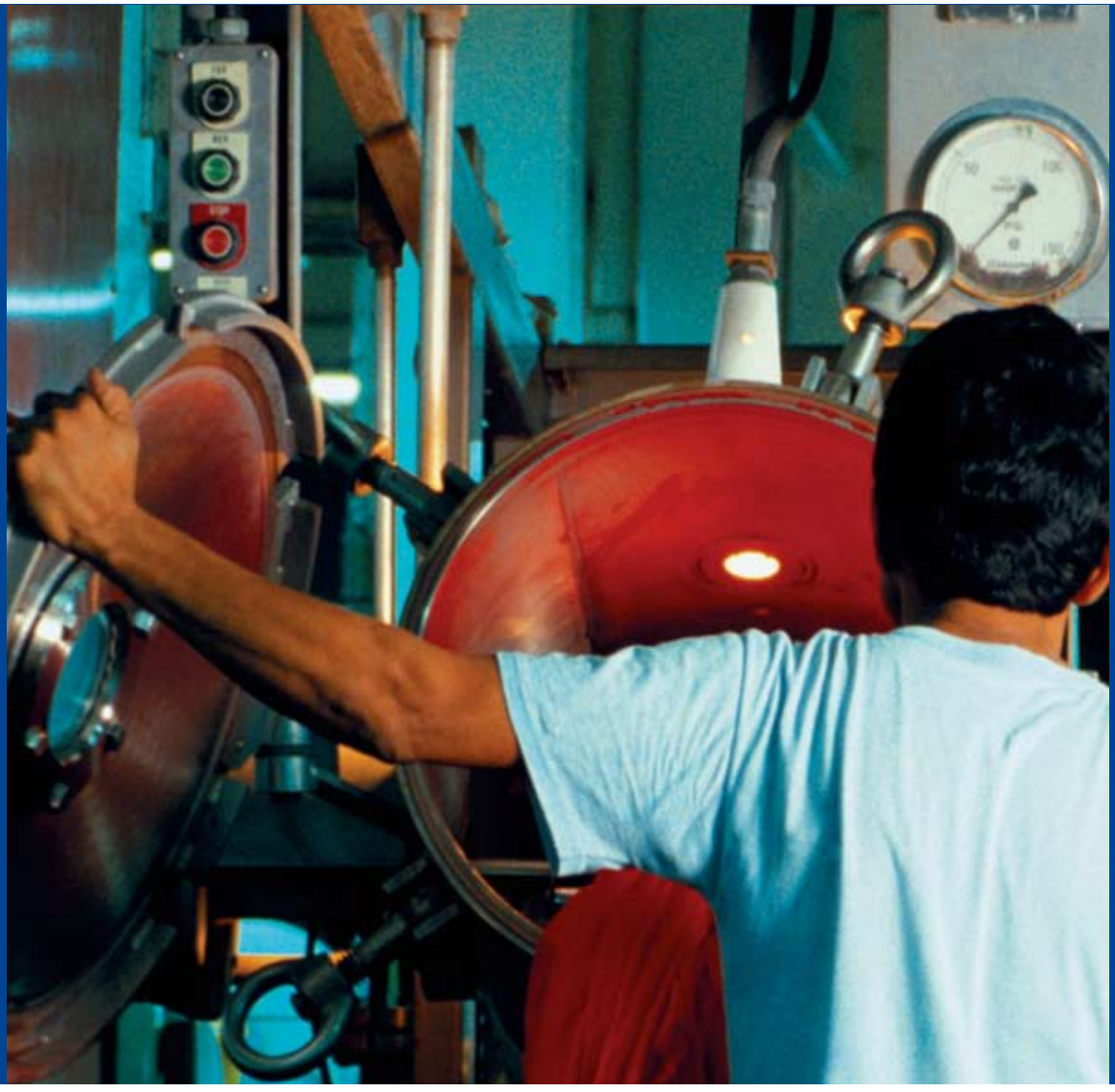
Höganäs



Stainless Steel Powders for Hot Polymer Filtration

You can depend on Höganäs Solutions

Höganäs is among the market leaders in stainless steel powders for hot polymer filtration. In terms of quality and capacity, we are a top performer in this highly specialized and demanding product segment. We have gained an unrivalled reputation for providing effective and reliable powder solutions that can be optimised in filter packs for particular polymers.

Filtration media characteristics

- high porosity maintained during filtration cycle
- large active surface area
- no chemical reaction with the polymer
- cost-effective

Spin-pack filter media

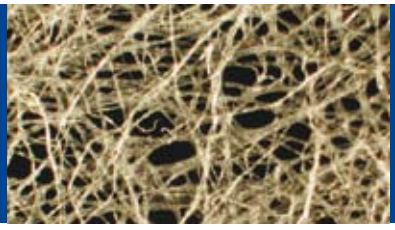
Metallic fibres: The filters are normally made of woven or non-woven stainless steel fibres. These are strong and inert to hot polymers, characteristics that are mainly determined by the alloy used. The drawbacks are a low porosity level and a quite small surface area for a given volume.

