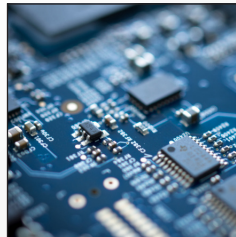


World Class Filtration Solutions

Materials and products for applications
in filtration and separation



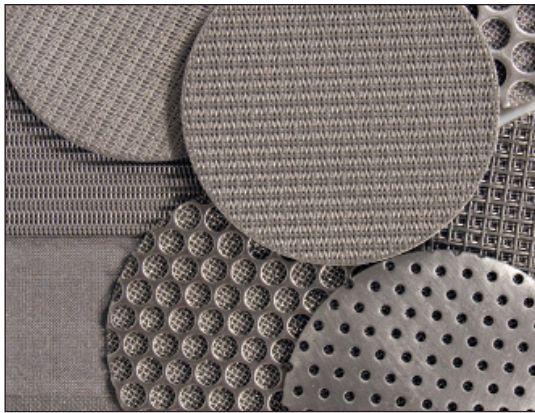
The Company

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

Porvair manufactures in the UK and USA and has 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
- Microelectronics
- Nuclear
- Pharmaceutical
- Printing
- Process
- OEM
- Oil, Gas, Petrochemical

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



Porvair designs, engineers and manufactures for a wide range of customers within a range of sectors.

Our capability to provide products from a single, specialised, retrofit element to complete fabrications, packages and vessels, is complimented with on-site support and a complete after-sales service.

In addition to our acknowledged leadership in engineering and quality, we have extensive laboratory, development and testing facilities to meet international standards.

Porvair continues to research new materials for applications into filtration and separation. Examples are the development of metallic membranes or the use of specialist surface modification, to provide chemical or physical properties that are beneficial to the separation activity or the longevity of the filtration equipment.



Aerospace and Defence

Effective filtration within aircraft and military equipment is vital to ensure that all systems are free from contaminants. High performance is essential to meet and exceed expectations, guaranteeing safety, long service life, reliability and cost effectiveness in the most demanding of situations.

We design and manufacture specialist filtration components and assemblies to meet the exceptional technical challenges of aerospace and defence industries for contamination control in hydraulic, fuel, lubrication, bleed air and avionics and environmental control air systems.

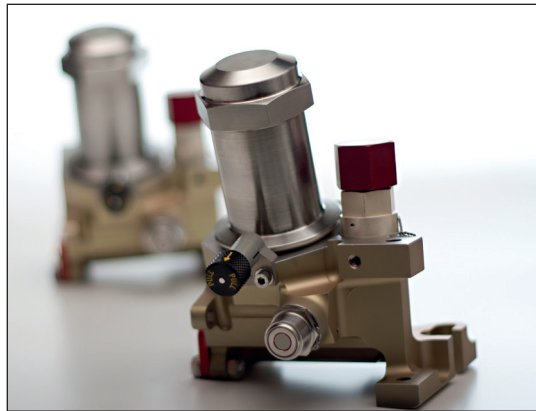
Our filters protect vital sub-systems in aircraft, helicopters, military vehicles, missiles and spacecraft including:

- primary and secondary flight controls
- fuel management
- fuel tank inerting
- power generation
- air intakes
- environment control
- potable water systems
- gearbox lubrication
- avionics and supplementary cooling.

Porvair has vast experience in development, design, certification and project management within the Aerospace industry.

Our key areas of expertise include:

- supply chain management of parts
- testing to industry specifications
- products including filter assemblies, non-return valves, pressure relief valves, and strainers
- innovative customer focused product development.



