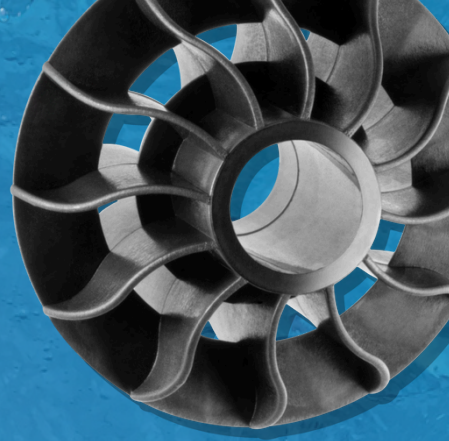
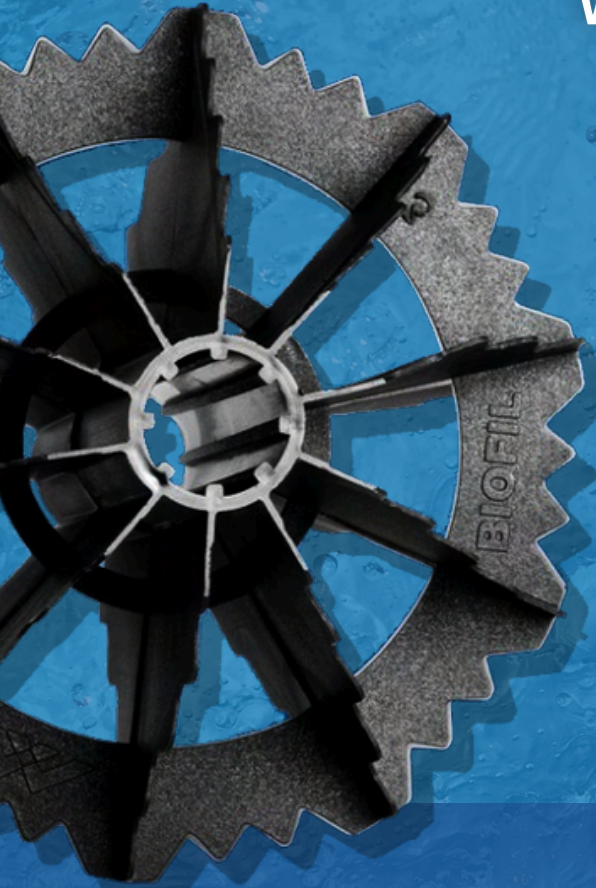




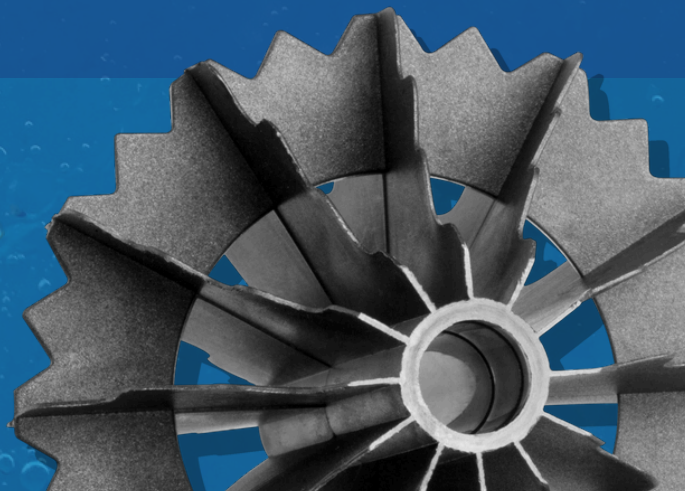
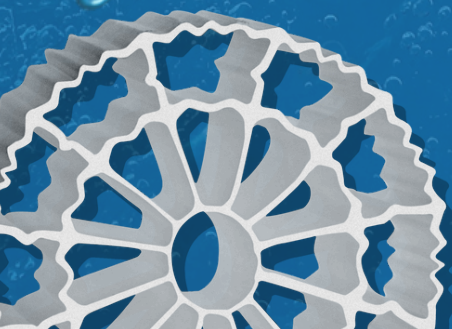
Warden Biomedia



High surface area, high voidage & sustainable

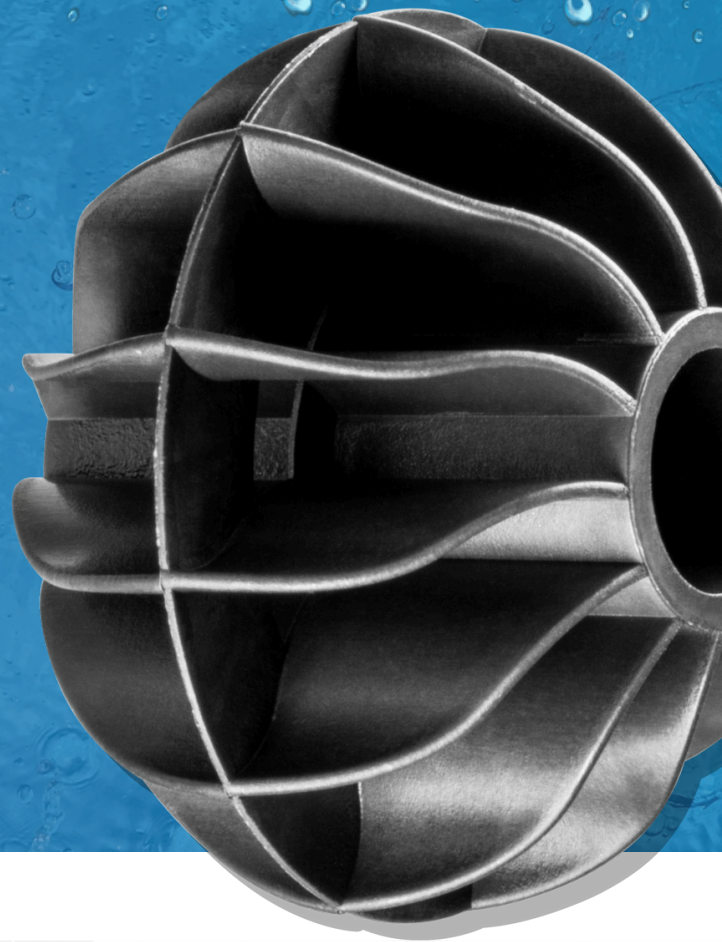
FILTER MEDIA

For biological wastewater treatment,
odour control & aquaculture



Designed to maximise the performance of biological treatment processes

The structure and surface textures are designed specifically to provide a large protected surface area and high voidage for active biofilm attachment and optimum biological treatment performance e.g. for biological wastewater treatment (municipal and industrial), aquaculture systems and odour control units.



Patented filter media technology

With the philosophy of increased surface area, innovative geometry and sustainability, the design of our biomedia is based on years of research. We have patented biomedia technology and most recently, have invested significantly in the development of our latest generation of spherical, high surface area and eco-friendly biomedia.

Available in 100% recycled material

We offer a range of sustainable biomedia which maximise performance whilst reducing energy requirements for wastewater and biological treatment processes.

Choose from a number of different media made from recycled polypropylene (PP).

PP is durable, lightweight, inert and non-toxic to the beneficial bacteria required for biological treatment processes.

High surface area & high voidage

Biomedia with up to $1000 \text{ m}^2/\text{m}^3$ surface area and up to 95% voidage. Since high surface area is not the only factor to consider when selecting filter media, we offer media with a variety of surface area-to-voidage ratios.

