Porous metal filter elements & systems for liquids

Partners in filtration innovation
At Bekaert, we believe each filter project is unique. That is why we offer our full support in our partnership with our customers; from investigating the possibilities of improving the filter process to the design, development and production of a filter solution that matches your quality, productivity, handling and maintenance requirements.

The best of both worlds in all-metal filtration

Depending on the desired characteristics and process requirements, our elements are either metal fibre or metal powder based. Thanks to our alliance with the Mott Corporation we can offer you the best of both worlds in all-metal filtration.

Modeled to your needs

With the Hypulse® filter systems, Bekaert also offers you a filtration solution that is completely modularized to your needs, including valves, instruments, controls, piping and gauges.

Certified quality

As a technology and customer driven organization Bekaert Advanced Filtration confirms its total quality management with our ISO 9001 certificate.

Metal fibre or metal powder based media

High performance, high strength filtration elements for liquid filtration

Customized filtration systems for a more efficient filtration of liquids

Registered by Mott Corporation
Bekaert filtration elements

Advantages

• **Long life**
  In most applications, porous metal powder maintains high filtration efficiency through years of continuous use.

• **Fully cleanable**
  Particles may be removed from porous metal media using backwash and other cleaning methods, restoring the media to its original efficiency for repeated performance.

• **High strength**
  Porous metal media are unsurpassed in tensile strength, making them well suited for high differential pressures and flow rates.

• **Uniform porosity**
  A strictly controlled sintering process enables to produce uniformly sized and distributed pores, in media grades ranging from 0.2 to 20 μ.

• **No media migration**
  “Solid-state diffusion bonding” holds filter media together at the molecular level, making it virtually inseparable, even under the harshest conditions.

• **High temperature tolerance**
  All metal construction and welded seams endure high temperatures, even in oxidizing atmospheres.

Features

**Removal ratings**

<table>
<thead>
<tr>
<th>Media grade</th>
<th>Initial removal ratings (μm)</th>
<th>90%</th>
<th>99%</th>
<th>99.9%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>0.5</td>
<td>0.9</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>0.5</td>
<td>1.7</td>
<td>2.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2.2</td>
<td>3.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4.5</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>8.7</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>16.7</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>26.7</td>
<td>35</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**High temperature capabilities**

<table>
<thead>
<tr>
<th>Material</th>
<th>Oxidizing</th>
<th>Reducing</th>
</tr>
</thead>
<tbody>
<tr>
<td>AISI 316L St.St.</td>
<td>400°C</td>
<td>480°C</td>
</tr>
<tr>
<td>Hastelloy® C276</td>
<td>450°C</td>
<td>540°C</td>
</tr>
<tr>
<td>Inconel® 600</td>
<td>600°C</td>
<td>815°C</td>
</tr>
<tr>
<td>Hastelloy® X</td>
<td>790°C</td>
<td>930°C</td>
</tr>
</tbody>
</table>

Product range

**Element diameters**

<table>
<thead>
<tr>
<th>Size</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot;</td>
<td>16 20 24</td>
</tr>
<tr>
<td>1 ¼&quot;</td>
<td>32 40 48</td>
</tr>
</tbody>
</table>

**Element lengths**

<table>
<thead>
<tr>
<th>Size</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot;</td>
<td>06 10 12 18 20 24 30 36 40 50 60 70</td>
</tr>
</tbody>
</table>

Wide choice of materials

In addition to 316L stainless steel Bekaert also offers other metals and alloys to meet special requirements such as a better temperature and corrosion resistance.

- Stainless steel: 316L, 304L, 310, 347 and 430
- Hastelloy® C-276, C-22, X, N, B, B2
- Inconel® 600, 625 and 690
- Nickel 200 and Monel® 400 (70Ni - 30Cu)
- Titanium
- Alloy 20

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Precise manufacturing - Meet the optimum filtration performance by controlling characteristics

Looking for the perfect upgrade of your liquid application? Altering shape, porosity, construction material, and other factors, complete functional control over a wide range of properties is provided to meet the optimum performance.

Overview of precision sintered porous metal filter elements

1. Primary design considerations

All porous products, whatever the material of construction, have specific properties which must be taken into account in design and manufacturing processes.

In order to select the best media for any application, one should be able to provide Bekaert with the following information:

- **Primary application considerations**
  - Desired particle retention
  - Process temperature
  - Pressure drop
  - System pressure
  - Flow rate
  - Corrosive effects, if any
  - Cleanliness requirements
  - Operating fluid - type, density, viscosity

- **Primary media considerations**
  - In some cases, the best choice of media is known for the application. Standard products are designated by shape and media grade, but other characteristics may be altered to “fine tune” product performance:
    - Mean pore size
    - Pore size distribution
    - Density

Our porous metal filter elements are manufactured in a broad range of materials and sizes, and with a selection of fittings, so they can be easily specified with the characteristics and configurations customers require. Custom features can be incorporated or completely original designs can be created for specific needs.

2. Construction features

Porous metal filter elements are manufactured in a wide variety of configurations including open-end, closed-end, and with welded hardware and fittings. Standard products can be configured to customize a design to meet specific process needs.

Some applications

- Catalyst recovery in chemical and petrochemical processes
- Polishing in food & beverages (syrups, liquors)
- Catalyst removal from flavour ingredients and other food specialties
- Steam filtration in pharmaceutical and food & beverage processes
- …
HyPulse®: high performance, high strength filtration of liquids

HyPulse® filter systems are completely tuned in on your specific filtration process and enable you to reduce an entire train of process filtration steps to one single stage.