Food and Beverage

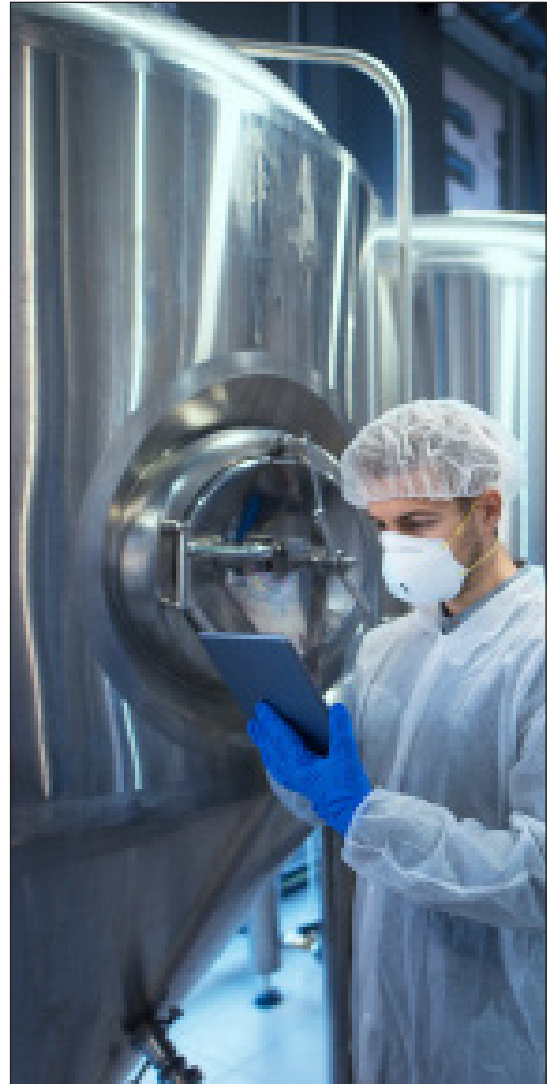
Filtration within food and beverage processing is a safe and economic method of removing impurities and extending the shelf life consumable products. High cleanliness standards and stringent contamination control is of the utmost importance to ensure the manufacture of superior quality produce, a significant reduction of waste and a minimum of product spoilage.

Porvair provides innovative filtration and separations solutions to this industry and prides itself in being able to offer high quality, cost effective filters for all stages of the purification or separation process.

Our range of filters are installed to effectively remove particulates, yeast, mould spores and bacteria for use in the following process applications:

- wineries
- breweries
- cider
- mineral water
- soft drinks
- food and dairy
- culinary steam sterilisation and sanitisation
- powder handling of milk powders, raw materials in bakeries and other food powders
- sparging to achieve efficient mass transfer of gas into liquid.

Our products are manufactured under strict quality process controls and are fully validated and technically supported by our qualified scientists and laboratory services. Our polymeric filter cartridges, manufactured from FDA-approved media under clean room conditions, include a wide range of end adaptors to enable easy retrofitting into new or existing competitor housings, and all membrane filter cartridges are 100% integrity tested during production.



Gasification

We have supplied a comprehensive range of filtration and separation products to the energy market since the 1980s. Our technology is used throughout a wide range of applications. These include, but are not limited to:

- clean coal technologies
- gasification
- alternative energy technologies.

Our unrivalled experience and extensive product range ensures we can supply a fully engineered tailored solution for every application.

We are also active in a number of areas concerning the generation and safeguarding of energy production, and is leading innovations in gasification technologies to enable the production of synthetic natural gas (syngas or biogas), as part of alternative clean energy techniques, minimising the cost of ownership and ensuring the availability of clean dry gas.

We are also using our expertise in filtration technology in a variety of alternative energy projects where our high performance media is a pre-requisite for emerging and developing technologies.



Microelectronics

Porvair manufactures a wide range of high purity porous media and reliable, high efficiency filtration products for both gas and liquid applications.

Gas Handling

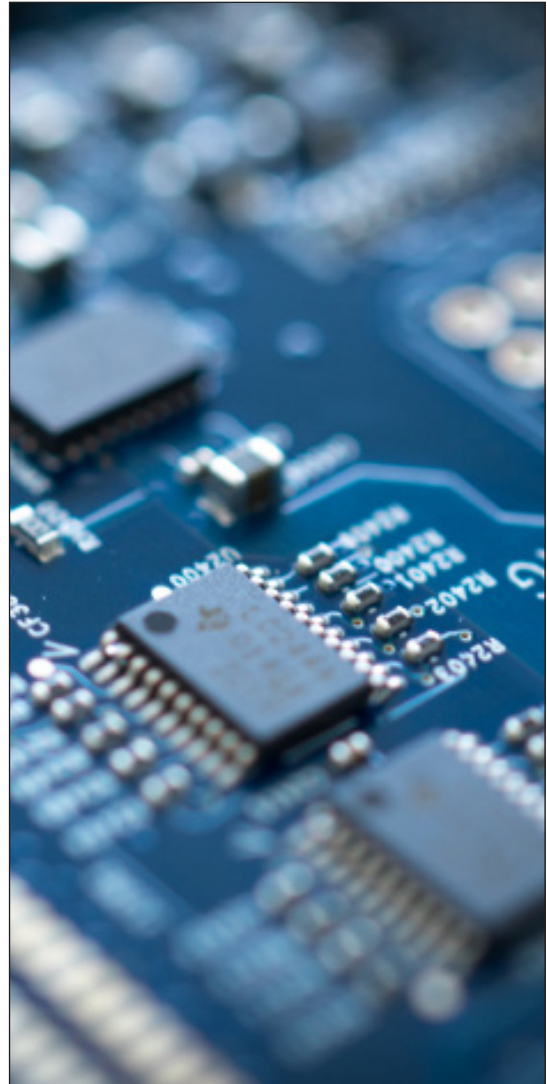
Our GasPro™ range of products ensure extreme cleanliness in critical semiconductor and microelectronics gas handling and delivery applications, including:

- gas safety management
- exhaust venting systems
- flow control
- yield enhancing particle reduction
- laminar flow diffusing
- pressure snubbing
- flame arresting.

High Purity Chemical Filtration

Our LiquiPro™ range focuses on the delivering improved performance, by reducing process defects to achieve an increased lifespan of the filter. The products are suitable for the following applications:

- CMP
- PVD copper plating
- Wet etch clean
- Photolitho
- Chemical delivery system
- General filtration
- Final cleaning and DI water filtration
- Plating, etching, stripper chemicals
- Chemicals of acid, bases and solvents (selected applications)
- Engineering or equipment companies requiring cartridge housings.



Porvair Filtration Group has been supplying high quality custom-engineered filtration solutions to the nuclear industries within Europe, the USA and the UK since the 1980s. Working across the field, designing and supplying filtration and other equipment, we offer solutions to the following sectors:

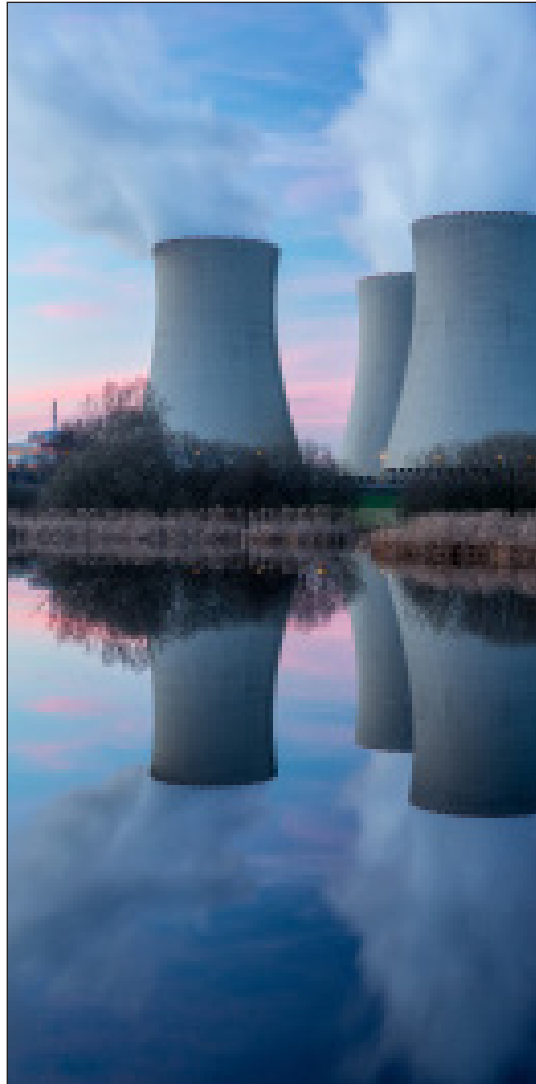
- power generation
- fuel production reprocessing
- decontamination and decommissioning
- waste packaging.

We have the capability to design and supply everything from a single, specialised, retrofit element to a complete, packaged system to meet the precise needs of a complex application, together with on-site support and a complete after sales service.

Porvair Filtration Group offers both the engineering competence and quality infrastructure to meet the challenges of the nuclear industry and produce solutions to ensure the efficiency and safety of its processes, using a range of technologies, products and techniques.

These include:

- filtered containment venting systems
- Iodine traps/absorbers
- pulsed jet self-cleaning air and gas filtration systems
- HEPA pre-filtration systems
- Caesium capture protection
- waste package filter vent/breathers designed to meet filtration efficiency, hydrogen diffusion and pressure differential requirements
- demisters to take aerosols out of gas and air streams.