Manufactured in the UK

We are proud members of Made in Britain and all our biomedias are manufactured at our factory in Luton, UK before being shipped around the globe. The biomedias are injection-moulded or extruded in virgin or recycled polypropylene (PP) or high-density polyethylene (HDPE).



Ideal for new builds & retrofits

With specific design features to increase the efficiency of biological treatment processes, our biomedias range are an excellent choice to retrofit and upgrade existing treatment plants, as well as, for newly built treatment plants.

Get access to expert technical support

We have extensive biomedias knowledge and experience in-house allowing us to help select the best biomedias for your application, no matter your biological treatment set up or capacity. We're able to

support with process design calculations to ensure that the media selection offers optimum performance.

Media never needs to be replaced

All of our biomedias are strong, durable, with high chemical and corrosion resistance. Unlike traditional media which degrades over time and needs replacing every few years, our media has a life-expectancy of 30+ years and almost never needs to be replaced.

APPLICATIONS



Municipal Wastewater

High surface area, high voidage biomedia offer a cost effective solution to maximise the performance of both existing and new treatment works. Our biomedia can upgrade trickling filters or submerged aerated filters (SAF), and allow for easy conversion of activated sludge plants to integrated fixed film activated sludge (IFAS) or moving bed biofilm reactors (MBBR).

Industrial Wastewater

Industrial wastewater treatment processes can be made more energy efficient and reduce the footprint using high surface area and voidage biomedia. The high surface area and large openings allow increased loading rate capacity producing excellent effluent quality whether in aerobic or anaerobic operational conditions. Suitable for new-builds, media replacement or uprating or upgrading of existing plant.



Ideal for:

- Moving bed biofilm reactors (MBBR)
- Integrated fixed film activated sludge (IFAS)
- Submerged aerated filters (SAF)
- Trickling filters
- Anaerobic treatment

Key benefits:

- Maximise performance of wastewater treatment processes
- Increased biomass retention time
- Smaller process footprint
- Increased treatment capacity
- Increased loading rates applied
- Easy retrofit existing treatment plants
- Long-life expectancy material



Aquaculture & RAS

Warden's biomedias allow for optimum biomass attachment, providing large protected surface area, creating a range of micro-environments conducive to the growth of different bacteria to ensure efficient removal of both BOD and ammonia.

Key benefits:

- Low BOD and ammonia residuals
- Smaller process footprint
- Increased treatment capacity
- Increased loading rates
- Easy retrofit existing treatment plants

Odour Control & Biological Scrubbers

There are several approaches to odour mitigation based on chemical or biological treatment, and selection depends on the specific chemical species present. Warden's range of high surface area, high voidage biomedias maximise the performance of chemical and biological scrubbers, and biofilters, to eliminate odour issues.

Key benefits:

- High specific surface area to minimise scrubber height
- Excellent chemical resistance
- Low gas phase pressure drop, minimising fan power



About us

We are leaders in research and development of high performance, eco-friendly biomedias.

We research, develop, design and manufacture sustainable, eco-friendly biomedias to maximise the efficiency of wastewater and biological treatment processes and provide bespoke filter media solutions to customers in the UK, Europe and across the world.



In-house technical services

Our in-house technical experts allow us to offer the best biomedias for every application. We provide our clients with the most efficient and cost-effective solution to meet their requirements and can assist with process design calculations including mass balance, flow rates and air requirements to ensure that the media selection is tailored for each customer.

Research partnerships with key universities

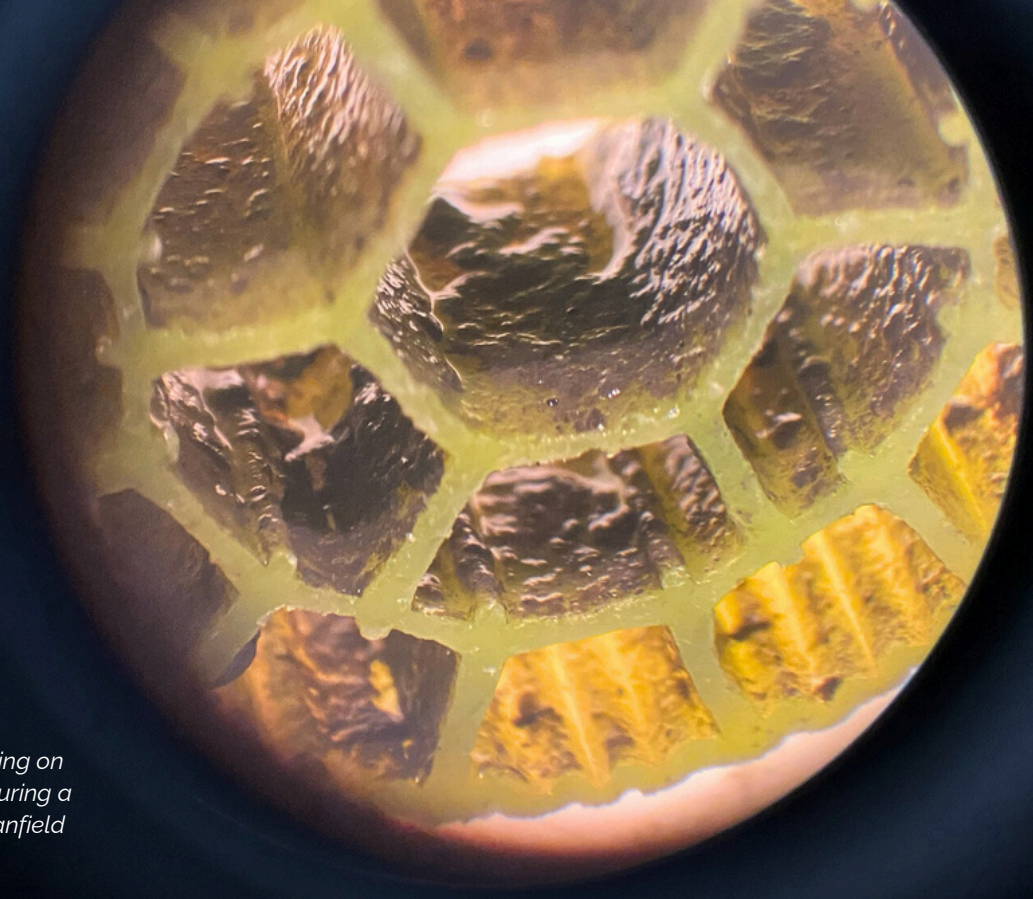
Research partnerships with Warwick and Cranfield Universities have allowed us to tackle new challenges in media development and work

collaboratively to create the next generation of wastewater treatment filter media solutions.

The Warden Group

Warden Biomedias is part of the Warden group. Established in 1957, Warden's initial business was the chipping and selling of reggranulated plastics, but it soon expanded its operations to include the design and production of plastic extrusions.

In the early 80's Amity & Co. became part of the Warden Group enabling Warden to manufacture and market their Biomedias range.



Pictured: Biofilm growing on Biopipe⁺ filter media during a research project at Cranfield University

Research, Development & Innovation

Innovation is at the heart of what we do – we lead the field in research and development of high efficiency, eco-friendly random biological filter media.