From lab development to design and construction

Laboratory and on-site evaluations provide a sound base for filter design. Our mobile filter systems and on-site testing assistance make it possible to analyze your needs on the spot, in order to configure our solution to your application.

Product range

Porous metal powder filter elements are offered with the widest selection of filter media, ranging from standard 316L stainless steel to corrosion resistant nickel and Hastelloy®.

Advantages

**Easy cleaning**

Porous metal filters are easily freed of particulate by using backwash cleaning methods without scraping, scrubbing, or rotating filter elements. Contaminants may also be removed with water, steam, air, solvents, caustic or acid washing, or with ultrasonic cleaning.

**Completely enclosed**

Backwashing filter elements reduce operator exposure to hazardous chemicals.

**High temperature and corrosion resistance**

Sintered metal elements are resistant to high temperatures and/or corrosive environments, making them suitable for a wide range of applications.

**Uniform, high-precision porosity**

Controlled pore size and pore distribution to create filtration media with distinct porosity characteristics.

**Waste minimization**

Cleanable filter elements eliminate incineration or landfill costs associated with disposable filters.

**High-strength filter elements**

Sintering bonds filter media together at the molecular level, resulting in high mechanical resistance in compression and stress.

**Reduced spare parts expense**

Porous metal filter elements seldom need replacing.

**Minimal maintenance**

Porous metal filters have no moving parts, resulting in simpler and less frequent maintenance procedures.

* HyPulse® is a registered trademark of Mott Corporation
Discover the possibilities of HyPulse® filter systems

HyPulse® filter systems can be designed to handle high flow rates in continuous operations typical in refinery applications. Hot hydrocarbon streams such as FCCU slurry oil often require removal of catalysts and other particulate. This not only improve the oil product, it also improves downstream operating equipment by preventing fouling and reducing maintenance.

Target in refinery

A key goal for removing the catalyst particulate is the upgrading of product fuel oils to provide feedstock for production of carbon black, needle coke, hydrotreater, coker feed, bunker oil amongst others. Removing the catalyst fines also reduces the wear of downstream components due to the abrasive nature of the particles, prevents settling and sludge formation in slurry oil storage tanks in addition to concerns over the hazardous waste classification of catalyst-containing tank sediments.

Typical filtration system & backwash operation

Filtration is operated through a HyPulse® LSI filter system consisting of two filter vessels, a backwash receiver, and a gas stabilizer tank, with supporting piping, valves, and instrumentation. The filter vessels each contain cylindrical porous metal filter elements that are open at the bottom and closed at the top. The filter elements are 2” diameter and length 70-80”, 0.5 micron grade, AISI 316L porous metal media. These removable filter elements are threaded into the filter vessel tube sheet. The filter system is designed for continuous operation with both filters on-line except when one filter is off-line for backwash. The backwash receiver provides surge volume to contain backwashes and is sized to hold 2 backwashes.

After the filtration phase, filter backwash is initiated by interrupting the feed stream and isolating the filter vessel. The filtrate in the vessel shell may be displaced with an alternate backwash fluid, typically cycle oil. The filter vessel is then pressurized with nitrogen or refinery gas from the stabilizer tank to reach the backwash pressure. The bottom discharge valve is opened and the applied pressure drop and reverse flow through the filter elements dislodges the cake and the vessel drains to the backwash receiver. After the backwash is complete, the filter is ready to begin the next online cycle. The backwash slurry, which has 15-20% solids content, is pressured at a controlled low flow rate to the FCC riser, or may be sent to an asphalt plant, a low-grade coke plant, or a settling tank.
Typical process conditions & requirements

<table>
<thead>
<tr>
<th>Process Fluid:</th>
<th>FCC Slurry Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravity, API:</td>
<td>+1 to -1.0</td>
</tr>
<tr>
<td>Process Flow Rate:</td>
<td>Normal 10,000 bpd / design 15,000 bpd</td>
</tr>
<tr>
<td>Slurry Solids Concentration:</td>
<td>1,000 ppmw</td>
</tr>
<tr>
<td>Product Solids Concentration:</td>
<td>Not to exceed 50 ppmw</td>
</tr>
<tr>
<td>Operating Temperature:</td>
<td>up to 340°C</td>
</tr>
<tr>
<td>Operating / Design Pressure:</td>
<td>3.5-9.0 bar / up to 20 bar design</td>
</tr>
<tr>
<td>Minimum Cycle Time (Interval between Backwashes):</td>
<td>2 Hours</td>
</tr>
<tr>
<td>Filter Backflush Liquid:</td>
<td>Light Cycle Oil</td>
</tr>
<tr>
<td>Operation:</td>
<td>Continuous with maximum interchangeability between the filter vessels. Backwash solids to a receiver tank with LCO.</td>
</tr>
</tbody>
</table>

Other applications

- **Chemical and petrochemical filtration**
  - PTA/CTA
- **Specialty chemical filtration**
  - Activated carbon, H₂O₂, Raney Nickel catalyst recovery
- **Nuclear filtration**
  - Ion exchange resins
- **Food & beverage filtration**
  - Filter aids, process steam filtration, catalyst removal, polishing if syrups, liquors and other liquids
- **Pharmaceutical filtration**
  - Decolourisation, catalyst recovery

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Bekaert at your service

Would you like to know more about the possibilities of Bekaert’s porous metal filter elements and systems for the liquid process filtration? Don’t hesitate to contact your nearest Bekaert sales office or send an e-mail to bafinfo@bekaert.com

www.bekaert.com