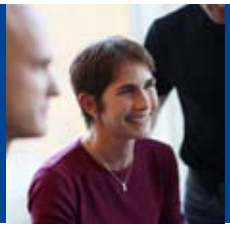
Mineral sand: This inexpensive filter medium is strong and, if well cleaned, inert to hot polymers. Due to the rounded shape of the particles, it does not offer a high porosity level or a large surface area. The silica sand tends to crack under high pressure and forms very fine particles that clog the holes during filtration.

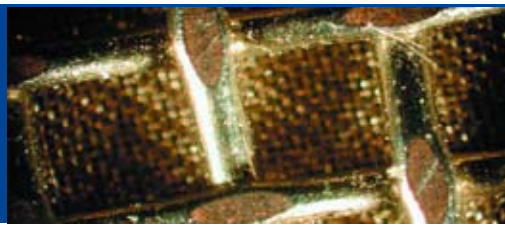
Glass beads: This relatively inexpensive filter medium is strong and inert to hot polymers. The particles are round, which gives a low ratio between the active surface area and the porosity volume. Under high pressure, the glass beads tend to crack and consequently form very fine particles that clog the holes during filtration.
We provide an alternative filter medium; specially designed corrosion-resistant metal powders that can be used as an excellent substitute or complement to the above-mentioned products.

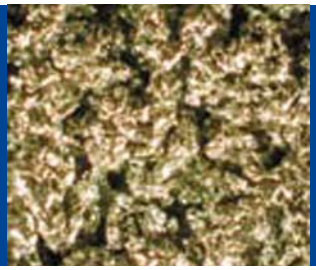
Höganäs filtration medium

The production method for this special material is based on high-pressure water atomization. A liquid metal stream is shattered by water jets into small particles. These grains have an extremely irregular shape.
The porosity volume and particle surface area are dictated by the size and shape of the powder particles. Larger grains tend to give a higher porosity, but a lower active surface area. Finer particles give a higher active surface area, but a somewhat lower porosity volume. The high active surface area ensures good cleaning during filtration.
The filtration particles are made of stainless steel alloys specially developed for hot polymer filtration. The chemical composition is important for the particles' strength. Iron is used as the basic metal and provides good strength, but alloying elements such as chromium, nickel, silicon and carbon are added to further improve strength and to maintain high porosity throughout filtration. This minimizes the pressure increase during filtration.
The alloys used should be strong enough to minimize compaction during filtration, but should not be very hard, in order to avoid brittleness. As the particles are not brittle, they do not crack up during filtration. Consequently there is no risk of the nozzles clogging.







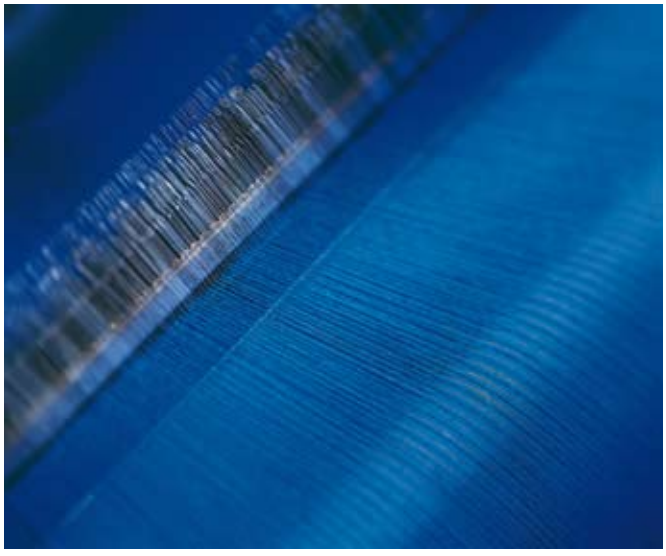


Metal powder filter packs

The metal powder filter pack for the fibres or filaments should contain two or three layers of different powder grain sizes. The best combination of the powder grain sizes depends mainly on the type of polymer used in the spinning process and its viscosity, purity, ability to polymerise, melt temperature and extrusion velocity. An optimized filter pack can be composed for a specific polymer. The grain sizes, such as 45/90, 90/125, 125/180, 180/250, 250/355, 355/500, 500/850 and 850/2000, the number of layers and the thickness of the layers are adapted in various combinations according to the polymer to be filtered.

Chemical composition is also a highly important factor in determining chemical resistance to hot polymers. We produce an alloy, P-270, specially developed for polymer filtration. The chemical composition of P-270 is specially designed to increase the powder's chemical resistance to hot polymers and avoid discoloration of the fibres. P-270 is suitable for the filtration of both polyester and polyamide.

P-271 is a powder used in the textile industry for filtration of polymer melts. It is a nickel-based powder with improved oxidation resistance and a low Fe content.