We're investing in the future of sustainable filter media

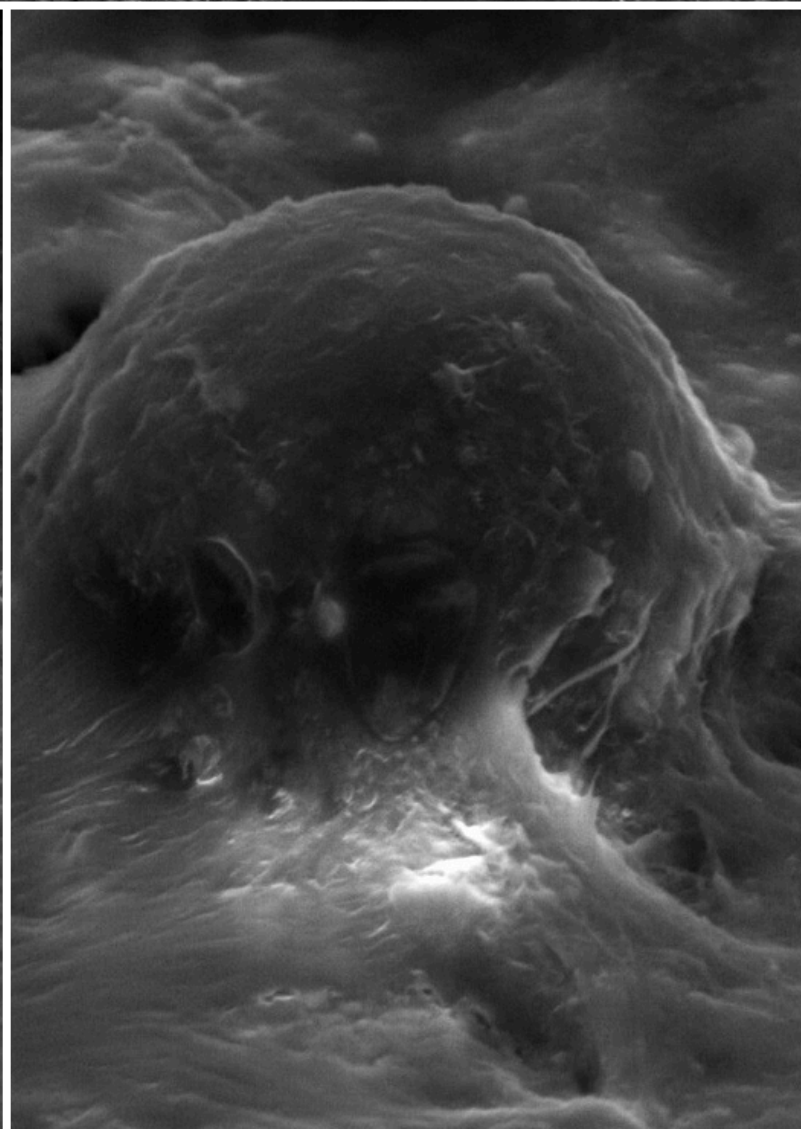
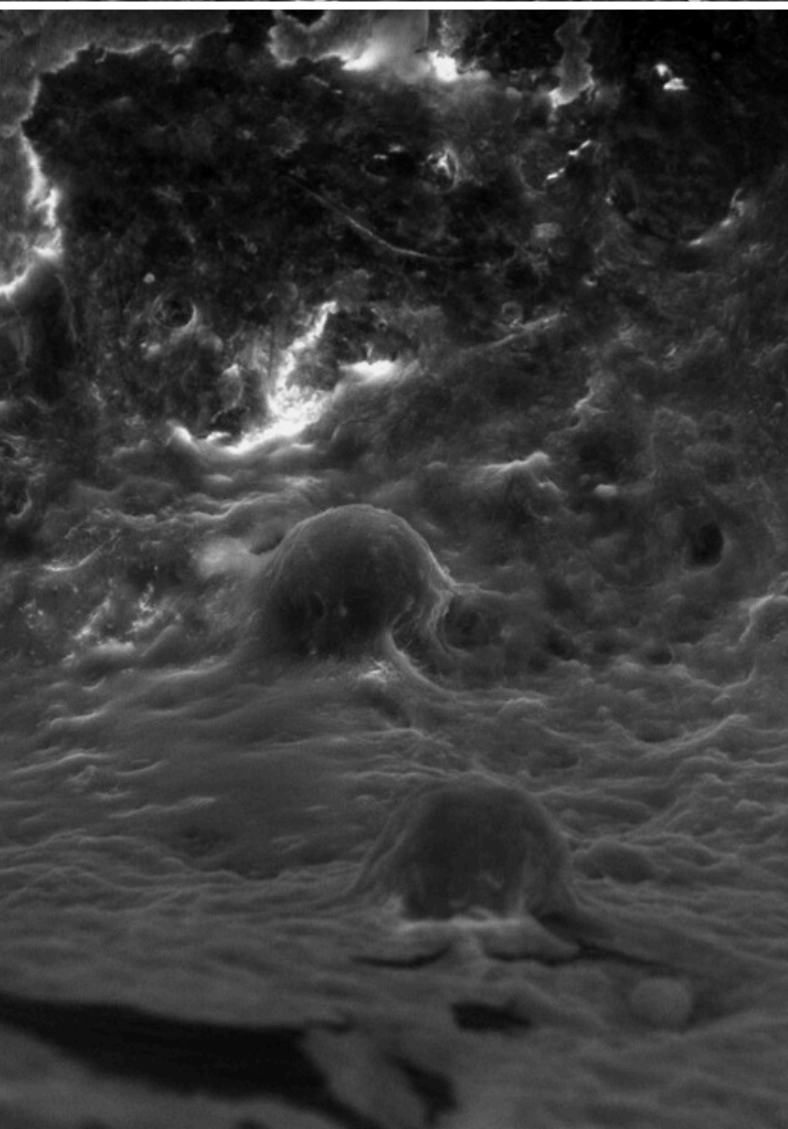
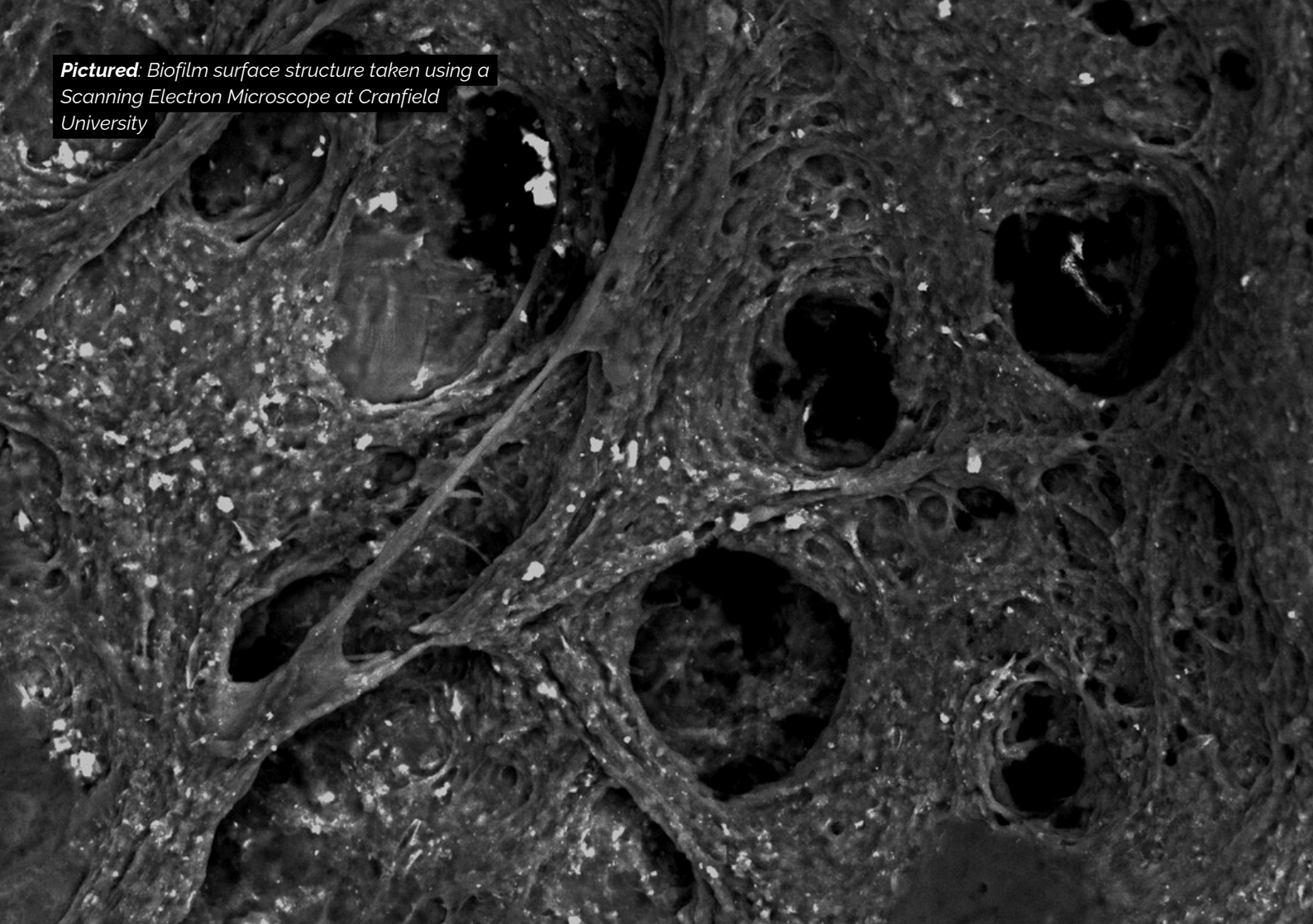
The wastewater treatment sector is under continuing pressure from sustainability and NetZero targets including ever tightening discharge consents, pressure to reduce power consumption and chemical usage, the need for increased nutrient removal to protect receiving bodies of water and increased hydraulic capacity to help reduce storm overflows.

