



Bespoke Porous Plastic Solutions



Introduction



Porvair Sciences are global leaders in the design, development and manufacture of cutting-edge porous plastics technologies. Specialising in filtration and separation of materials for biotechnology, pharmaceutical and life science industries, we deliver bespoke design and engineering expertise for a wide range of products and applications. From our UK headquarters, we work closely with our global network of customers to provide custom OEM solutions and build strong, long-lasting partnerships.

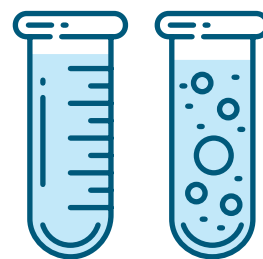
Markets We Serve



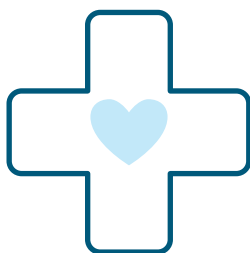
Laboratory



Drug Delivery



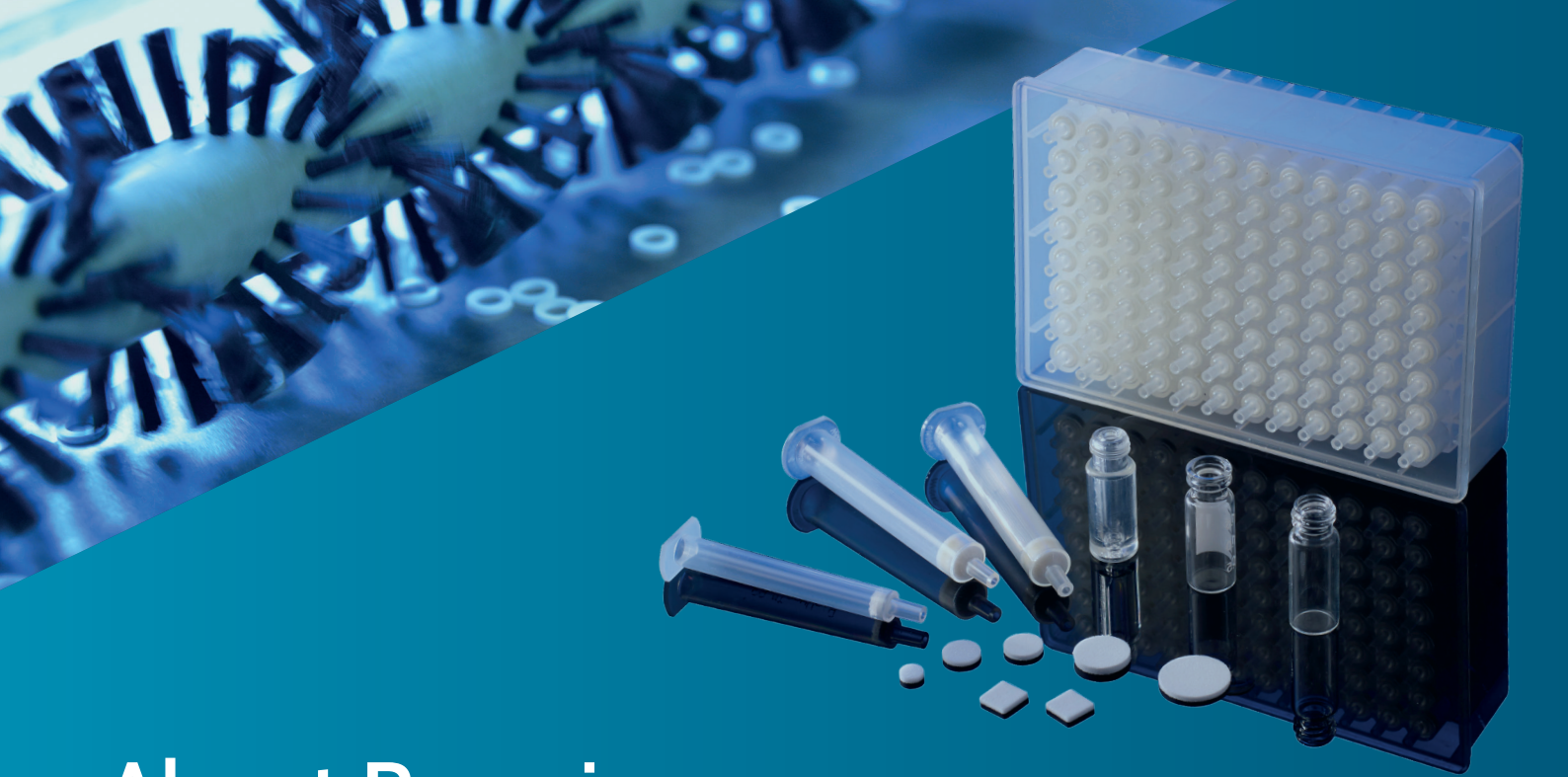
Chromatography



Medical and Healthcare



Industrial



About Porvair

Leading Manufacturers of Porous Plastic Materials

With patents dating back to the 1950's, Porvair Sciences continues to pioneer excellence in manufacturing and product development by evolving, adapting and responding to changes in technologies, markets and most importantly, customer needs. Empowered by 70 years of industrial experience, we strive to deliver world class, high performing products while providing superior customer service, every step of the way. Our diverse team of scientists, engineers and creative thinkers are committed to providing expert solutions that brings value and integrity to our customers.