Available types of filter cut materials

P-270: A modified austenitic stainless steel material especially developed for polymer filtration. Compared to 316L, it offers a somewhat higher Cr, Si and C content. *Fe bal- 20% Cr- 12% Ni- 3.0% Si- 2.2% Mo.*

DP-1: This nickel-free stainless material is not austenitic. *Fe bal- 35% Cr- 2.8% Si.*

P-271: This is a nickel-based alloy (type IN 600). The material is low in Fe and extremely oxidation resistant. The powder has been specially developed for the spinning of nylon yarn. *Ni bal- 15.5% Cr- 8% Fe.*

Typical physical properties

Size micron	Size mesh	Apparent Density g/cm³	Tap Density g/cm³	Porosity %
45-90	170/325	2.6	3.5	55
90-125	120/170	2.4	3.1	58
125-180	120/80	2.2	3.0	61
180-250	60/80	2.0	2.8	64
250-355	45/60	1.8	2.6	66
355-500	35/45	1.7	2.2	71
500-850	20/35	1.7	2.1	73
850-2000	10/20	1.5	1.9	75
Alternative cuts				
150-300	50/100	1.9	2.1	73
180-425	40/80	1.8	2.0	74
250-600	30/60	1.7	1.9	74
300-710	25/35	1.7	1.85	75
710-2000	10/25	1.5	1.8	76

Quality control

All batches are carefully controlled regarding sieve analysis, apparent density and chemical analysis. The sieve analysis is carried out according to the standard, ISO 4497 (1983) equivalent to ASTM B214. A sample is dry sieved through a set of wire cloth test sieves and then weighed. A laser beam scattering method can also be used.

The apparent density measurements are made in accordance with ISO 3923/1 (1979) equivalent to ASTM B212. A test portion of the powder is poured through a standardized funnel into a 25 cm3 cylindrical cup and then weighed. The chemical analysis is performed by X-ray fluorescence, ICP and wet chemistry methods. Other regularly measured properties are tap density, surface area and microhardness.

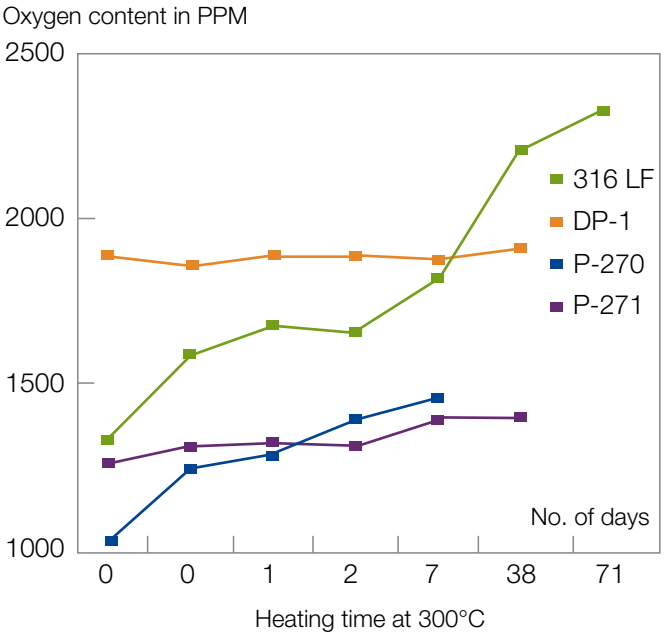
Oxidation resistance

The oxidation resistance of the powder is also an indicator of the inertness of the material in a polymer environment. A heat treatment of the powder at 300°C in an electrical furnace shows the degree of oxidation of the particle surfaces. It can be seen that P-270 is less prone to oxidise than regular 316L material.

Powders with low oxide content are very important in order to maintain a low degree of interaction with the polymer. This is especially important from the perspectives of light reflection and dye-evenness of the yarn.

This effect can clearly be seen on yarn from a pack that has been held too long at elevated temperatures prior to spinning.

The oxygen content vs. heating time at 300°C



Metallic powder offers you benefits and flexible solutions:

- low level of inventory, as the powder can be easily adapted to changing production formulas
- a media extremely resistant to the chemicals and temperature of the environment
- a porous structure with deep filtration properties that remain unchanged during the filtration cycle

The Power of Powder

Metal powder offers entirely new possibilities to create more effective, lighter products with a reduced environmental impact. By combining the right alloy with a suitable morphology of the powder grains, new opportunities open up to match your challenges. Contact us and together we will release the power.

Metal powders are traditionally used to manufacture sintered components for vehicles. But there is a lot more to them. By fortifying food with elemental iron, anaemia can be reduced. By coating with nickel, glass bottle production life is prolonged with wear and temperature resistance. By employing new iron based powders, high temperature brazing of heat exchangers is possible. By utilising the three dimensional magnetic flux of encapsulated metal powders, smaller electrical motors can now be produced. And so on.

In fact, the possibilities of metal powder technology are almost endless. To take advantage of the inherent Power of Powder, please contact your nearest Höganäs office.

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