It is of critical importance that the industry invests in innovating and integrating, sustainable and efficient

wastewater treatment processes to protect the environment and reduce resource consumption. We continue to invest considerably in R&D and have research partnerships with two of the UK's leading academic centres of excellence, Cranfield Water Sciences Institute (CWSI) and Warwick University, working collaboratively to create the next generation of wastewater treatment biomedica solutions.

Our commitment to research and development is helping us build a formidable reputation in the sector and helping the European wastewater industry reduce its energy consumption to meet environmental targets and reduce costs.

Pictured: Biofilm surface structure taken using a Scanning Electron Microscope at Cranfield University





Latest Research



Partnership with Cranfield University:

The Knowledge Transfer Partnership (KTP) programme was partially funded by the Innovate UK and was a 3-year partnership between Cranfield University and Warden to embed cutting-edge wastewater treatment knowledge and capabilities in Warden and allow for the development of a novel media and the future development of novel wastewater treatment technologies.

With Cranfield University, we demonstrated that a spherical media shape was far superior to standard industrial tubular-shaped biocarriers (TSB). TSBs need high levels of energy input to aerate the system whereas Warden's spherical shape reduce the energy input required in the effluent treatment system by 35% - 40%, since the spherical shaped media requires less energy to be agitated in solution.



The novel media developed was in an advanced MBBR to achieve enhanced nutrient removal including biological P removal, ammonia and total nitrogen removal.

The technology developed in this project aims to allow removal of total N and P in a single tank using specially adapted support media and operational conditions. Currently, total N and P removal is done by a combination of biological suspended processes and chemical precipitation. Processes such as MBBR allow for higher biomass concentrations, reducing tank sizes and consequently reducing CAPEX cost and equipment footprint for WWTP operators.





Case Study: Yorkshire Water uses Warden's Biomedia in £8 Million upgrade to Malton Treatment Works

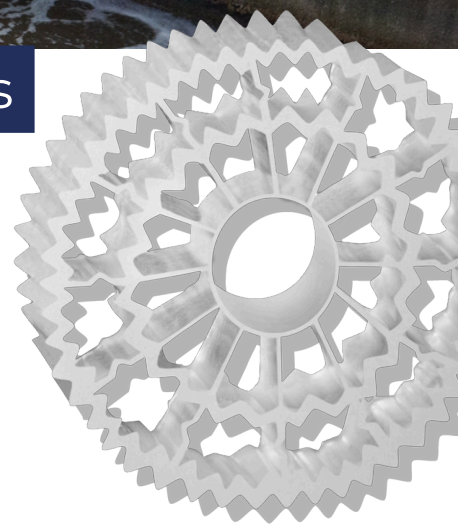
Yorkshire Water's Malton WwTW serves a domestic population of around 15,000 but trade effluent from local industry increases the load on the works to a population equivalent of around 60,000.

During the winter months, lower temperatures resulted in challenges to meet ammonia consent and with final effluent being discharged into the River Derwent near wetlands of significant value for nature conservation, Yorkshire Water allocated £8 million to upgrade the works.

It was concluded that the most cost-effective option was a moving bed biofilm reactor (MBBR) which would act as tertiary treatment handling the total flow from the trickling filters.

The media is critical to the MBBR operation and therefore it is vitally important to select media which will allow optimum treatment process performance, Warden's Bioflo+ 800 was selected by ACWA Services. Although having used Warden Biomedia's products previously, this was the first time Bioflo+ 800 had been used for an MBBR project at Yorkshire Water.

So a review and comparison with the media previously used was undertaken prior to acceptance, which found Bioflo+ 800 to offer significant benefits including; large protected surface area, prepared media surface, improved durability and structural integrity.



Bioflo+ used at Yorkshire Water's Malton WWTW



Pictured: The bioscrubber tower being installed at Staunton Foods

Pictured: The bioscrubber after installation

Case Study: Staunton Foods install highly efficient odour control system fitted with Warden's recycled plastic filter media

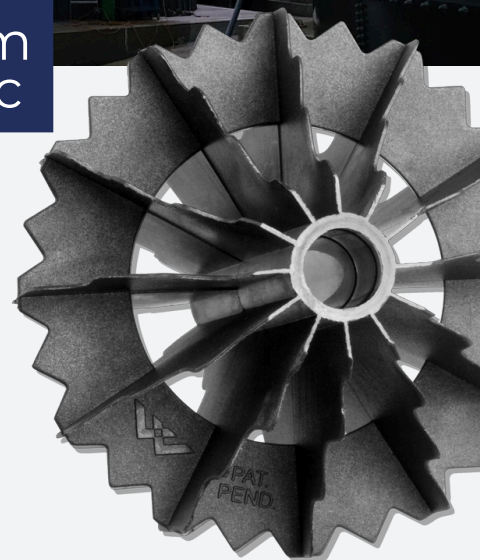
Staunton Foods is nestled in the picturesque village of Timoleague in rural West Cork. To meet strict environmental regulations, Staunton invested in a state-of-the-art wastewater treatment plant.

After a review on volumes and concentrations of emissions from all identified points, odour samples were taken to determine the odour mass emissions.

The preferred option was a bio-scrubber in which the odour sources from the wastewater treatment plant are ducted to a fan which blows the potentially odorous air into the bottom of a 4.2m diameter tower. Water is continuously circulated from the bottom of the tower to spray distributors at the top which give even distribution of the liquid over the packing and the pH is automatically controlled between 8.5 and 9.5. Bacteria in the circulating water biologically remove the odour producing contaminants. The process uses no hazardous chemicals, has low maintenance and low operating costs.

