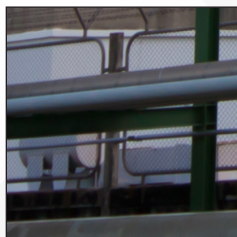
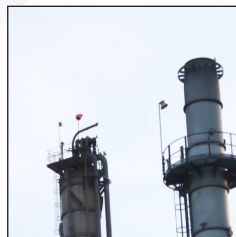
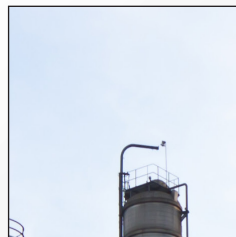
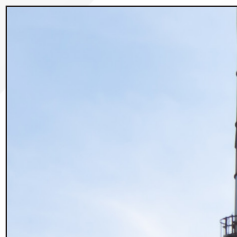


# High Temperature Gas Filtration

Metal Media Filtration Solutions for the  
Hot Gas and Gasification Industries



## Porvair Filtration Group and High Temperature Gas Filtration

**Porvair Filtration Group** is an international leader in the development and supply of materials and products for applications in filtration and separation.

**Porvair** manufacture in the UK, USA and India and have an extensive network of sales offices and distribution channels throughout the world. Our expertise is wide and varied, with products used in markets such as:

- Aerospace and Defence
- Food and Beverage
- Gasification
- Life Sciences and Scientific
- Microelectronics
- Nuclear
- Pharmaceutical
- Porous Media and OEM Materials
- Printing
- Process
- Transportation
- Water

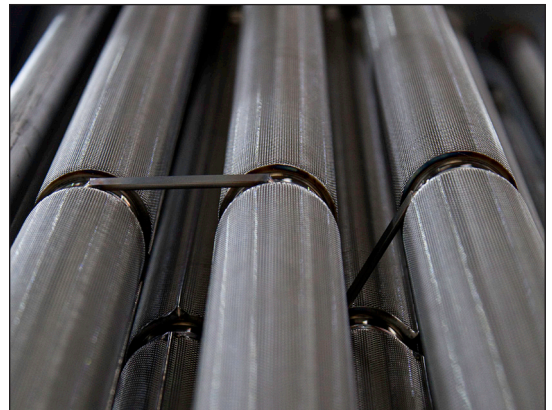
Our ongoing success is based on a dedication to technical excellence and superior customer service. Our future will be built on our investment in research and development to provide innovative new products that exceed the expectations of our customers in solving the challenges that they face.

For over 30 years, **Porvair** have provided high temperature gas filtration solutions in a wide range of industrial applications. These applications are typically in the chemical, petrochemical and power generation industries, where the filtration of high temperature gas is paramount in the protection of downstream equipment from contamination or achieving environmental regulations.

**Porvair Filtration Group** manufacture a range of metal media filtration solutions, which perform consistently under a broad range of pressure and temperature conditions.

Our filters also provide the following benefits:

- high permeability assisting process flow and blowback operations
- integral strength at high temperature
- thermally resistant with transient temperature conditions
- corrosion resistant with alloy options
- minimal downtime in service due to inherent cleanability
- minimal operator handling through on-site cleaning
- consistent filtration performance with transient conditions
- longer operational life.



## Catalyst Recovery

**Porvair** design and develop specific catalyst filter cartridges and systems to provide high efficiency pulsejet blowdown units. These units use Sinterflo® F sintered metal fibre filter cartridges that have a large filter area enabling them to accept high transient solids loads.

## Photovoltaic Cell Production

**Porvair** supply high-integrity Sinterflo® P sintered metal powder filter elements for the removal of dust particles created during the manufacture of silicon wafers for photovoltaic cells, which face operating temperatures of 1,400°C (2552°F). These filter elements can be cleaned in-situ through pulsejet operation.

## Tyre Pyrolysis

**Porvair** supply high-efficiency Sinterflo® F sintered metal fibre filter elements in an iron, chrome and aluminium speciality alloy that is specifically prepared for the high temperature duty involved during pyrolysis, which is performed at near off-gas temperatures up to 1,000°C (1,832°F).