From devices for laboratory liquid handling and sample cleanup to systems for medical diagnostics and drug delivery applications, our patented materials can be found at the heart of a wide range of innovative technologies.



- 1957** Vyon® porous plastic technology first developed by Porous Plastics Ltd., Dagenham. First patents using Vyon® filed globally.
- 1970's** Porvair PLC acquires Porous Plastic Ltd. Vyon® manufacturing relocates to King's Lynn, Norfolk.
- 1993** Vyon® manufacturing moved to current Wrexham site to be manufactured by Porvair Technology Division.
- 2013** Porvair Technology rebranded to be part of Porvair Filtration Group.
- 2018** Vyon® business incorporated into Porvair Sciences.

Introducing Vyon®

Porous Plastics

Vyon® Porous Plastics

Vyon® is manufactured from virgin grade plastic polymers, polyethylene (high density and ultra-high molecular weight), polypropylene and polytetrafluoroethylene.

Proprietary sintering conditions produce porous structures composed of tortuous interconnected pathways with minimal dead-end pores. These features offer highly controlled pore distribution, controlled flow of liquids and gases and the ability to create products ideal for filtration, separation and retention of biological and chemical materials.

From flat discs to 3D moulded structures, Vyon® is routinely manufactured into various shapes (e.g. square, round) and sizes to suit specific applications. Tightly controlled manufacturing processes ensure that materials are produced with consistently reproducible and controlled critical properties such as thickness, diameter and porosity.

Key Vyon® Characteristics

Pore Size

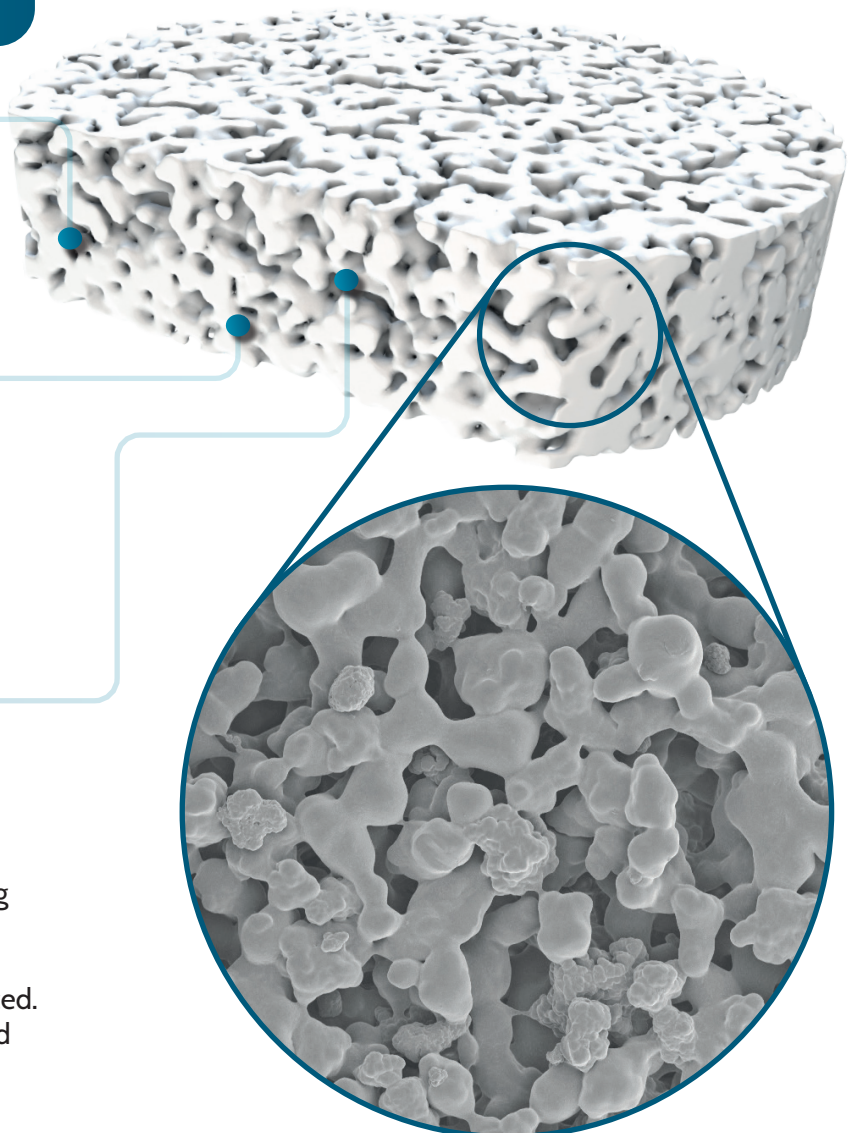
The size and distribution of open pores within the porous structure of Vyon® are essential characteristics influencing filtration efficiency of liquids and gases through the material.