"The recycled plastic filter media and low energy consumption of the bioscrubber, combined with zero chemicals use, fits well with our environmental goals and sustainability initiatives. The unit has been in full operation since day one without any service needs or down-time."

Peadar Murphy, CEO of Staunton Foods



Bioball used at Stanton Foods

Pictured: Layers of Bioflo+ and Bioball inside the odour scrubber at Tipperary Creamery



Case Study: Tipperary Creamery Upgrades Odour Control System with Warden's Latest Filter Media Technology

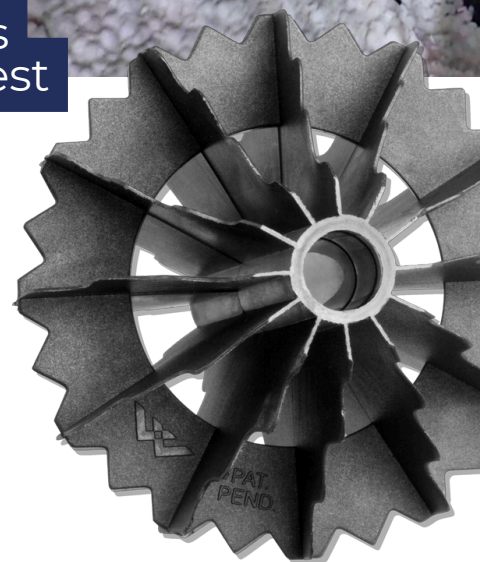
Tipperary Cooperative Creamery in Ireland processes around a million litres of milk daily, producing around 60,000 tonnes of cheeses, butters, milk powders and other dairy products every year to be sold in Ireland and across Europe, UK, USA, Middle East and Asia.

The Tipperary Co-op's existing odour control system was designed to treat 7500 Nm³/h of air. When MEHS checked the odour control system, they found the air flow was only 600 Nm³/hr, a significant order of magnitude below the design figure.

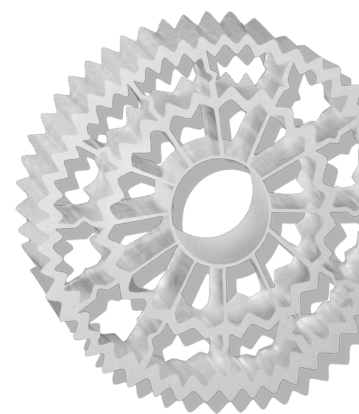
1.8m depth of Bioflo+ was installed on a 0.3m layer of Bioball. After adding the new media, the water recycle was re-started and concentrated bacteria added to system. The air flow was checked at 7,500 Nm³/hr and the inlet and outlet flow sampled for odorous parameters by SOCOTEC UK, an accredited laboratory.

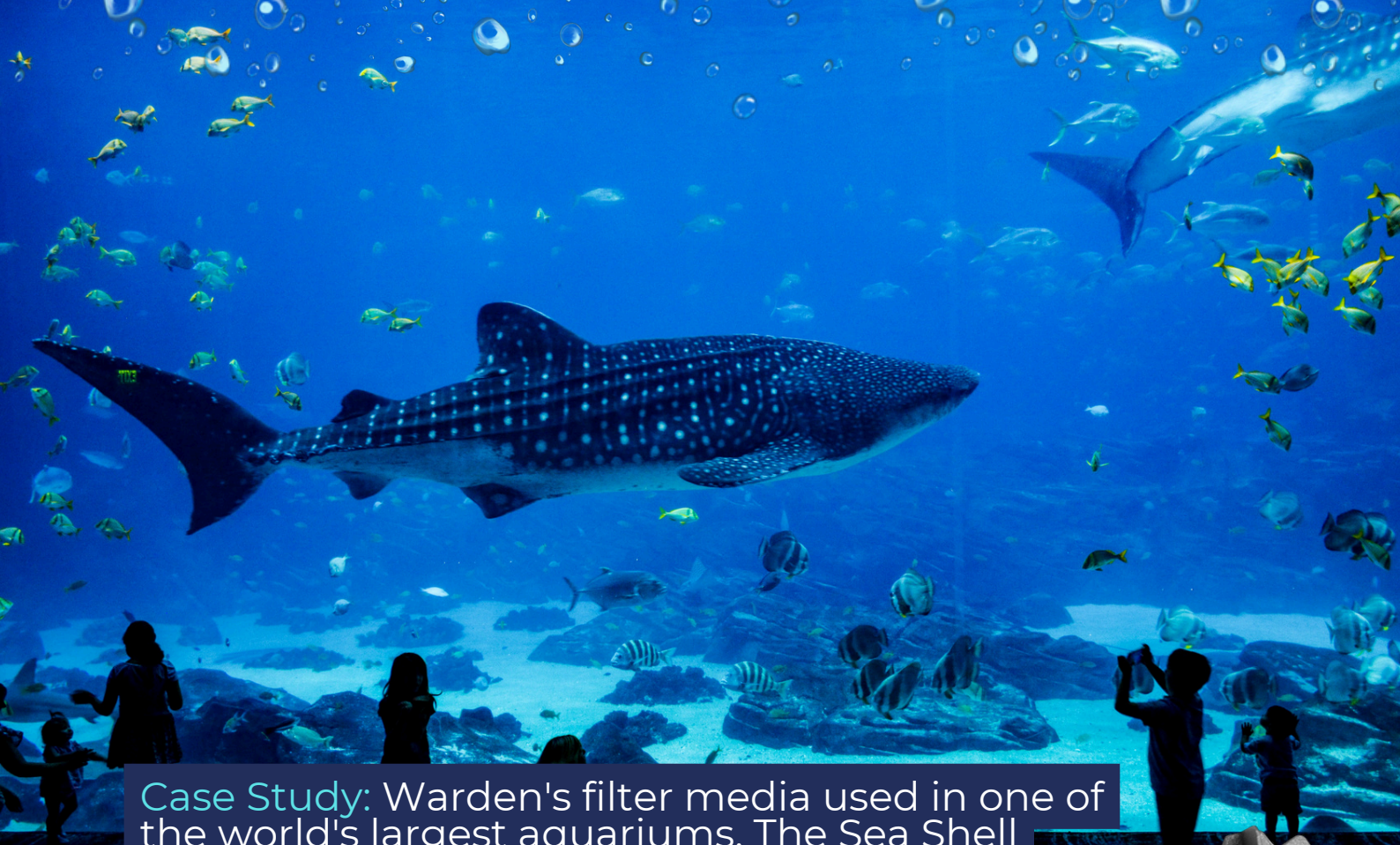
The odour concentration on the inlet was 25,747 OUE/m³ and the outlet odour concentration was 350 OUE/m³ – a 98.6% reduction of the odour concentration.

The media have a high surface area, which is important for contact between the liquid and gas, but also means a low pressure drop, minimising fan power.