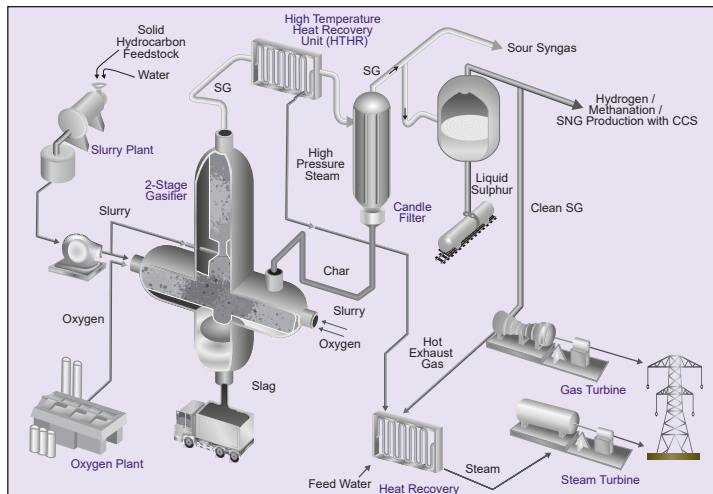
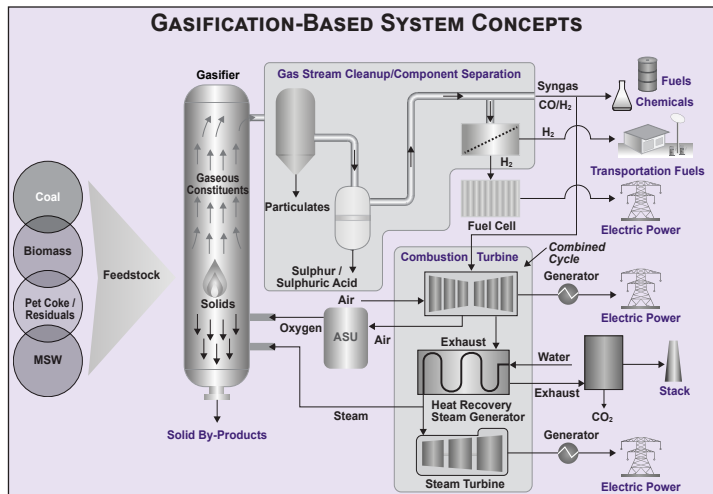
## Calcining

Sinterflo® F sintered metal fibre filter elements can be used during calcining due to their inherent high permeability whilst also providing the required level of filtration efficiency.

## Chemical Production

**Porvair** supply high performance pulsejet blowdown systems with high efficiency robust filters suitable for chemical production, such as Sinterflo® P sintered metal powder and Sinterflo® M sintered metal mesh composite. These operate in:

- high temperatures
- low pressure and/or corrosive environments
- high pressure environments with highly cohesive solids where the solids challenge may be high.



## Gasification

Our experience with the design and manufacture of the filter equipment for gasification dates back to the middle of the 1990's and has continued on with filter element design, pulsejet cleaning delivery design, pulsejet valve selection and inlet flow distribution and control.

**Porvair Filtration Group** has proven expertise in the filtration systems that operate with IGCC (Integrated Gasification Combined Cycle) gasification of coal and petroleum coke. We also design and manufacture equipment for processes such as PFBC (Pressurized Fluidized Bed Combustion), biomass and pelletised MSW (Municipal Solid Waste).

**Porvair** design and manufacture char filter packages to retain the highly abrasive and corrosive char produced during the process, in order to prevent downstream contamination that would lead to the inevitable failure of critical components.

The main constituents of a char filtration system within an IGCC plant are filter elements, inlet flow distribution, pulsejet cleaning and pulsejet valves.

### Experience

As testament to our capability in this field, **Porvair** has been selected by various power generation and refinery operations using gasification technologies such as E-Gas, including one of the largest gasification installations at one of the largest refineries in the world.



### Filter Elements

The primary equipment in our char filter package is the filter elements. Their performance has a significant impact on the efficacy and through-life cost of a gasification plant. Our design optimises:

- strength
- permeability
- filtration efficiency to enable the removal of the char from the syngas and provide the downstream protection.

**Porvair** have developed patented technology to change the chemical and physical properties of the filtration media to resist the effects of the operating environment and maximise the lifetime of the filters. The filter elements are subjected to a constant and regular reverse pressure condition as the pulse removes the developed filter cake of char.

### Inlet Flow Distribution

The control of the incoming char contaminated syngas is equally important in ensuring the good operation of the char filter. **Porvair** design the distribution system to ensure that the gas and char is evenly distributed within the char filter vessel.