Porosity

This is a measure of pore or void space within the porous material. Vyon® has a wide range of porosity ranging from 25% - 65% offering a suitable solution for a variety of applications such as diffusion and filtration. The porosity will have an influence on the permeability, liquid flow and the strength of sintered Vyon®.

Permeability

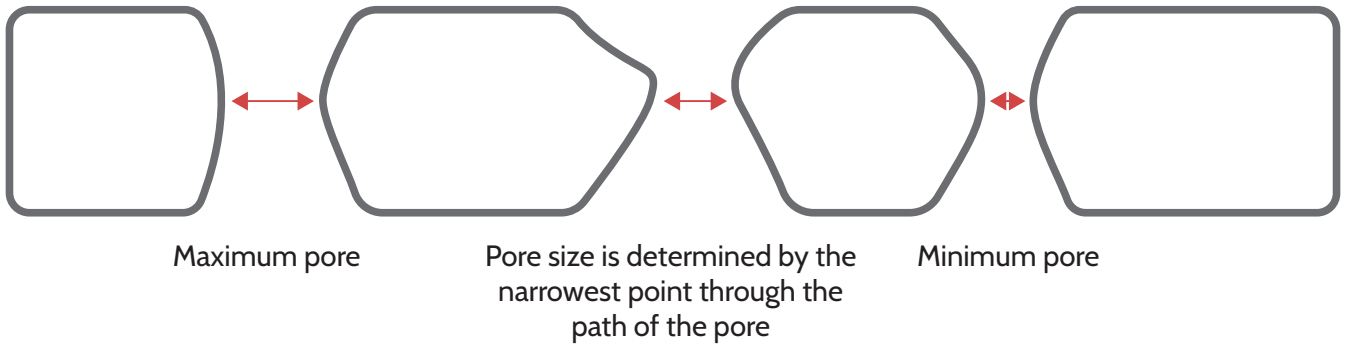
Permeability is the capacity of a medium to transmit fluids or gases through the porous structure. This is measured by flowing a gas of known viscosity through a porous sample of known dimensions at a set rate, and measuring the pressure drop across the porous material, or by setting the gas to flow at a set pressure difference and measuring the flow rate produced. The permeability will influence both the air and liquid flow rate characteristics of Vyon®.



How Are Pores Measured?

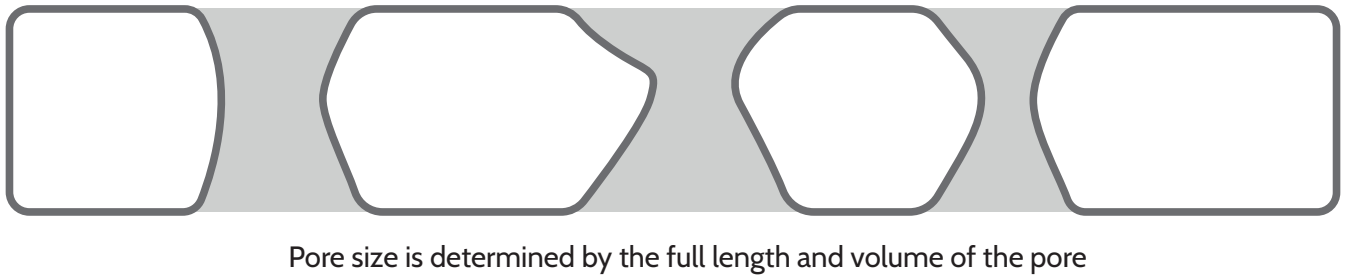
Pore size measurement by Porometry

Pores are filled with fluorocarbon and then expelled using compressed air. The flow measured during this process determines the pore size distribution. The pore size using this method is determined by the narrowest point through the pore.



Pore size measured by Mercury Intrusion Porosimetry (MIP)

MIP is a powerful measurement tool used to evaluate pore size, porosity and the surface area of Vyon[®] porous plastics. A pressurised chamber is used to force mercury into a sample of Vyon[®]. Mercury intrudes and permeates through empty spaces (voids) filling the largest pores first.



The ability to tightly control these key properties enhances the performance of filtration, fluidisation, diffusion, media support, venting, absorption, silencing and wicking solutions. See page 6 and 7 to learn more about our Vyon[®] solutions.