Bioball (above) and Bioflo+ (below) used at Tipperary Creamery





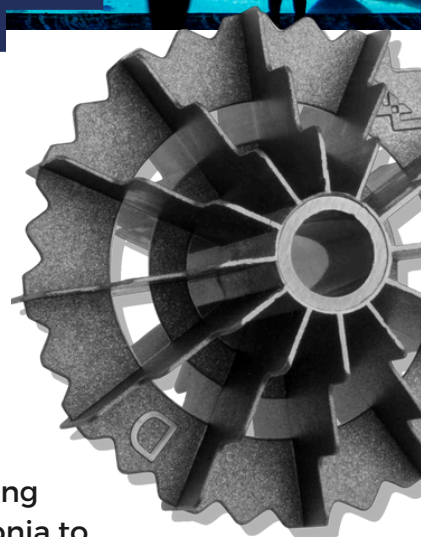
Case Study: Warden's filter media used in one of the world's largest aquariums, The Sea Shell Aquarium, Vietnam

The Sea Shell Aquarium is one of the world's largest ever built and certainly the most imaginative. Constructed in the shape of a giant turtle, the 20,500m³ of water is home to many species of sea creatures including whale sharks. The aquarium will be the most technologically advanced and ethically managed of its type.

ADEC selected Biopipe 600 for the MBBR and Biomarble 310 for the degassing and bio-filtration duties. Biopipe 600 provides a range of micro-environments conducive to the growth of different bacterial populations. In particular, it encourages the growth of the slow-growing nitrifying bacteria, *Nitrosomonas* and *Nitrobacter*, that convert ammonia to nitrate. This ensures efficient removal of both BOD and ammonia. The high surface area increases the overall biomass concentration, minimising the aeration tank volume, and the large openings allow for the wastewater to pass freely through the media helping to maintain a healthy and thin biofilm.

"This is the sixth international project on which we have used Warden Biomedia. Biomarble plays a critical role in degassing applications, where the water splashes into giant degassing columns after the outlet of protein skimmers. We found that Biomarble performs well in eliminating supersaturation which can cause excessive air bubbles in the exhibits and, more importantly, provides the perfect surface area for nitrifying bacteria."

Ekrem Yanik, Head LSS designer at ADEC



Biomarble 310 (above)
and Biopipe 600
(below) used at The
Sea Shell Aquarium,
Vietnam





Case Study: QUBE Renewables selects Warden for high-rate anaerobic digester on sustainable flower farm in Kenya

Bohemian Flowers on the south shores of Lake Naivasha, Nakuru County, Kenya, is today one the largest rose and mixed flower farms, exporting blooms all over the world.

The farm has long been involved in sustainability, boasting a large solar farm, geothermal wells and vermiculture farm. Now the farm plays host to a waste-to-energy project funded by Innovate UK, in partnership with QUBE Renewables, Grants Biotech and the University of South Wales. The project uses new dry digestion technology, batchQUBE, to process high cellulose flower waste and produce renewable energy in the form of biogas which will be used for cooking in the flower farm's canteen.

The aim is to process ligneous wastes that need long retention times. These containerised dry digesters are followed by the high-rate digester, where conditions are optimised for methanogenesis, the stage of anaerobic digestion in which the bacteria produce the most amount of useful biogas. In this reactor, the bacteria grow on the surface of Warden Biomedia's Biofil 135.



*Biofil 135 used at
Bohemian Flowers
in Kenya*

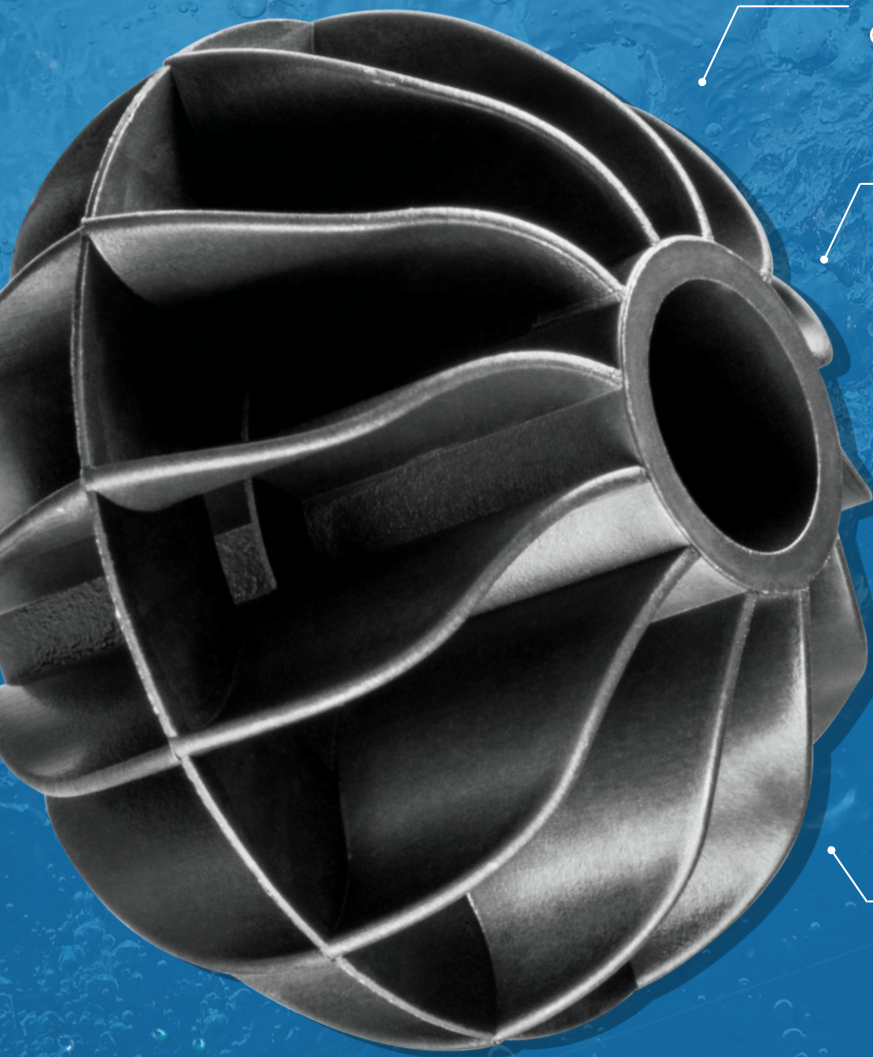
“Warden’s Biofil is an excellent media for our high-rate digester. We have 20m³ of Biofil in the unit which provides 135m² of surface area per m³ and it’s made from recycled polypropylene which is very much in line with our philosophy of sustainability”

David Payne, Head of Engineering at QUBE.



Next generation, high efficiency filter media

Choose Biopebble.



Large protected surface
area of **500 m²/m³**

Optimised for efficiency

New design improves mobility,
minimising aeration energy
consumption

Designed for
**enhanced nutrient
removal**

Available in virgin and
**100% recycled material,
& fully recyclable**

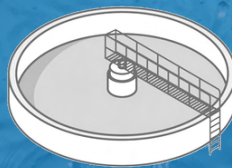
New dimensionality
**improves biological
commissioning times &
overall process security**

NEW

BIOPEBBLE

Our latest generation, sustainable filter media optimised for efficient biological wastewater treatment.