Pharmaceutical

Filtration and separation processes in the pharmaceutical industry are critical, not only to ensure products are adequately purified and fit for consumption, but also to optimise process economics and prevent loss of valuable product.

The manufacturing of our high performance cost effective products is underpinned by our quality assurance programme, cGMP practices and clean room environment to ensure products meet the stringent requirements of the pharmaceutical, generics and veterinary medicines industry. Applications for these products include sterile filtration for LVP and IV's, sterile air for fermenter feeds, sterile vent filters, solvent extraction, veterinary products, ophthalmic solutions, sterile growth media and sera products.

Our polymeric cartridge filters are constructed from FDA-approved materials carrying the CFR 21 number for biological safety and materials of construction meet USP Class VI-121°C plastics. Designed and manufactured for robustness, our sterilising grade polymeric filters are fully validated providing retention of $>10^7$ colony forming units per square centimetre of effective filtration area as stipulated by PDA Technical Reports 26 and 40.

The **Porvair** range of metal cartridge filters, cartridge housings and filtration systems are manufactured from 316L stainless steel and other alloys and can be surface treated to meet the exacting requirements of the pharmaceutical industry. Coded vessels are supplied to BS5500, ASME VIII U-Stamp and other standards as required.



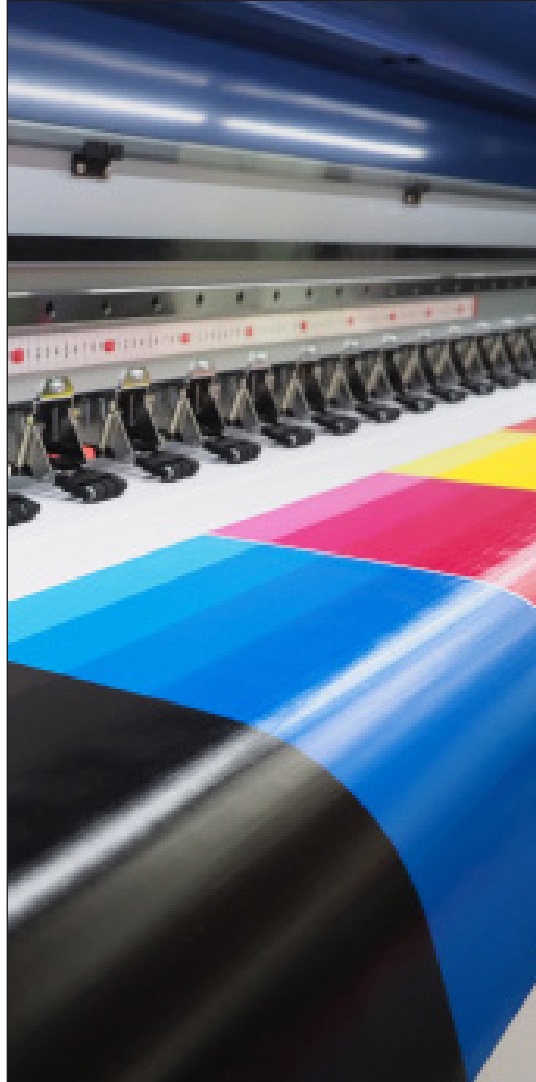
Printing

Porvair's experience in inkjet filtration and separation technology, ensures that we design, develop and manufacture filtration solutions to suit every application. Our filter media is compatible with all commonly used solvents and chemicals and is designed to provide consistent batch to batch ink quality, long run periods between purge cycles and minimum hold-up volume to reduce wastage and product loss during change out.

Our product range includes:

- last chance filters (LCF)
- inline filters
- capsule filters
- customised OEM products.

Our manufacturing capabilities include plastic injection moulding and mould tool design, enabling us to offer full over moulding practices using the highest grades of engineering materials. Additionally we offer a full assembly service with a wide range of skills including electronics and testing of complete fluid management systems.



Process

The process industry demands filters that withstand the most extreme and aggressive conditions of temperature, pressure and corrosion, whilst safeguarding operators and systems from particulates and ensuring environmental protection. Each filtration and separation requirement presents its own critical challenges and requires superior reliability, durability and a robust product construction.