Filtration

Porvair Science's Vyon® and sintered porous plastic materials serve diverse filtration needs across various industries. These porous plastics excel in both liquid and gas filtration, providing effective solutions for medical, healthcare, and industrial applications. With their intricate paths, Vyon® and porous plastics offer outstanding depth filtration.



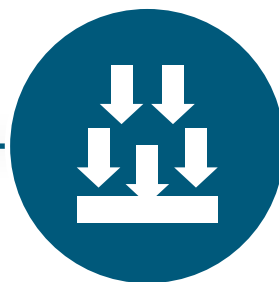
Silencing

The Vyon® silencer combines a sintered polyethylene body with a high-density polyethylene adapter. Its intricate structure forces air to expand through the porous material, reducing noise levels. When attached to an exhaust port, it reduces noise from around 90 decibels to 60-70 decibels, making it safer for extended exposure.



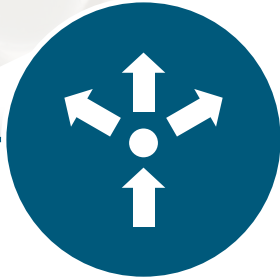
Venting

Our porous materials excel in venting applications, providing vital breathability to enclosed spaces. Key factors for efficient venting include strength, pore size, and airflow. These attributes, coupled with effective filtration capabilities, enable us to offer vents that also protect against microbial contamination. This makes Vyon® porous plastics especially well-suited for the pharmaceutical and medical sectors.



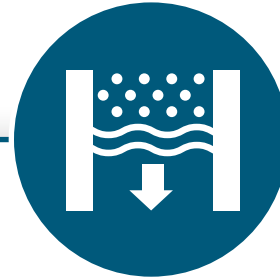
Absorption

Vyon® porous plastics are perfect for wicking and fluid transfer tasks, thanks to their uniform porosity. This porosity enables precise substance release, including chemicals, fragrances, and drugs. Furthermore, we can enhance material properties and performance through surface chemical modifications.



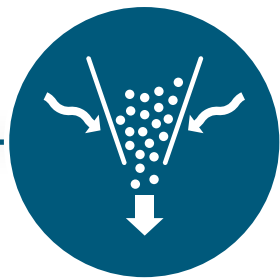
Diffusion

Vyon® porous plastics feature a tortuous design for even airflow distribution. We've perfected these materials by carefully managing pore size and maintaining uniform density. Applications range from medical inhalation devices to industrial water aeration and sparging. Our diffusion and sparging solutions are customized to meet precise end-use performance needs.



Media Support

Vyon® offers a rigid, self-supporting structure which will retain the required media without any breakthrough. Our bespoke design Vyon® and porous plastics are optimised with specific flow and pore size characteristics to meet industry requirements. Media support is a key application in many products, from chromatography SPE resins through to dialysis cartridges.



Fluidisation

Our Vyon® porous plastic excels in the powder handling industry, thanks to its uniform pore structure that promotes consistent airflow within hoppers and beds. Manufactured from FDA approved polymers, Vyon® is ideal for the use in the food and pharmaceutical industries. Vyon® is self-supporting, eliminating the need for external support structures found in traditional canvas and felt media.



Application

Initially solving industry needs in the consumer markets, porous plastics are ideal in topical applicators and other medical devices. With its rigid and self-supporting structure, Vyon® applicator materials can easily be incorporated into automated assembly and can withstand multiple application cycles within its lifespan.

Range of Vyon® Materials

Porous Plastics

Our lightweight and versatile Vyon® porous plastics are available in a variety of different thermoplastic base materials; high density polyethylene (HDPE), Ultra High Molecular Weight Polyethylene (UHMWPE), polypropylene (PP) and Polytetrafluoroethylene (PTFE). These base materials exhibit a range of chemical resistance, strengths, densities and thermal properties that can be manufactured to create Vyon® products to tight specifications and requirements.

Below is an overview of the most common Vyon® materials based on popular design specification; base material, thickness and pore size.

Vyon® Polyethylene (PE)

Vyon® can be manufactured from both UHMWPE (Ultra-High Molecular Weight Polyethylene) and HDPE (High Density Polyethylene). Both materials are strong, highly dense porous plastics which exhibit high mechanical strength and good chemical resistance. PE is the most used material as it is suitable for a wide range of applications across different industries. With their wide ranging regulatory approvals, Vyon® PE is an ideal material for use in the medical and pharmaceutical industries.