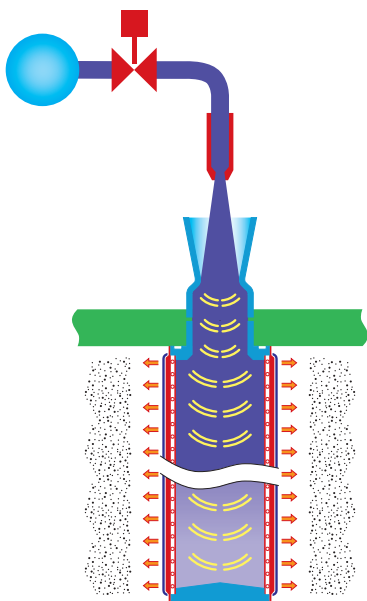


## Pulsejet Cleaning

Critical to the on-going operation of the filter elements is the efficacy of the pulsejet blowdown cleaning system. **Porvair** has consistently promoted the use of the pulsejet blowdown cleaning systems in all high temperature applications as the most effective *in-situ* online cleaning system.

The filter media, as a permeable barrier or partition, provides the surface upon which a permeable filter cake develops. This filter cake increases in thickness with time and provides an increased filtration efficiency whilst also increasing the differential pressure. The differential pressure; which is a function of the selected media, the cake thickness, particle size distribution and compressibility; can be monitored and used to control the application of the pulsejet cleaning system. The pulsejet system provides a highly directed sonic pulse of clean process gas into the filter elements providing the expanding pressure front to fluidise and release the filter cake. The agglomerated contaminant settles within the vessel and is available for removal.

Pulsejet gas is generally clean process gas, but carbon dioxide, nitrogen, air, argon and superheated steam can also be considered depending upon acceptability to the process, availability and suitability as regards the pulsejet requirements.



## Pulsejet Valves

The delivery of the pulsejet gas is provided via the action of a pulsejet valve. The pulsejet valve operates reliably over hundreds of thousands of sub-second cycles under conditions of high pressure and high temperature. The valves are high speed actuation metal seated trunnion-mounted ball valves which have a cycle time between 0.25 and 0.85 seconds. The operation of the valve causes a high velocity (sonic) pulse to be initiated that is delivered through the pulsejet pipework to the primary nozzle.

**Porvair** will identify suitable valve types and manufacturers for pulsejet operations using manufacturers with a proven capability. The pulsejet valve is a critical part of ensuring effective operation of the char filtration system



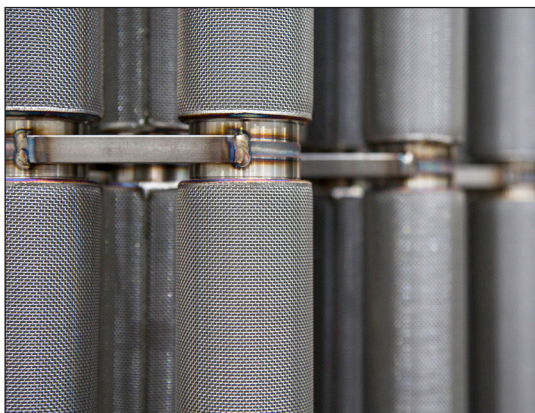
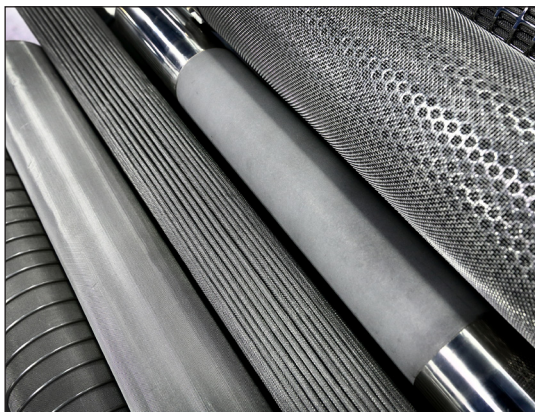
## Filter Elements

**Porvair** metallic filter elements and pleated high area cartridges have been in use in high temperature gas filtration for over three decades in various types of construction.

The range of media includes Sinterflo® F sintered metal fibre, Sinterflo® P sintered metal powder, Sinterflo® M sintered metal mesh and Sinterflo® MC sintered metal mesh composite. These medias are offered in cylindrical, pleated and disc forms.

The filter elements and cartridges are assembled onto tubeplates by various types of removable locking systems or by direct welding onto the tubeplate enabling the tubeplates to be removed as required.

The cylindrical filter elements are manufactured in both single elements format as well as constructed into a TEF (Triple Element Filter) format and braced in groups of three, which ensures good packing efficiency and spacing between them. In all cases the filter media is produced to provide a surface capture orientated media structure to maximise solids capture on the surface and not in the matrix.