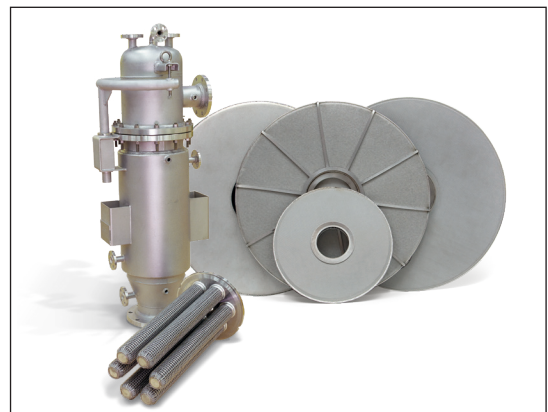
Porvair supplies the process industry with innovative and performance driven filtration equipment (elements, cartridges and vessels). We provide highly specialised filtration solutions for use throughout the manufacturing process and we have proven filtration solutions for the following applications:

- chemical processing
- petroleum refining and petrochemical production
- catalyst recovery
- polymer melt
- toiletries and cosmetics
- powder fluidisation, mixing and solids handling
- adhesives
- coatings and paints
- steam
- water treatment.

The foundation of our products is the filter media itself; we offer a range of media to fulfil the most demanding duties.

Our metallic and polymeric filter media are in both cartridge and element forms, with a variety of hardware to suit any housing or vessel configuration.

Available for OEM producers and as fabricated products designed to meet your needs, our advanced welding and assembly capability, supported by a high quality ethos, ensures total customer satisfaction.



Porvair Filtration Group is a major manufacturer and developer of porous materials, offering bespoke solutions in a wide range of applications.

Whether used in finished products or supplied for OEM manufacture, our materials span industries as diverse as aerospace, chemical processing, pharmaceuticals and inkjet.

Our extensive range of polymeric and metallic materials allows us to select the fit-for-purpose option gained through understanding the customer's requirements and our in-depth knowledge of the material's properties.

OEM Partnering

Porvair Filtration Group offers OEM partnering and manufacturing capabilities combining material science and engineering know-how. Using state-of-the-art design systems and in-house manufacturing, OEM requirements are project-managed for delivery on time and within budget.

Applications for these materials include:

- analytical instrument filters
- chromatography frits and filters
- flow restrictors
- flame arrestors
- spargers
- sampling filters
- engineered products



Core Materials

- **Sinterflo® sintered porous metal materials**

Mainly sintered porous stainless steel and bronze materials, sintered metal fibre and multilayer stainless steel meshes. Available for OEM producers or as fabricated products designed to meet project requirements.

- **Vyon® sintered porous plastic materials**

Mainly sintered porous polyethylene and polypropylene materials. Produced in both sintered porous polyethylene and polypropylene, materials are available in roll, sheet, cut shapes and moulded formats. The materials can also be fabricated into cylinders, cones and other three-dimensional shapes.

Core Competencies

- **Material selection and manufacturing**

Our experience in separation and filtration materials, fluid/gas dynamics and manufacturing ensures fit-for purpose materials and fabricated products.

- **Design and engineering**

Our strength in design, engineering and prototyping enables us to provide the optimum bespoke solution to any application.

- **Project management**

Our understanding of your regulatory requirements, deliverables and timescales means your product will meet market demand, placing you ahead of the competition.

- **Quality and reliability**

Our high expectation for quality, coupled with our commitment to continuous improvement, ensures that our raw materials are carefully selected and our manufacturing processes are optimally controlled to cGMP standards.



Oil, Gas and Petrochemical

Royal Dahlman is a major supplier of tailor-made industrial filtration solutions and services to the Oil, Gas and Petrochemical markets.

Royal Dahlman is recommended by leading licensors worldwide for the supply of basic engineering packages including delivery of critical, proprietary internals, up to fully dressed filtration skids.

Dahlman Filter Services

Dahlman Filter Services is an independent manufacturer and distributor of filter replacement parts and metal filter elements for a variety of industries. We offer Key Supply services; filtration supply chain optimization resulting in reduced stock, improved availability and total cost reduction.

Main filtration services:

- Technical filtration consultancy
- Filtration spare parts and equipment
- Key supply frame agreements
- Maintenance and cleaning services
- After sales services

Dahlman Filter Technology

Dahlman Filter Technology provides advanced filtration systems and packages in accordance with the most demanding requirements and specifications, adding value to critical processes.

Proprietary key filtration technologies:

- Process gas / off-gas filtration and scrubbing
- Process liquid filtration



Process Gas / Off-gas Filtration

- **Fluidized Catalytic Cracking**
Catalyst fines from flue gas / vent gas.
- **Polyolefin Production**
PE/PP solids and catalyst from gas
- **Speciality Chemicals**
Solids from process gas
- **Starch Production**
(Sticky) solids from process gas

Process Liquid Filtration

- **Fluidized Catalytic Cracking**
Catalytic fines from slurry oil
- **Gas Treating**
FeS & solids from amines and glycols
- **Rubber and Plastic Production**
Solids & impurities from process streams
- **Hydrocarbon processing**
Solids from hydrocarbon process streams

For further details, please contact a member of the team:

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Porvair has a policy of continuous improvement in all areas of our business. Listening to our customers' present and future requirements is a vital part of our operations and a key part of driving change. We have a fully equipped test house and laboratory and a dedicated team of scientists, engineers, production and quality professionals working towards the best possible filtration solutions for our customers.

Quality

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

Our policy is to provide products and services that consistently satisfy the commitments made to our customers by complying with their requirements, working together as a team and by achieving continual improvement in our skills, systems, processes and performance.

We have a dedicated team of quality professionals with many years 'experience in definition, implementation and maintenance of quality management systems meeting multiple industry requirements. This extends across the workforce through a strong quality culture and a philosophy of 'getting it right first time', driven from the top of the organisation. Our quality management systems are regularly audited internally and by customers and regulatory bodies.



Research and Development

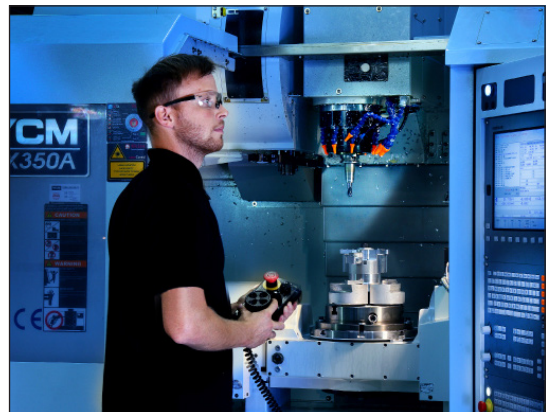
Development plays a fundamental part in our operations and we have developed a number of custom designed products based on our established porous polymeric materials (Vyon®) and sintered metal media (Sinterflo®), as well as developing a range of filters for fuel tank inerting applications.

Although we operate across many filtration and separation markets there is significant interaction between each division in terms of product research and development. Our new product development team is drawn from scientists and engineers from across all divisions, encouraging new ideas and new solutions. The success of this approach has been in the interaction of chemists and engineers working together to find practical solutions to some extremely complex scientific challenges identified in specific market areas.

Manufacturing

We produce filters and filtration systems, and a range of porous materials, at production sites within the UK, USA and China. We manufacture for a wide range of industrial and pharmaceutical applications, as well as supplying filtration solutions for extreme conditions of temperature, pressure and corrosion for the aerospace and nuclear markets.

Our production capabilities include complete element or cartridge construction, and build of entire tubeplate and vessel assemblies. We boast specialist fabrication skills and techniques in all of our manufacturing sites around the world as well as extensive ISO cleanroom facilities.



Engineering

From initial concept design through manufacture and validation to in-service support, our highly experienced team of dedicated engineers work to develop the optimal filtration solution. Our team utilises the latest engineering tools of 3D AutoCAD®, Finite Element Stress Analysis, Computational Fluid Dynamics (CFD) and bespoke pressure vessel design software (PD5500, ASME VIII, EN13445). This is combined with our knowledge and strong ethos of working closely with our customers, ensuring filtration solutions that meet customers requirements.

Testing and Laboratory

Our dedicated test, development and laboratory services underpin our design and development activity; from filtration media and material characterisation, product verification testing to customer systems simulation trials and in service performance evaluation. Our capabilities include filtration characterisation, environmental testing and analysis.

Technical Support Services

- **Validation services:**
 - Process specific validation
 - Filter compatibility
 - Retention studies
 - Microbial challenge tests
 - Endotoxin and particulate testing
 - Extractables testing
- **On-site services:**
 - Customer plant surveys
 - Process filter optimisation
 - Trouble-shooting
 - Pre-inspection review
- **Training:**
 - Integrity testing
 - SIP and CIP methods





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