Our PE range is available using bio-based virgin polymers. Offering a sustainable solution with regulatory approvals to meet market requirements.



| Grade | Material Type | Operating Temperature (°C) | Pore Size Range (µm) | Available Thickness (mm) |
|----------|---------------|----------------------------|----------------------|--|
| Vyon® M | UHMWPE | -70 - +80 | 7 - 10 | 1.50, 2.00, 3.20, 4.75, 6.00 |
| Vyon® PT | UHMWPE | -70 - +80 | 10 - 30 | 3.55, 4.00 |
| Vyon® D | HDPE | -70 - +80 | 15 - 25 | 3.20, 4.75, 6.00 |
| Vyon® F | HDPE | -70 - +80 | 20 - 40 | 0.75, 1.00, 1.50, 2.00, 2.50, 3.20, 4.75, 6.00 |
| Vyon® HP | HDPE | -70 - +80 | 80 - 100 | 2.00, 2.50, 3.20, 4.75, 6.00 |

Vyon® Polypropylene (PP)

Polypropylene (PP), while similar to polyethylene materials in mechanical strength and chemical resistance, PP is a tougher porous plastic with higher temperature resistance. Vyon® manufactured from PP is mainly used in industrial applications where both its superior hardness and thermal properties are desirable.

| Grade | Material Type | Operating Temperature (°C) | Pore Size Range (µm) | Available Thickness (mm) |
|-------------|---------------|----------------------------|----------------------|------------------------------------|
| Vyon® PPD | PP | -10 - +110 | 15 - 25 | 3.20, 4.75, 6.00 |
| Vyon® PPF | PP | -10 - +110 | 20 - 40 | 1.50, 2.00, 2.50, 3.20, 4.75, 6.00 |
| Vyon® PP-HP | PP | -10 - +110 | 80 - 100 | 2.00, 2.50, 3.20, 4.75, 6.00 |

Vyon® Polytetrafluoroethylene (PTFE)

PTFE (Polytetrafluoroethylene) is a versatile, high performance fluoropolymer composed of carbon and fluorine atoms. While similar in structure to polyethylene (PE) and polypropylene (PP), PTFE carbon chain is shielded by fluorine atoms (Figure 1). This carbon-fluorine bond is known as 'one of the strongest bonds in organic chemistry' (dissociation energy: 460 KJ/mol) and as a result, gives PTFE exceptionally high chemical and thermal resistance.

Our expertise in sintering porous plastics enables us to produce high quality, PFOA-free, sintered Vyon® PTFE with consistent pore size and permeability with no compromise on performance. Although PTFE is commonly associated with non-stick applications in the food industry, PTFE is widely used the life science, medical and pharmaceutical applications for its hydrophobic properties, high mechanical and chemical resistance.

| Grade | Material Type | Operating Temperature (°C) | Typical Mean Pore Size (µm) | Available Thickness (mm) |
|--------------|---------------|----------------------------|-----------------------------|--------------------------|
| Vyon® PTFE10 | Sintered PTFE | -60 - +260 | 10 | 1.0, 1.5, 2.0 |
| Vyon® PTFE20 | Sintered PTFE | -60 - +260 | 20 | 1.0, 1.5, 2.0 |

Manufacturing Capabilities

Porvair Sciences expertise lies in our ability to efficiently and robustly manufacture Vyon® that has a secure and long-lasting fit in the final assembled product. The flexibility of Vyon® manufacturing allows us to convert sheets and rolls into plethora of configurations through in-house, state-of-the-art equipment.

- Excellent edge finish
- Cut-to-fit precision
- Wide range of sizes and dimensions

Machined Shapes

Transforming Vyon® materials into simple and complex products is no challenge for Porvair Sciences. Using temperature and humidity-controlled CNC (Computer Numerical Controlled) routing facilities offers a versatile way to create complex shapes. This machining process enables us to create clean cut products with well-defined edges ensuring a good fit into components such as industrial scale process chromatography columns and filter housings.

Cut Discs

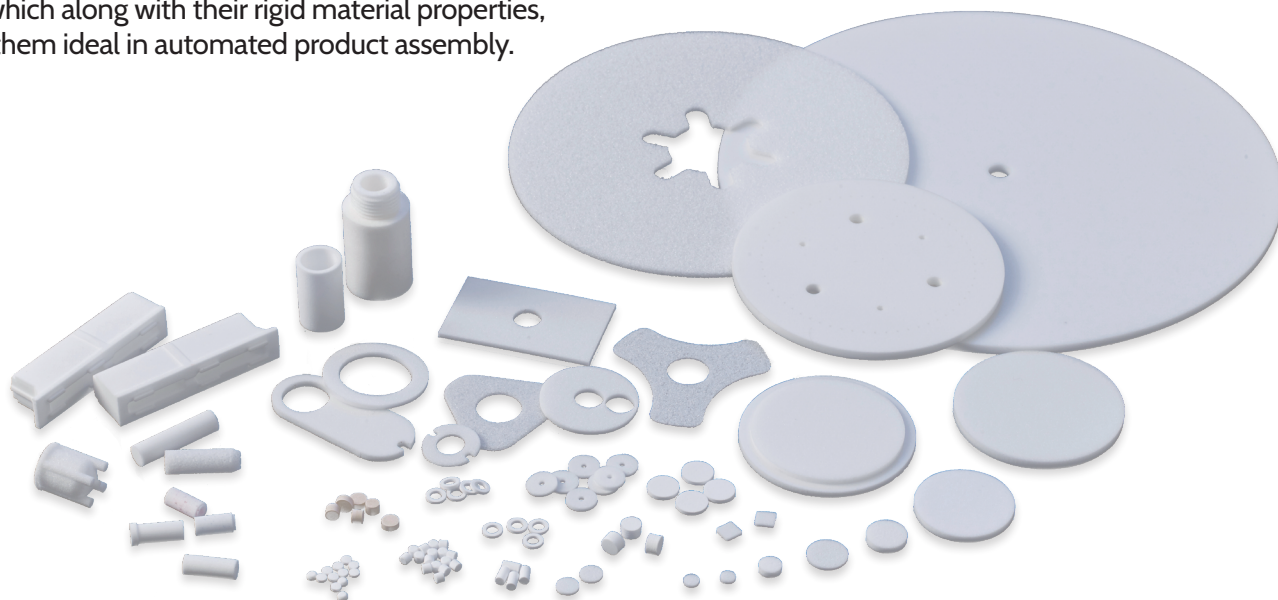
With single and multi-impression rotary cutters we can convert Vyon® porous plastic rolls into discs and washers. Our versatile approach means we can offer rotary cut products in diameters ranging from 3 mm to 100 mm using any of our Vyon® roll materials up to 4.75 mm thick. Our rotary cut discs have excellent edge finish, which along with their rigid material properties, makes them ideal in automated product assembly.

Fabrications

Vyon® roll and sheet material can be fabricated to create alternative 3D shapes including cones and tubes. Tubes are expertly seam welded and can be supplied with additional features such as end caps or adaptors. These tubes can be further processed into standard or customised filter cartridges for liquid and gas filtration, sparging and other applications.

Sheet and Roll

Our range of Vyon® porous plastics can be manufactured in widths up to 1060mm and in lengths bespoke to our customer requirements. We also offer a standard product range of 1m x 1m sheets in many of our materials. Sheets can be cut down to size or welded together to meet your needs.

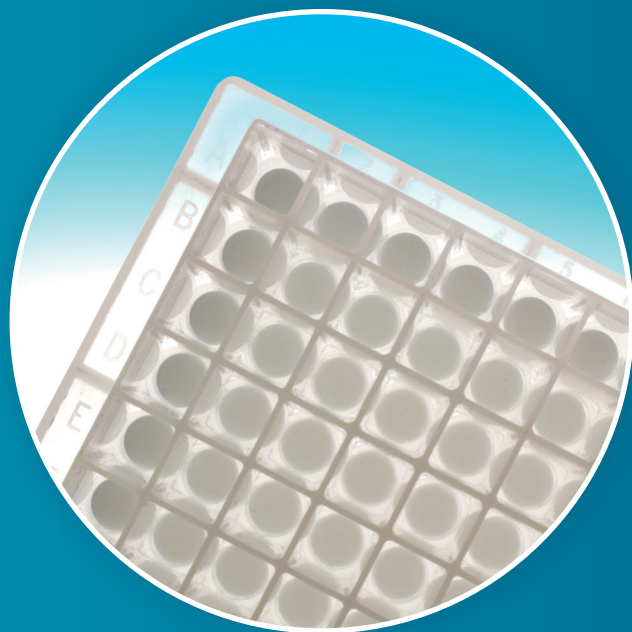


Mouldings

Our state-of-the-art Vyon® moulding facility allows for simple, complex and intricate component manufacture. We offer an elevated level of design from a large selection of material options. Our moulding expertise allows us to offer moulded products in varying levels of complexity; shapes may vary from simple pipette tip filters or sample preparation frits to highly complex shapes. Vyon® moulded components (2D & 3D) can be further enhanced using additives; including CMC for self-sealing properties, colours or activated compounds such as silica to create a composite frit for SPE.

Punched Parts

Complex flat shapes (e.g. clover), which cannot be rotary cut, can be expertly converted with precision from Vyon® roll material using a punching method. Vyon® punched shapes exhibit the same outstanding quality as our other cut products.



For chromatography and laboratory applications, Porvair Sciences has the unique capabilities of combining both microplate technologies with Vyon® materials to create market-leading specialised products.

To see our products, visit:
www.microplates.com



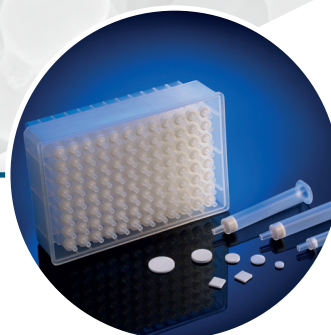
Products

At Porvair Sciences, we design and manufacture bespoke porous plastic products to meet the needs of our customers. From small drug delivery vents to large scale process chromatography bed supports, Vyon® can be found at the heart of a wide range of applications across laboratory, chromatography, medical and pharmaceutical applications. Through partnerships and collaborations, we continue to develop new, high quality innovative products that keeps you ahead of the competition while meeting regulatory and market standards.