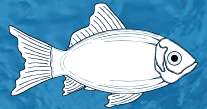
Municipal wastewater



Industrial wastewater



Recirculating aquaculture systems (RAS)



TECHNICAL INFORMATION

Material	Recycled PP	Virgin HDPE
Protected Surface Area	500 m ² / m ³	500 m ² / m ³
Voidage	81%	81%
Specific Gravity	0.92 ± 0.02	0.96 ± 0.02
Dimensions	23 x 17.70 mm ± 1.5 mm	23 x 17.70 mm ± 1.5 mm
Weight (dry)	~ 126 kg / m ³	~ 129 kg / m ³
Flow Direction	Non specific	Non specific
Pieces / m ³	142,535	142,535

ZERO HALOGENS
ZERO CONTAMINANTS
ZERO DEGRADATION
ZERO MICROPLASTICS

100% Quality Guaranteed



Manufactured
in the UK

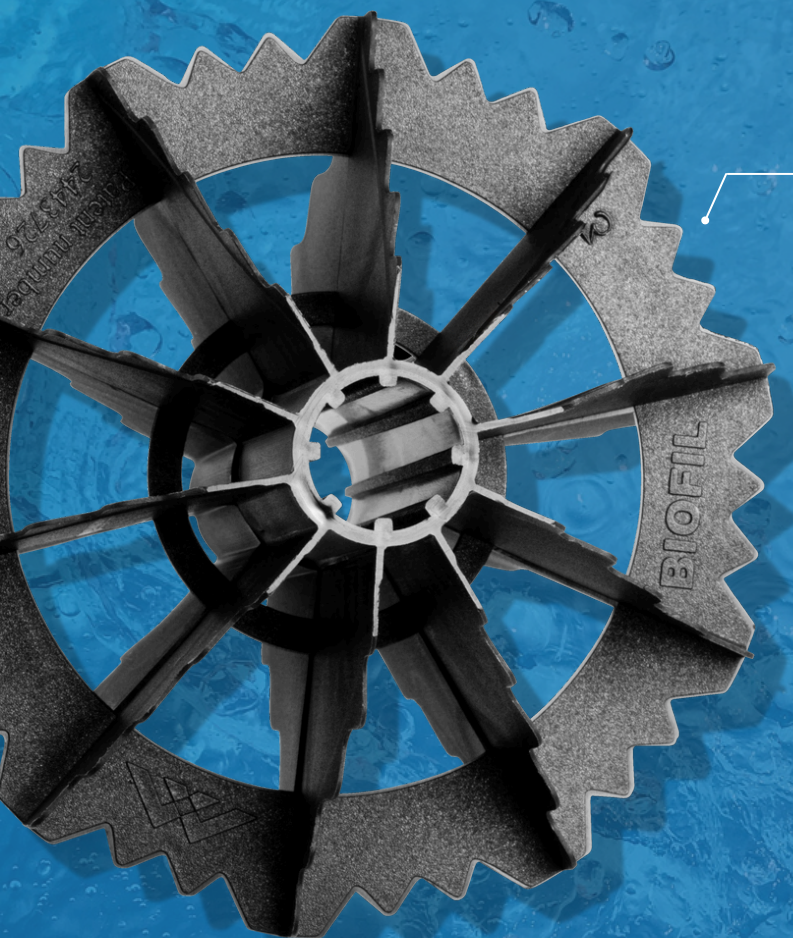
Expected
service life of
30+ years
Under normal use

**Fully recyclable
& sustainable**

Contributing to circular
economy



FILTER MEDIA

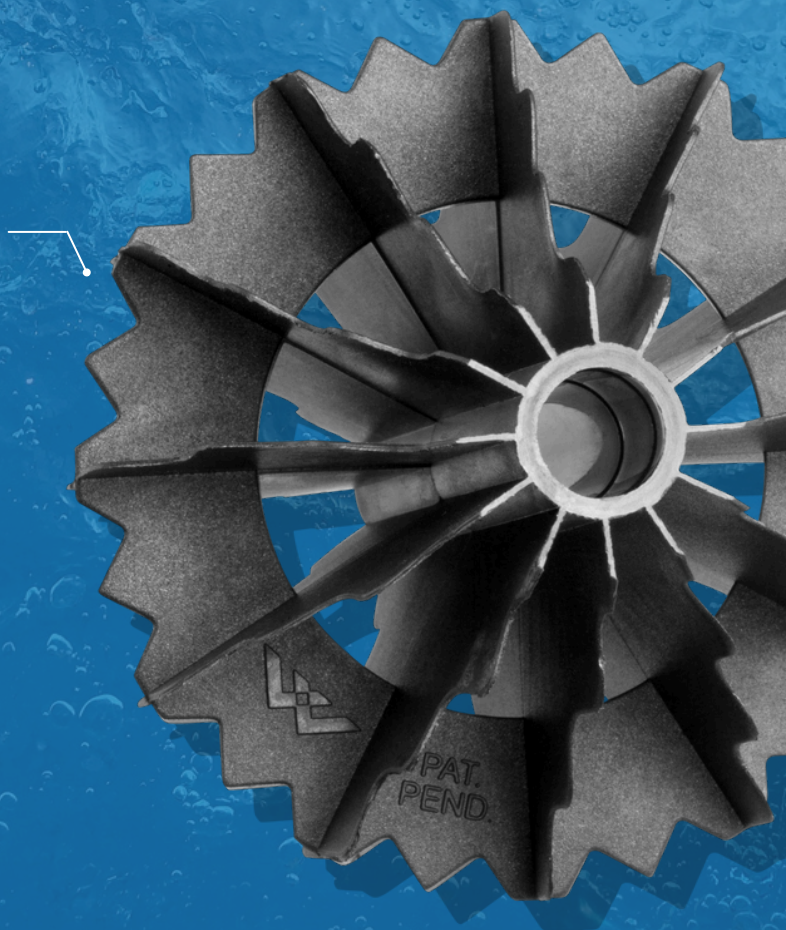


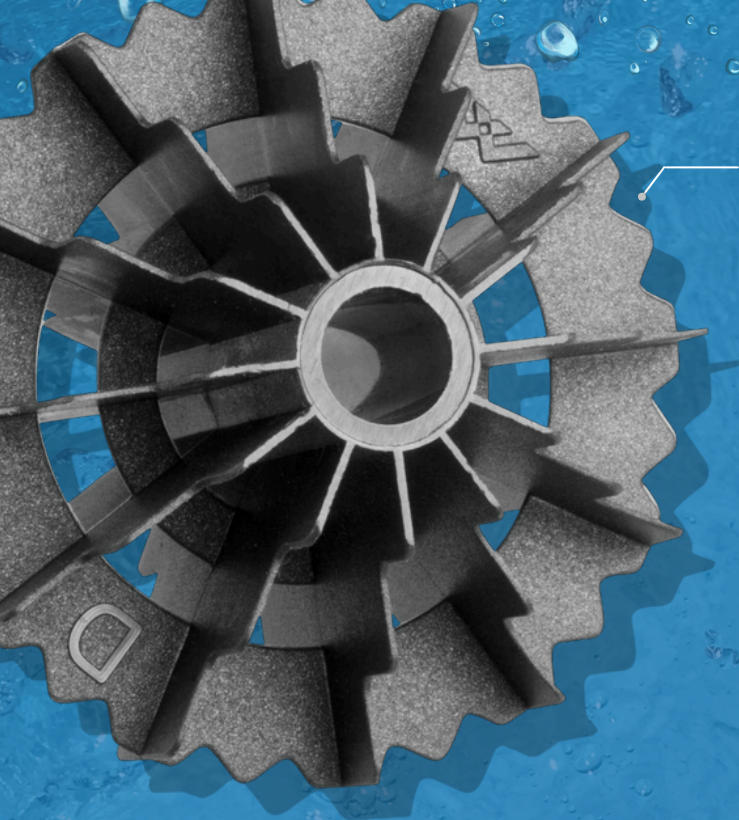
BIOFIL 135

Material	Recycled polypropylene
Surface Area	135 m ² / m ³
Voidage	95%
Specific Gravity	0.92 ± 0.02
Dimensions	95 x 65 mm
Weight (dry)	45 kg / m ³
Consolidation	5 - 10%
Flow Direction	Non specific