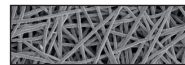


## Media and Materials

The demands of the various industries require a broad base of alloys to be available to provide duty compatible materials. Starting at 304(L) and 316(L) grade stainless steel, **Porvair** also provide alloys such as 310 grade stainless steel, Monel® (400), Hastelloy® (C22, C276 and X), Alloy 59, Inconel® (600, 601, 625 and 800), various FeCrAl based alloys and FeCrAlloy® A. This provides for a material base that encompasses temperatures up to 900°C (1652°F), as well as some instances of up to 1000°C (1832°F), and gas species from reducing to oxidising atmospheres as well as sulphidising atmospheres at reduced temperatures.

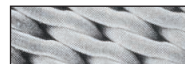
Using **Porvair** Sinterguard® surface treatment technology, Porvair can also modify standard materials, adapting properties to suit a broad range of extreme process conditions.

**Porvair** manufacture a range of metallic filtration media including:



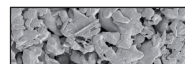
### Sinterflo® F Sintered Metal Fibre

- High permeability for forward flow and reverse flow cleaning.
- Excellent cleanability, particularly in pulsed jet operation.
- Pleatable, offering a higher filtration area per element.
- Efficiency performance up to HEPA level (99.97% @ 0.3µm) with standard materials.



### Sinterflo® M Sintered Metal Mesh

- Available in a wide range of mesh sizes and separation ratings.
- Offers precise aperture sizing.
- Smooth surface structure for ease of filter cake release.
- Sintered, composite mesh structures that combine high strength with filtration performance.



### Sinterflo® P Sintered Metal Powder

- Isostatically pressed cylinders.
- High strength robust structure.
- Smooth surface versions available.
- Broad material availability.

## Porvair Sinterguard® Surface Modifications

**Porvair** has developed surface modification techniques through a patented CVD process to significantly enhance the corrosion resistance in harsh operating conditions.

We have also developed patented technology, **Porvair Sinterguard®**, to modify the surface chemistry and physical properties of our metallic filter media to improve its performance in the harshest extremes of temperature, pressure and corrosive environments. This proven technology improves filter lifetime and reduces overall life cycle costs of operation.

### Porvair Sinterguard® PHC

Extends the life of 316L Stainless Steel in highly corrosive liquid / chemical environments. The **Porvair Sinterguard® PHC** surface treatment is ultra-effective in inhibiting the attack of corrosive liquids either acidic or basic. The stability of AIS 316L is enhanced for many acidic applications including Hydrochloric acid (HCl) and Nitric acid (HNO<sub>3</sub>) and in particular, applications where sulphuric acid (H<sub>2</sub>SO<sub>4</sub>) is present.

### Porvair Sinterguard® HTR

Extends the service life of 316L Stainless Steel at elevated temperatures. The **Porvair Sinterguard® HTR** treatment has the added ability to extend the operating conditions of the filter elements and cartridges in high temperature gaseous duties. In particular duties where sulphur (H<sub>2</sub>S, COS) and/or chlorine (HCl) is present the surface modification has been highly effective in providing a barrier resistance to the effect upon various base metals (316 stainless steel, Hastelloy®, Inconel® and various Iron/Chrome/ Alumina alloys).

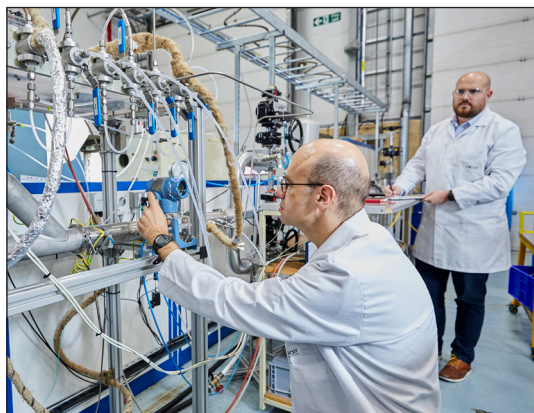
## Product Innovation, Manufacturing, Testing and Quality

**Porvair Filtration Group** has a policy of continuous improvement in all areas of its business. Listening to the customers' present and future requirements is a vital part of our operations and a key part of driving change.

We understand that product development involves building multidiscipline teams, not only within the company, but often in partnership with our customers, improving project efficiency and ensuring complete customer satisfaction. This continuous development of products and materials is vital, to enable us to offer new and better solutions to applications.

We have a dedicated team of scientists, engineers, production and quality professionals working towards the best possible filtration solutions for our customers. We have a fully equipped test house and laboratory, and our experienced design engineers use the latest modelling technologies to give full structural assurance capability.

Quality is at the heart of every stage of our operation and a fundamental part of our culture. We are ISO9001 approved at all of our manufacturing facilities and hold many other accreditations for the various industries we serve.





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