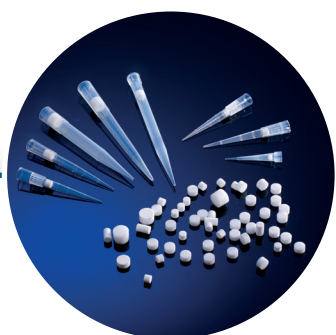
Drug Delivery

Drug delivery vents
Inhalation device filters and diffusers
Absorber/wicks for ophthalmic dispensing



Chromatography

Solid phase extraction frits
Process and flash chromatography bed supports



Medical and Healthcare

Catheter vents
Fluid collection vents
Bone cement filters
Media support and filters for dialysis equipment



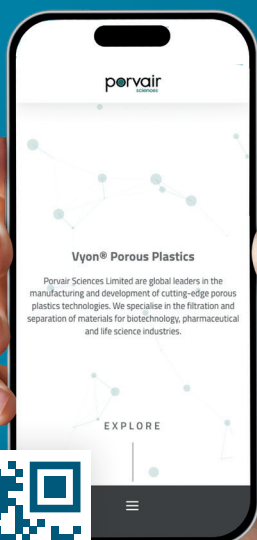
Laboratory

Diagnostic pipette filters
Microplate filters
Water purification filters
Biological sample homogenisers

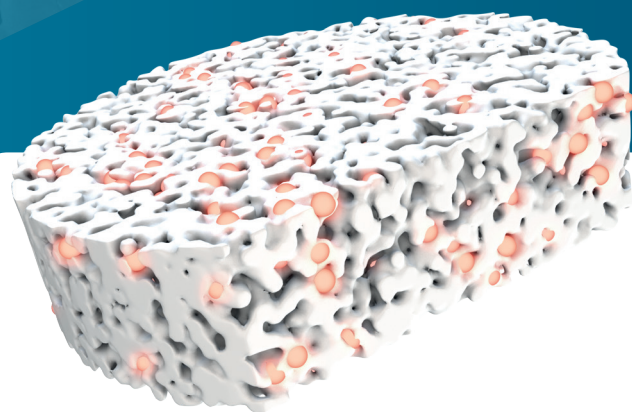


Ultraclean Treatment

Vyon® materials are known for their very low extractables and leachables. Vyon® can be post-treated to further reduce extractables such as short chain hydrocarbons. This is important if the frit or composite is being used in highly sensitive analyses, such as mass spectroscopy.



Learn more about Vyon®:
www.vyonporousplastics.com



Composites

Composites provide a unique ability for customers to develop blends containing chemically active agents immobilised within the Vyon® structure. Popular composites include carboxymethylcellulose (CMC) powders, SPE resins, controlled pore glass (CPG) and carbon. Products and applications using this unique hybrid technology offers advantages in pore size and controlled flow over the traditional loosely-packed systems offering marketing differentiation and benefits over traditional manufacturing processes.

Hydrophilic Treatment

HDPE & UHMWPE are naturally hydrophobic so it can be difficult for water and aqueous solutions to be absorbed into or pass through the porous structure. Through a process called plasma oxidation, the surface energy of these materials can be increased to allow them to wet out when in contact with water and other aqueous solutions. This allows liquids to be absorbed into the porous structure. Hydrophilic Vyon® is perfect for applications such as wicking, absorption and chromatography and can also be used to improve liquid passage through the structure or to enable the porous structure to act as a liquid reservoir (like a sponge).



Why Work With Us?

When designing using porous plastic you want the reassurance that you are working with the experts. Our diverse Vyon® team of scientists, engineers and creative thinkers are committed to providing expert solutions that brings value and integrity to our customers. As part of our product development, you will be welcome to visit our site, meet your expert team and see our manufacturing facilities.

Partnerships for Life

Combining your product with the right technology is achieved by understanding not only the requirements but the application and performance needs. All projects are assigned a key contact and team who will work closely with your company up to the point of completion. Our team is flexible in their approach enabling us to collaborate and ensure a successful project completion.

Regulatory Approvals

Vyon® materials are available and manufactured from a wide selection of regulatory approved polymers. These include, but are not limited to, REACH, ROHS and FDA. Our understanding of your regulatory requirements, deliverables and timescales ensures your product meets the markets requirements and standards and places you ahead of the competition.

Centre for Quality Excellence

Our high expectation for quality, coupled with our commitment to continuous improvement, assures you that our raw materials are carefully selected, and our manufacturing processes are optimally controlled to cGMP standards. Porvair Sciences are an open company who regularly partake in audits and are ISO9001 certified.



Clean Manufacturing

To help support the needs of our expanding medical and pharmaceutical customers, Porvair Sciences has a range of different room manufacturing options to suit requirements.

Precision Engineering

- Tight tolerances
- Pore size ranges
- Bespoke configurations and specifications

Corporate Sustainability

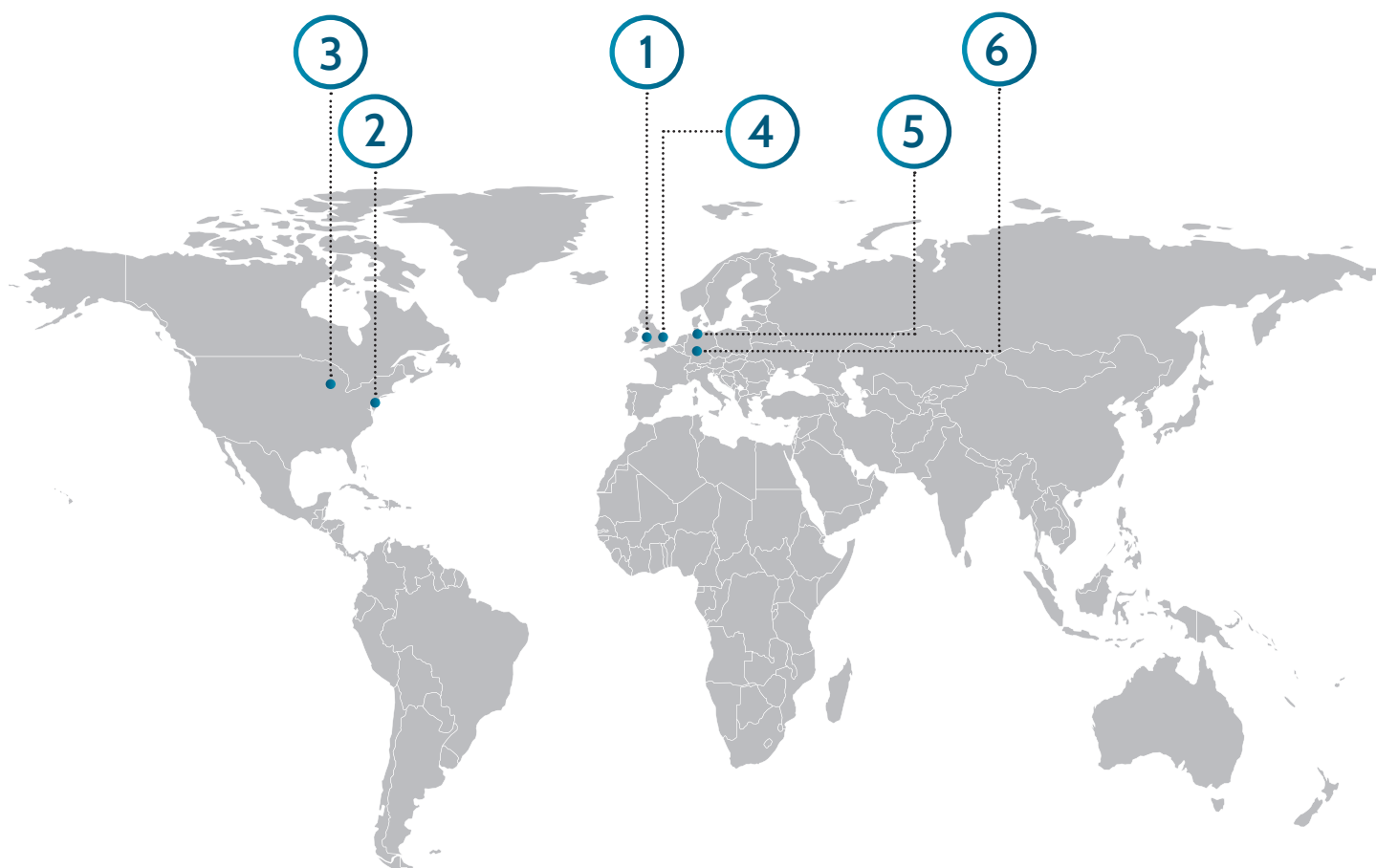
At Porvair Sciences, our dedicated ESG team drives our sustainability goals, addressing environmental concerns and giving back to our Vyon® team and the local community since its 2022 establishment.

- Cut on-site paper use by 40%, now sourced from recycled materials.
- Switched to environmentally friendly cleaning products whenever available.
- Had Electric Vehicle charging points installed.
- Organised team volunteer days to support the community.
- Managed charity fundraisers where team donations are matched by Porvair.
- Our Laboratories are now My Green Lab certified to the highest level.

Follow our LinkedIn for up to date news about our ESG initiatives.

Global Vy^{on}® Operations

Porous Plastics



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