BIOBALL 220

Material	Recycled polypropylene
Surface Area	220 m ² / m ³
Voidage	92%
Specific Gravity	0.92 ± 0.02
Dimensions	65 x 53 mm
Weight (dry)	55 kg / m ³
Consolidation	5 - 10%
Flow Direction	Non specific



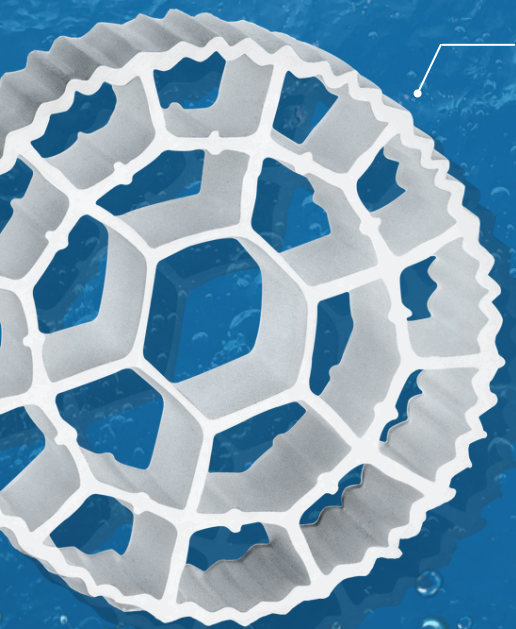
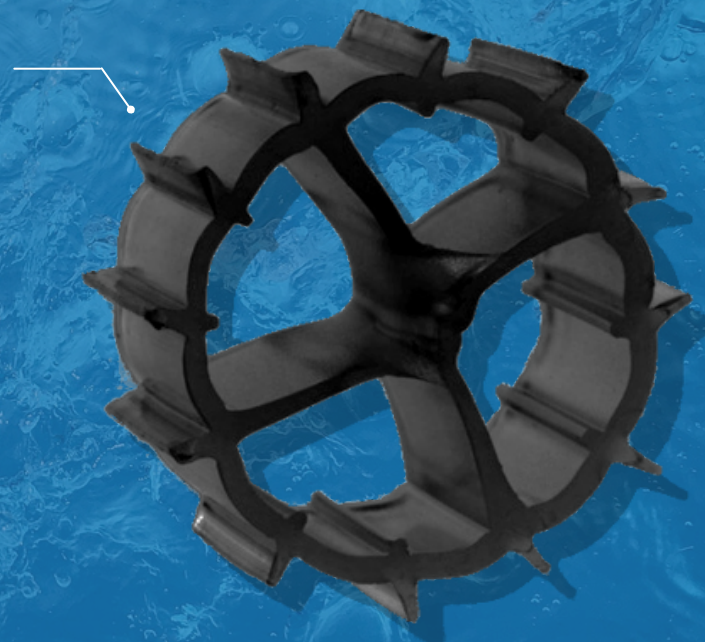


BIOMARBLE 310

Material	Recycled polypropylene
Surface Area	310 m ² / m ³
Voidage	90%
Specific Gravity	0.92 ± 0.02
Dimensions	46 x 36 mm
Weight (dry)	64 kg / m ³
Consolidation	5 - 10%
Flow Direction	Non specific

BIOPIPE 600

Material	Recycled polypropylene
Total Surface Area	600 m ² / m ³
Voidage	82.5%
Specific Gravity	0.92 ± 0.02
Dimensions	21.5 mmø x 13 mm
Weight (dry)	133 kg / m ³
Consolidation	5 - 10%
Flow Direction	Non specific

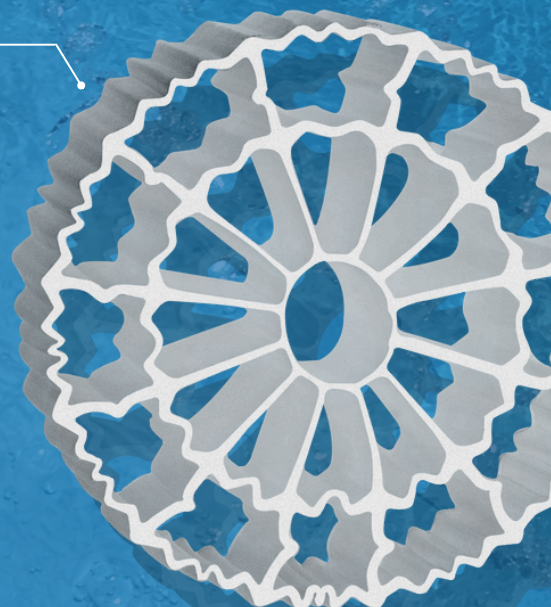


BIOPIPE+ 500

Material	Virgin PP	Virgin HDPE
Protected Surface Area	500 m ² / m ³	500 m ² / m ³
Voidage	83%	83%
Specific Gravity	0.92 ± 0.02	0.96 ± 0.02
Dimensions	25 mmø x 10 mm	25 mmø x 10 mm
Weight (dry)	114 kg / m ³	120 kg / m ³
Flow Direction	Non specific	Non specific

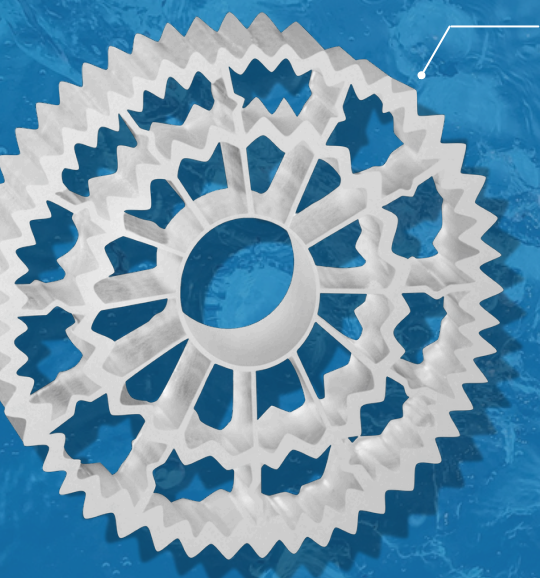
BIOTAG 650

Material	Virgin PP	Virgin HDPE
Protected Surface Area	650 m ² / m ³	650 m ² / m ³
Total Surface Area	832 m ² / m ³	832 m ² / m ³
Voidage	68%	68%
Specific Gravity	0.92 ± 0.02	0.96 ± 0.02
Dimensions	21 mmø x 8 mm	21 mmø x 8 mm
Weight (dry)	130 kg / m ³	135 kg / m ³
Flow Direction	Non specific	Non specific



BIOFLO+ 800

Material	Virgin PP	Virgin HDPE
Protected Surface Area	800 m ² / m ³	800 m ² / m ³
Total Surface Area	1036 m ² / m ³	1036 m ² / m ³
Voidage	63%	63%
Specific Gravity	0.92 ± 0.02	0.96 ± 0.02
Dimensions	16.75 mmø x 5 mm	16.75 mmø x 5 mm
Weight (dry)	170 kg / m ³	176 kg / m ³
Flow Direction	Non specific	Non specific



BIOTUBE 1000

Material	Virgin HDPE
Total Surface Area	1000 m ² / m ³
Voidage	80%
Specific Gravity	0.96 ± 0.02
Dimensions	12 mmø x 8 mm
Weight (dry)	200 kg / m ³
Consolidation	5 - 10%
Flow Direction	Non specific





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out our website:

