

A photograph of a wastewater treatment plant featuring a large green structure on the left and a series of metal troughs where water is being distributed. The water is cascading over a dark, textured surface, likely a filter bed. The background shows a clear sky and some greenery.

# A Guide to Trickling Filter Wastewater Treatment

Design and Installation of Trickling Filters

**ENEXIO**   
2H WATER TECHNOLOGIES

Water Management Professionals

[2hwatertechnologies.co.uk](http://2hwatertechnologies.co.uk)

# What is your #1 wastewater treatment challenge?

- Increased demand for high quality of effluents
- Insufficient capacity of the water treatment plant
- Energy costs
- Reliability of operational and maintenance processes
- Meeting tougher consents

**In this step-by-step Guide we take you through the most important factors you need to address to make the best buying decision and ensure the best performance from your installation.**

Trickling Filters have a long history of providing reliable, efficient and cost-effective solutions to a diverse range of industrial and municipal wastewater treatment applications.

#### **But everything changes**

As Trickling Filter technology continues to evolve, the breadth and depth of application options available have expanded to provide significant opportunity to improve operational efficiency.

#### **The more you know the more you can take advantage of the breadth of choice available**

.... which is particularly important given that wastewater treatment is under constant scrutiny, development and revision. Life is already tough for wastewater professionals. It's not going to be any easier as the legal and regulatory standards governing wastewater and effluent treatment and discharge become increasingly more demanding.



Take a look – and find a way of using this technology to benefit your wastewater application

# Trickling Filter - Evolution

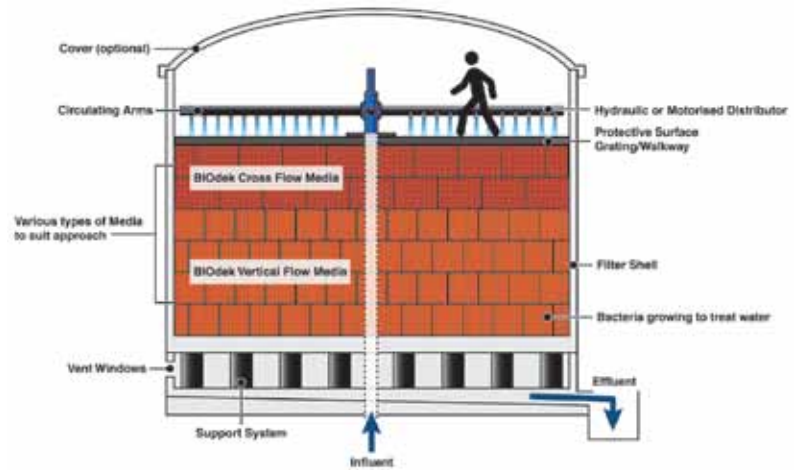
## The BASICS

The Trickling Filter process is based on the biological oxidation of pollutants contained in the wastewater.

The media in the Trickling Filter provides a surface for the growth of bacteria and other micro-organisms that feed on the organic pollutants in the wastewater, and then uses oxygen in the air to convert these into harmless by-products.

Trickling Filters can provide biological treatment of wastewater to reduce Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) in carbonaceous systems, BOD and ammonia in combined carbonaceous and nitrifying systems and nitrifying filters to reduce ammonia.

Originally built using rock or stone media, Trickling Filters have proved simple to run, reliable, energy efficient and able to achieve successful treatment. The modern version of Trickling Filters uses the structured plastic cross-flow media. This continually splits and re-splits the applied flow at each point of contact between the opposite downward sloping corrugations of adjacent sheets in each media block to produce efficient mixing.



Nitrifying Trickling Filter Ammonia Reduction

### Municipal

Trickling Filters built with structured plastic media can be designed to meet the increasingly stringent standards required for modern wastewater treatment works. Plastic media can be used to create an 'add-on' to an existing Trickling Filter and decrease the load during pre-treatment, when, for example, the capacity of an existing works has to be increased or the consent tightened.

Additionally, a Trickling Filter can provide a supplementary 'special treatment' stage to meet new standards dictated by legislation. The versatility of plastic media enables existing assets and treatment systems to be upgraded to meet future needs with minimum cost and disruption to the treatment capacity.



Paper Mill BOD Roughing Filter (Source Glatfelter)

### Industrial

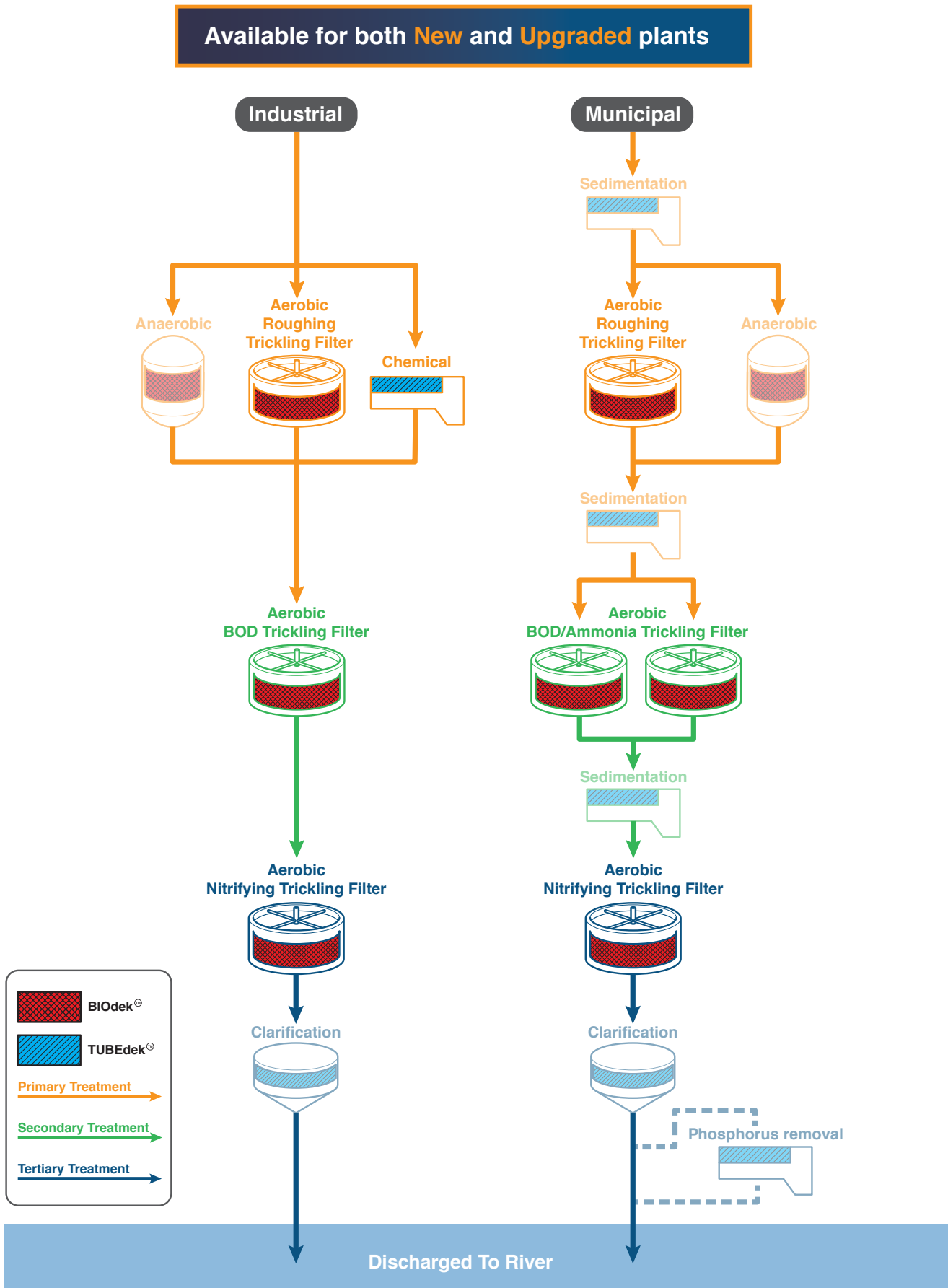
When a company is faced with tighter discharge consents or higher industrial effluent charges, high rate plastic filter media offers an economic, simple and reliable option for meeting these demands. 2H offers vertical flow media with optimised space and construction requirements compared to other processes. This type of media is more energy efficient and requires less supervision.

## Every Wastewater Management Challenge is Different

It is possible to meet almost any wastewater filtration requirement, and achieve great results, by using a purpose-built system that incorporates exactly the right combination of products and processes. 2H offers a comprehensive range of plastic media Trickling Filter products, with which we can build a wastewater treatment solution to deliver precisely the results you require.

# Trickling Filter - Approach

Modern Trickling Filters can be adopted at each stage of wastewater treatment. With the correct design application Trickling Filters can be used to replace or compliment existing equipment at whatever stage.



# Trickling Filter – Increased Treatment

Trickling Filters with plastic structured media offer a solution to increasing capacity requirement at the same time as providing enhanced reliability, at every stage of the treatment process.

BIODEK media can be supplied for **Roughing Filters and Secondary Filters** for carbonaceous treatment to reduce BOD, for Tertiary Filters for **Nitrification** to further reduce the level of ammonia concentration and for **Denitrification**.

## Roughing Filters for primary reduction of high level BOD

Trickling Filters are an effective option to reduce the load coming into the existing works as BIODEK media can be produced in various configurations to achieve the required level of treatment and for particularly heavy loaded applications, vertical flow media is ideal to ensure that excess sludges are expelled.

## Secondary Filters for carbonaceous treatment

The higher loading rates applied to 2H BIODEK secondary filters are typically between 0.2 kgBOD/m<sup>3</sup>/d to 1.0 kgBOD/m<sup>3</sup>/d – depending on the required effluent quality. With appropriate topographic layout, BIODEK filters can operate in gravity feed mode without the supply of additional energy. No other aerobic water treatment process offers this advantage.

### Case Study:

## Thames Water Wheatley



Since going live in 2017, a purpose-built BIODEK trickling filter solution has continued to exceed expectations by ensuring Thames Water's SWT plant in Wheatley, Oxfordshire:

- hits the company's 100% compliance target by removing over 75% BOD and achieving ammonia levels of 1mg/l in the final effluent
- meets Thames Water's commitment to safeguarding the local water environment
- has a resilient, sustainable future

2H designed, manufactured and supplied the components for a new glass coated, steel tank Trickling Filter measuring 16.25m in diameter with 443m<sup>3</sup> BIODEK KFP619 structured PP (Polypropylene) plastic media with a specific surface area (SSA) of 150m<sup>2</sup>/m<sup>3</sup>. The 2H solution also includes a Shallow Bed media support system constructed from highly-resilient, erosion resistant, moulded concrete tiles and a customised Equiflo rotary distributor.

### Case Study:

## Yorkshire Water



A 2H BIODEK solution improved treatment at an existing works for Yorkshire Water. 2H supplied and installed 3030m<sup>3</sup> of BIODEK 19mm plastic cross flow structured media (150m<sup>2</sup>/m<sup>3</sup> specific surface area) in three secondary Trickling Filters. Each tank was 16.5 metres in diameter with a media packed depth of 4.8m.

The filters were designed to treat 767 kg/day settled BOD and 168 kg/day of Ammonia and achieve a final effluent compliance of 50:35:15mg/l SS: BOD: Ammonia.

The media was installed into concrete tanks protected by tall sidewalls which ensure safe access across the top of the filter and provide wind protection for the distributor to prevent spray being blown off the filter. Ventilation slots were built into the tank periphery to serve the media and plenum area under the pack. The vents have doors that can be closed in cold weather.

# Trickling Filter – Increased Treatment

## Tertiary Nitrification Water Treatment

Trickling Filters used in tertiary nitrification are designed to meet tighter ammonia discharge consents. The nature and type of biomass that establishes itself within tertiary nitrification filters produces negligible amounts of solids.

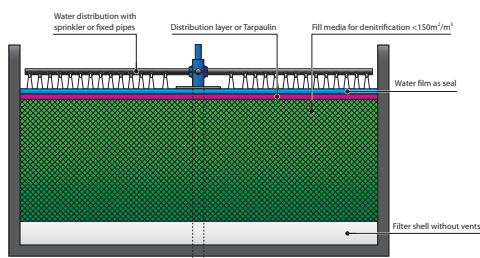
As such media with higher specific surface areas can be used to optimise the overall volume of media and, therefore, the filter footprint. Provided the works is within its suspended solids consent, no additional capital expenditure is required for post filter settlement.

BIOdek plastic media is particularly effective for use in a nitrification plant; its long retention times, smaller passage crossflow structure, and high specific surface area all combine to produce a very high specific nitrification rate with the lowest levels of ammonia concentrations in the effluent.

For extremely low ammonia discharge contents, Nitrifying Trickling Filters can be configured in their operation to ensure that healthy nitrifying biomass is maintained throughout the media to maintain a robust process.

## Denitrification Process

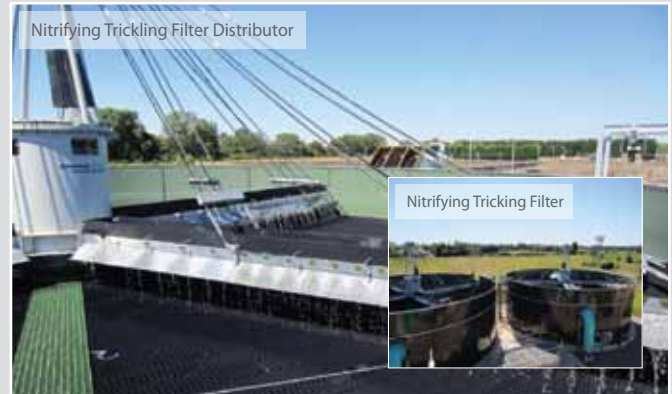
Over the past decade, research has proved that anoxic Trickling Filters are a reliable process for denitrification. 2H has patented a process solution which even enables shallow filters to denitrify with greater efficiency. The filter media is sealed against atmospheric oxygen, forcing the biomass to use nitrate ( $\text{NO}_3^-$ ) within the effluent stream for the supply of oxygen.



Preventing access of air/oxygen from the top can be difficult. In addition, alternatives such as building a GRP roof can prove expensive, especially for larger diameters. The 2H approach uses a top layer of high density media, 10cm thick, creating a clogged media cover. Water distribution is achieved using a low spray and head through discharge pipes lying directly on the top media layer. A cover is used to 'seal' against the ingress of air/oxygen which can be placed either beneath or above the water distribution system. To achieve the best results the denitrification Trickling Filter should be placed upstream, where the BOD level is the highest.

### Case Study:

## Severn Trent Water



Within 3 months of adding BIOdek modular plastic media filters from 2H to an existing rock-based nitrifying Trickling Filter, Severn Trent Water (STW) recorded a drop-in ammonia from approximately 4 mg/l to 0.2 mg/l.

The original rock media Trickling Filter met BOD filtration requirements, but was incapable of meeting future ammonia consent levels. However, as the existing filters were all in good condition, STW decided to add Trickling Filters built from 2H's BIOdek plastic media. It was not only the simplest and most effective approach but also offered many long-term advantages:

- **Ease of operation and management:** 2H's BIOdek plastic Trickling Filters have a single moving part and are easy to operate and manage.
- **Future proofing:** the design allows for the initial installation of two filters, whilst allowing for easy addition of a third filter to meet anticipated future load increases.
- **Low Carbon Footprint:** the production, transportation and installation of lightweight, modular plastic media generates low levels of  $\text{CO}_2$ . When operative, plastic Trickling Filters produce lower levels of carbon dioxide than, for example, a comparable Sludge Activation plant.
- **Modular Media:** 2H modular plastic media comes in many different sizes so can be used to create Trickling Filters that fit into the available space on site. 2H supplied 1,484m<sup>3</sup> of BIOdek FKC615 PVC media, all of which was produced in the company's Northampton factory, together with the timber support matrix.

# Trickling Filter – Technology, what’s so good?

## A Real Solution with Quantifiable Benefits

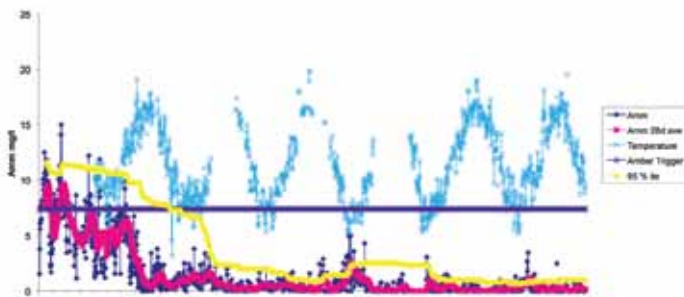
Using structured plastic media, Trickling Filters can be configured to provide a practical, customised solution to a wide variety of different bio filtration needs.

## Quantifiable Benefits:

### Ammonia Reduction

#### Yorkshire Water Ammonia Performance Site Data

Demonstrating ammonia reduction after a BIOdek plastic media Trickling Filter.

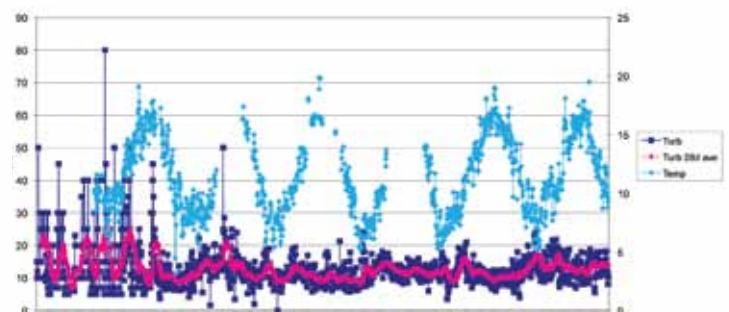


Measurements taken on site 3-4 times per week (not based on regulatory samples) for period Aug 2009 – Nov 2012

### Lower Sludge Production

#### Yorkshire Water Turbidity Performance Site Data

Trickling Filters produce less sludge than suspended growth systems. The sludge that is produced generally settles efficiently and results in low turbidity in the clarified water.



Measurements taken on site 3-4 times per week (not based on regulatory samples) for period Aug 2009 – Nov 2012

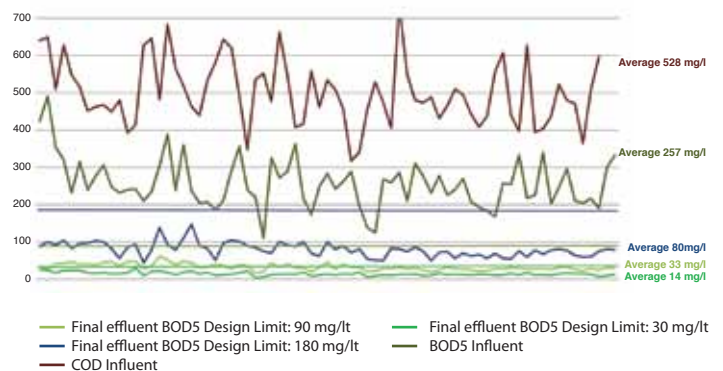
## Reduced Operational Costs

### Managua Trickling Filter Performance Site Data

Demonstrating savings in annual operating costs after a BIOdek Plastic Media Trickling Filter.

#### The BIOdek solution will deliver the following benefits:

- Lower operational energy demand compared to the initial design for an Activated Sludge Plant. The BIOdek solution will consume 0.21 kwh per kg of BOD removed. That’s less than half the 0.6kwh of energy per kg of BOD removed that would be needed to power an Activated Sludge Plant.
- **Cost Savings:** over a single year, the energy efficient BIOdek solution will generate savings of around €550,000.
- **Effluent quality that exceeds expectations:** the BIOdek solution will deliver a final effluent quality of 14mg/l. (on average).
- **Low Carbon Footprint:** production, transportation and installation of lightweight, modular plastic media generates low levels of carbon dioxide. In operation, plastic Trickling Filters produce far lower levels of carbon dioxide than a comparable Activated Sludge plant.
- Proven reliability
- Simple control equipment



Measurements taken on site 3-4 times per week for period July - Sept 2009

# Trickling Filter - Benefits

## Simple Operation

Trickling Filters require less operator involvement than comparable treatment systems. At the same time, the system provides enough flexibility to allow operators to optimize performance. For example, recycle rates, flushing rates, and wetting rates are important variables that can be adjusted to accommodate changing organic and hydraulic loadings.

## Minimum Operator Intervention

While management and monitoring is essential, Trickling Filters are designed to minimize the necessity for operator involvement in the simpler filtration processes.

## Easy to Manage, Monitor and Maintain

Control and monitoring processes are far more streamlined and require less control data than alternative treatment solutions such as Activated Sludge. The system allows operators to optimize performance, for example, by adjusting variables and loadings.

## Sustainability Comes as Standard

During the 25-year lifetime of a Trickling Filter, over 90% of the carbon (CO<sup>2</sup>) footprint results from day to day operations, such as pumping the feed up to the filter and recycling water, either by separate pump or by feeding back into the feed pump chamber. If the feed-to-filter is driven by gravity, only the recycling pump will be required.

## Easy on the environment

Sustainability Studies show that a gravity fed Trickling Filter has a carbon footprint (including construction and 25-year operation) which is around 10% of an Activated Sludge Plant. If the system were pumped, this would equate to around 30% of a similar sized activated sludge plant.

## Recycle, repurpose

The latest plastic media are resistant to rot, fungi and most dissolved chemicals. Filters can be reused and, when no longer required, 2H can remove unwanted or failing plastic media which is then recycled.

While management and monitoring is essential, Trickling Filters are designed to minimize the necessity for operator involvement in the simpler filtration processes.

## Case Study:

### Low Carbon Footprint

On site assembly



A leading UK water company opted for a modular plastic media Trickling Filter system from 2H for a Secondary Treatment Plant at a large municipal Sewage Treatment Works. The main contractor awarded the contract to supply the 21,000cm of BIOdek 150m<sup>2</sup>/m<sup>3</sup> media to 2H who installed 8 Trickling Filters of 30.5m diameter packed with 3.6m depth of media.

The processes used significantly reduced the project's carbon footprint. The media was assembled on site thereby eliminating over 300 delivery truck movements from Northampton to site and saving over 89,300kg CO<sup>2</sup> which would otherwise have been generated.

Using Polypropylene (PP) rather than PVC to construct the media further reduced the environmental impact of the project. The PP was welded on site, rather than glued - which would have required around 120 tonnes of chemical solvent glue. The 2H welding process is more energy-efficient as, in this case, it saved on the electrical power that would have been needed to run four gluing machines and associated ventilation systems. The process also ensured a further 19,000kg CO<sup>2</sup> did not enter the atmosphere.



# Trickling Filter - Benefits

## Easy on Energy Consumption

Trickling Filters built using structured plastic media only require power for pumping, and do not need the large and expensive power-hungry aeration blowers used in suspended growth systems such as Activated Sludge and Sequencing Batch Reactors. Consequently, plastic Trickling Filters are an ideal solution for locations lacking reliable energy infrastructure, for example, in developing countries. A low energy requirement is also beneficial in more developed countries reducing the lifetime cost and carbon footprint of the Trickling Filter.

## Easy to Upgrade - and Increase Treatment Capacity

There is no need to take out entire Trickling Filter units as requirements change. New or upgraded filters can be replaced or added without complexity or expense. It is an environmentally friendly approach that extends the working life of an existing asset and improves the overall return on investment.

## Replacing or Enhancing Existing Rock and Random Media

Replacing or upgrading rock or random media-based filters with structured plastic media is a cost-effective way of increasing treatment capacity. It is possible to replace even older rock filter installations, which tend to be shallow, with plastic media.

Plastic media has a more open structure and 2-3 times more effective surface area than rock, so it provides more surface area for biomass attachment. Replacing rock with plastic allows for around three times the organic load and up to 10 times the hydraulic flow that would be possible using rock media.

### Case Study:

## Thatchers Cider



When increased demand prompted a 60% increase in production, Thatchers Cider asked 2H Water Technologies to upgrade its effluent treatment plant in Sandford, Somerset.

A purpose-built BIOdek Trickling Filter solution copes easily with a substantial BOD/COD load, which varies significantly when fruit such as blackcurrants are being processed, and keeps the facility within consent.

The Trickling Filter system includes a custom-designed Equiflo distributor and pump system. In addition, 2H liaised with Thatchers Cider's specialists to ensure effective integration with existing chemical treatment systems.

### Case Study:

## Premium Whisky Brand



When a representative of the environmental protection agency unofficially classifies the treated wastewater as "good enough to drink", you know the Trickling Filter is doing an excellent job.

One of the world's most successful producers of internationally renowned, premium whisky brands needed to replace the legacy onsite effluent treatment plant (ETP) at Dufftown, one of the company's – and Scotland's – largest distilleries. The failing ETP was based on a three-stage 'Davenport' rectangular section trickling filter system and two mineral – rock - media filters.

2H Water Technologies was commissioned to supply the process, civil, mechanical and control aspects of a BIOdek Trickling Filter system. 2H designed, manufactured and installed three BIOdek Trickling Filters with Equiflo rotary distributors at the Dufftown distillery. The project was carried out in collaboration with Design Supply & Install Ltd (DSI).

# Trickling Filter - Configuration

Making the right choice starts with understanding of your wastewater treatment requirements- roughing, secondary treatment, or nitrification. Factors such as organic loading, the media's specific surface area, void volume, and distribution characteristics are all vitally important in ensuring application and system performance. Similarly, the wetting rate, organic load, ammonia load, temperature of the wastewater, and desired effluent quality all play a part in determining the type and volume of media that will be required.

## Efficient biomass utilisation, quality effluent

We all accept that specific surface area and void ratio are important factors in securing effective performance. But have you considered the importance of configuration? Research has shown that media configuration has a significant effect on treatment quality. In other words, it is not just what you use, but how it is used.

When used with accurate wetting rate and distribution rates, 2H products enable wastewater to be treated in a controlled manner. The result is efficient biomass utilisation and quality effluent.

For Trickling Filter or Integrated Fixed Film Activated Sludge (IFAS) plants, BIOdek's open, uniform structure and high effective surface area supports greater organic and hydraulic loading rates than random media. In addition, the structured cross flow and vertical flow plastic media design of the 2H BIOdek range means biological wastewater treatment is simple to operate and requires low levels of energy, supervision and capital expense.

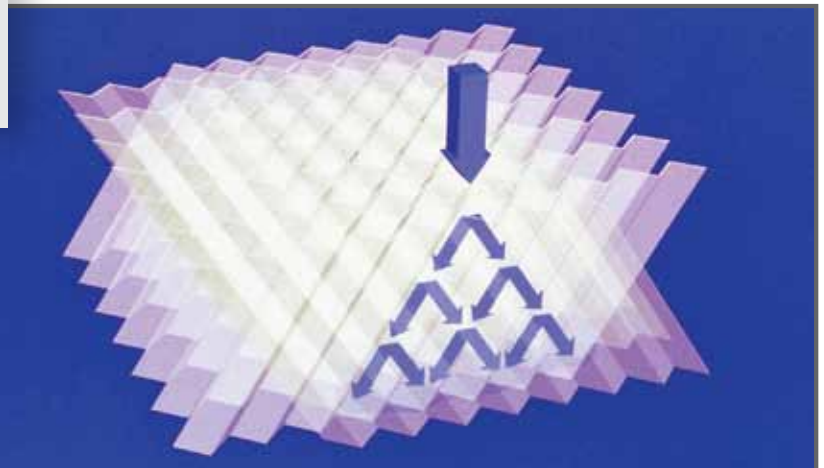
## PP or PVC: it's your choice

2H can provide Trickling Filter modules built using Polypropylene (PP) or PolyVinylChloride (PVC). We have extensive experience in using various grades of both PP and PVC, and can customise media equipment specifications to match each application, be it a new installation or a refurbishment. From a process performance point of view, both options perform equally well. However, the inert nature of PP has some advantages in the initial start-up of the seeding process. PP has another advantage in that it is always welded, which means there is no need to use expensive glues or environmentally threatening solvents with potentially harmful gaseous bi-products.

## Cross Flow Media

Structured configuration

- Total redistribution of flow
- No short circuit
- Maximum effective surface area
- Optimum mixing of air and water
- Modular



## Cross-flow configuration

The cross-flow configuration ensures distribution of the flow preventing the effluent from choosing preferential, short circuit paths.

# Trickling Filter - Media Configuration



## BIOdek Cross Flow Media

Cross-fluted flow media is made from sheets corrugated at 60° angles. The sheets are welded to form modules that can be packed per the Trickling Filter need and the available space.

The media is cross flow to create the maximum number of mixing points where adjacent sheets touch. For example, 150m<sup>2</sup>/m<sup>3</sup> specific surface area media provides 25,000 mixing points/m<sup>3</sup> to optimise the mass transfer of oxygen into water across the filter. This continually splits and re-splits the applied flow at each point of contact between the opposite downward sloping corrugations of adjacent sheets in each media block.

With structured cross-flow media, the 60° angle presents very few horizontal surfaces to impede the solids expulsion, encouraging the filter to remain aerobic and thus odour free.

The flow is split into a very thin film that flows down all the available surfaces.



## BIOdek Hybrid Media

In certain applications Hybrid media can be supplied with the media block configured with sheets of different flute sizes or cross flow sheets combined with vertical sheets. This allows optimisation of the specific surface area to allow for particular solids concentrations and more closely suit the applied loading rate.

Also the BIOdek media can be mixed, for example media with a lower Specific Surface Area (SSA) can be used at the top of the Trickling Filter to accept higher loadings with media of a lower SSA or even Vertical Flow media below to maintain process treatment but still allow the solids to flush through the filter.

## Benefits

Excellent mass transfer	Due to high mixing turbulence by cross-fluted structure
High resistance to erosion	Reinforced edges
Self supporting structure	High bearing capacity achieved by connecting points & variable sheet thicknesses
Flexibility in material & dimensions	Adaptation to plant requirements according to customer request
Long service life	Due to chemical, bacterial and UV resistance of PP and PVC

# Trickling Filter - Media Configuration

## Vertical Flow Media

Vertical flow media has vertical channels which redistribute the liquid flow only at module interfaces.

As a result, vertical flow media offers a superior bio-solids flushing action to prevent plugging with solids in high rate (Roughing Filter) applications.

Also for submerged aerated applications this allows easy distribution of oxygen through the pack.



## Benefits

High operation reliability	Limits the accumulation of solids and thick biofilms
Optimum solids discharge	Due to vertical channels and open interfaces
Self supporting structure	High bearing capacity with variable sheet thicknesses
High resistance to erosion	Reinforced edges
Low pressure drop	Due to vertical direction of all channels
Long service life	Due to chemical, bacterial and UV resistance of PP and PVC

## Structured Plastic Media – a Building Block not a Solution

The specific media used to construct wastewater treatment plants, for example, structured plastic media, is an important component, but it is not a solution, and should be considered as one key part of the overall water processing approach.



# Trickling Filter - Media Design, Build and Configuration



## Eradicating The 'Memory Effect'

2H has pioneered a patented approach to processing PVC/PP/PVDF granulates that eradicates the negative impact of the 'memory' effect which is a result of stresses inside foils resulting from conventional manufacturing processes. The stress-points become increasingly obvious on renewed heating, ultimately resulting in the foil pulling back into its original, flat shape.

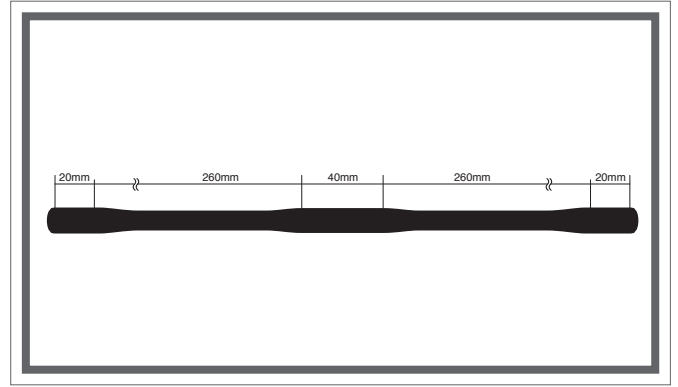
The memory effect is eliminated by the 2H production method as foils are formed directly from the molten mass which does not provoke the same 'stress' reaction. The customer receives a product that will retain its shape both during the installation phase and in normal operating life. In addition, compounding allows modules to be tailored to meet specific demands such as colour, or for implementation in a particularly hot environment.



## Welded for Strength and Safety

The method used to bond is important in ensuring the structural integrity of the Trickling Filter.

We use a unique welding process to assemble BIOdek, particularly for the PP product, which ensures a secure bond. Another significant benefit of the welding process, particularly in large projects, is that it allows for on-site assembly. Welding can provide significant health and safety benefits compared to using chemical solvents.



## Optimised Foil Thickness

2H developed a patent process for manufacturing embossed PP foils allowing the foil, including embossing, to be extruded directly out of the melting mass.

In addition to the production efficiencies this delivers, it also means that PP foils can be extruded 30% stronger at the edges and in the middle than at other points, thus providing much greater stability of the upper and lower edges of the fills.

This optimised foil strength distribution, combined with our developed PP compound ensures an exceptional high resistance to erosion – something which is caused by the constant impact of water.



## Perfect connections. Environment Sustainability

2H devised a sealing process as part of its environmental focus without adhesives or solvents.

The films are systematically welded with up to 20,000 sealing points per m<sup>3</sup> – depending on fill type – to ensure excellent foil connection and load bearing capabilities.

This connection technology strength has been accredited by TÜV.

# Trickling Filter – Media Support Systems

Trickling Filter media requires support off the tank base to allow the treated wastewater and sludge to drain away to the discharge gully or outlet. In the past, wastewater treatment managers had a choice of two approaches according to whether the Trickling Filter had a deep (over 3M) or shallow (up to 3M) plastic media bed.

For deep beds, the media support system would usually consist of a civil construction of dwarf walls supporting concrete lintels or a timber matrix. For shallow beds, the media support system generally consisted of solid concrete blocks - which lacks drainage and are easily eroded - laid directly onto the tank floor.

2H offers the following cost effective support solutions:

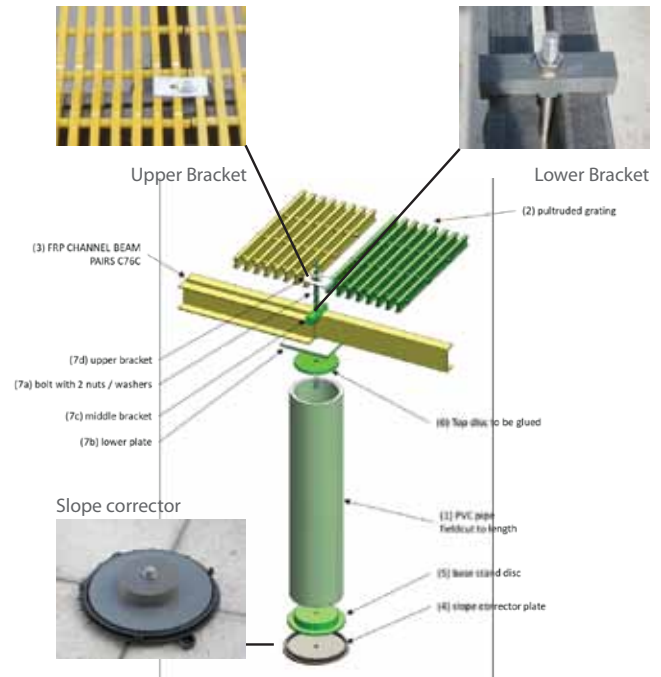
## PIERdek:

### Deep Bed applications over 3m

PIERdek has been designed to support Trickling Filters with deep bed BIOdek media.

2H builds and installs each PIERdek media support system from project-specific components - in plastic with stainless steel fixings - in a precise configuration calculated to match the operational load.

Because it's built from highly resistant materials, and has a far more open structure that helps maximise airflow, PIERdek is ideal for use in long term applications with more corrosive wastewaters. For example: in nitrifying filters where the alkalinity has been known to corrode dwarf wall concrete support structures.



## Media Support Tiles

### For Shallow Bed applications up to 3m

The 2H approach uses purpose-built, high-strength, corrosion resistant concrete tiles that offer better drainage **and** a longer working lifetime. The moulded tiles measure 500mm long x 250mm wide x 105mm high and provide 60% voidage to enhance drainage.

For plastic media applications, the tiles are laid in parallel lines on centres to provide the required 25% to 30% supporting area.



### Case Study:

### United Utilities, Ulverston

2H Water Technologies was commissioned by main contractors, C2V+ (a joint venture between Jacobs and VolkerStevin) to manufacture and install BIOdek structured plastic media and the PIERdek media support system in a new Trickling Filter at United Utilities' wastewater treatment plant in Ulverston, Cumbria.

Since going live the 2H Water Technologies installation has helped United Utilities meet its BOD reduction targets by cutting BOD levels from 68mg/l to 25mg/l.

### New Media, New Support System

2H was tasked with providing a custom-built PIERdek media support system.

2H designed a customised PIERdek solution that could be installed on a gradient and still present a horizontal support for the BIOdek media.

# Trickling Filter The Rotary Distributor

Trickling Filters can't operate efficiently - and deliver the results you want - without a rotary distributor capable of delivering consistent and reliable wastewater distribution. That's a big ask when many rotary distributors currently on the market have inherent design faults which can cause long-term problems and expensive downtime.

For example, badly positioned drives and other electrical components make the distributor prone to water damage while tubular arms with nozzles can easily become blocked.

# Equipflo

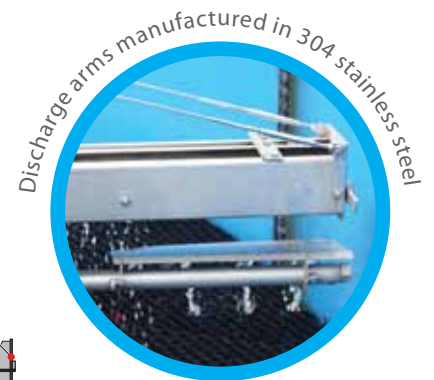
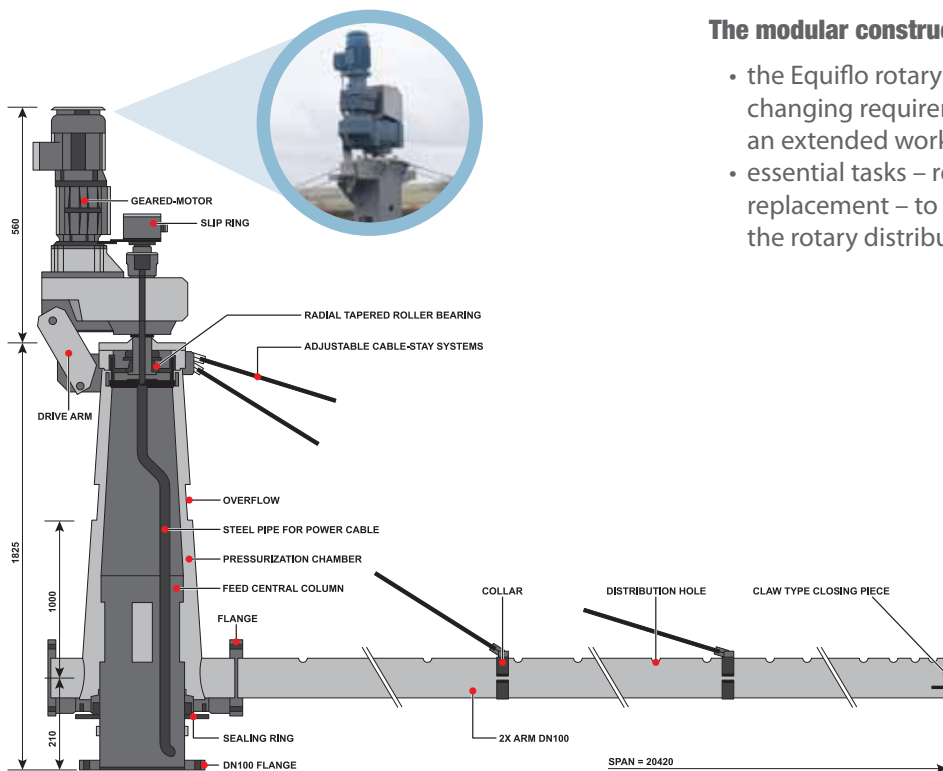
Equipflo is a new concept in intelligent, modular rotary distributor design which is not only free from common design faults but also adaptable, robust and reliable.

**Equipflo is built from modular, precision-built stainless steel components to the client's exact technical specifications with:**

- the motor and all electrical parts mounted well above the wetted floor to ensure they remain dry and problem-free.
- trough shaped, sectional arms which reduce the potential for blockage and are easy to clean and maintain.

**The modular construction allows:**

- the Equipflo rotary distributor to be adapted to meet changing requirements which means you benefit from an extended working lifetime and enhanced ROI.
- essential tasks – repair, cleaning, maintenance or replacement – to be carried out without dismantling the rotary distributor or suspending operations.



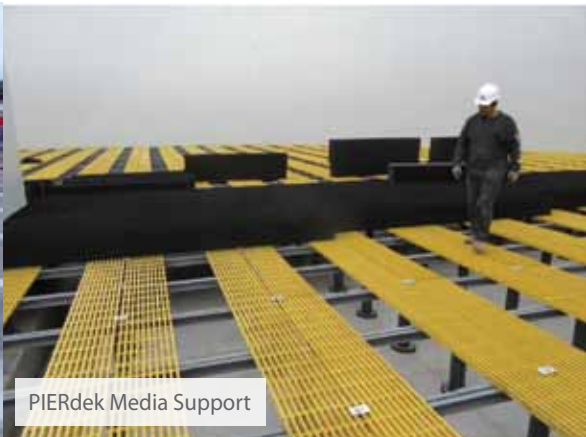
FEATURES	BENEFITS
<ul style="list-style-type: none"> <li>• Drive motor mounted on top of distributor</li> <li>• Drive motor is direct drive</li> <li>• Drive motor automatic disengage</li> <li>• Splash Plate application</li> <li>• Proof of curtain effect</li> <li>• Adjustable plate installation</li> <li>• Open Trough Arms</li> <li>• Manufactured fully in Stainless Steel</li> <li>• Top mounted main bearing</li> <li>• Motor Removing Davit</li> </ul>	<ul style="list-style-type: none"> <li>• Motor is mounted well above the wetted area of the filter</li> <li>• No requirement for air service or belt drive system required</li> <li>• Disengage system for motor failure is a simple mechanical by-pass</li> <li>• Creates a curtain effect to ensure all the media contributes to the process</li> <li>• Pan test as part of final installation set up</li> <li>• Simplifies the civil requirements and accurate distributor levelling</li> <li>• Not prone to blockage like tubular arms with nozzles</li> <li>• Ensures distributor life is minimum 25 years</li> <li>• Allows changing with just support from the distributor support column</li> <li>• The removable davit lifts motor and lowers to ground without a crane</li> </ul>

# Trickling Filter – Installation

Trickling Filter performance and reliability is only as good as the sum of its parts, which is why 2H Water Technologies offers a comprehensive packaged solution - products, services and consultancy - that covers all the bases from construction and installation to key ancillary equipment.



Simple civil design for base slab



PIERdek Media Support



Media Installation



Filter Shells



Concrete Tiles



Rotary Distributor



## Construction

- General installation services
- Simple civil design for base slab
- Media Support Systems
  - PIERdek
  - Concrete tiles



## Ancillary Equipment

- Media Installation
- Filter Shells
- Rotary Distributor
  - Equiflo
- Walkways

For more information, please call 01604 742300

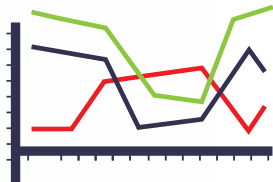


# Trickling Filter – Design Process

An effective Trickling Filter is not a commodity but a purpose-built solution in which the choice and combination of media has been carefully assessed to deliver the required operational objective.



## What do you want achieve



### Technical Considerations

- Media depth
- Influent application
- Media flushing
- Filter ventilation
- Media installation



### Design Information

- Biological Load (Kg BOD/day)
- Ammonia Loading rate (Kg Amm/day)
- Flow rates (m<sup>3</sup>/day):

- Minimum Flow (MF)
- Dry Weather Flow (DWF)
- Full Flow to Treatment (FFT)

Treatment rate required eg % BOD removed  
Consent mg/litre of BOD or Ammonia discharged from works

Influent Temperature (Min/Max)

We then apply our experience and knowledge to achieve the relevant design

ENEXIO FILTER DESIGN		DATE: 10/10/2018	
NO.	DESCRIPTION	QTY	UNIT PRICE
1	1000mm dia x 1000mm high	1	1000.00
2	1000mm dia x 1000mm high	1	1000.00
3	1000mm dia x 1000mm high	1	1000.00
4	1000mm dia x 1000mm high	1	1000.00
5	1000mm dia x 1000mm high	1	1000.00
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97	1000mm dia x 1000mm high	1	1000.00
98	1000mm dia x 1000mm high	1	1000.00
99	1000mm dia x 1000mm high	1	1000.00
100	1000mm dia x 1000mm high	1	1000.00

# About 2H Water Technologies

## R&D Expertise and Experience you can trust

2H Water Technologies invests heavily in an R&D strategy that produces the continuous improved technology our customers need to meet new legislative and increasingly tough regulatory demands.

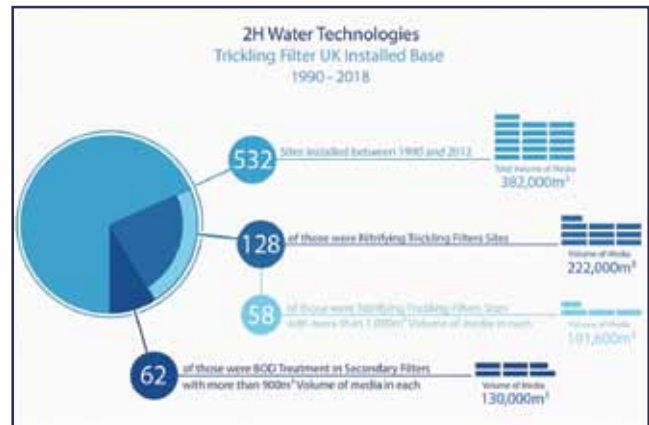
We're a key player in collaborative research with national Government bodies, globally renowned educational establishments and industry organisations which produces insight and guidance on wastewater management issues.

It's a powerful combination of practical, industry and academic expertise which, in combination with our deep understanding of customer needs, informs the design and development of new equipment and applications that improve water treatment equipment productivity.

2H Water Technologies provides specialist wastewater treatment management consultancy and engineering expertise at its HQ in Northampton, UK. However, our global presence means, wherever they're located, our customers can access expert advice and support.

2H Water Technologies' customers know they can trust our highly skilled engineers to provide exceptional quality service that's rooted in an understanding of operational and technical challenges.

## Here's proof



## Case Study:

# Establishing Universal Wastewater Treatment Standards



2H Water Technologies took a leading role in a four-year research project – EXPOVAL - aimed at establishing universal standards for wastewater treatment design and management.

The project, which was initiated in 2012 by the German Research Ministry, investigated seven key wastewater treatment areas, ranging from Activated Sludge systems to Tricking Filters. 2H, together with the University of Stuttgart collaborated on the Tricking Filter element of the project.

The result was a comprehensive range of standards, design algorithms, tools, rules and guidance on practical design and operational issues.

# 2H Water Technologies: the company

2H Water Technologies is the UK's leading manufacturer of plastic media for wastewater management plant.

## History

2H Water Technologies has served customers in the wastewater management sector for more than 30 years.

Formed from the Environmental Controls Division of Munters, Ranik and 2H Aqua operations, 2H Water Technologies has built an outstanding reputation for quality products and services.

We have a record of successful partnerships with customers and long-term market knowledge means that we work with most key operators in the wastewater treatment, potable water treatment, lamella settlement, industrial effluent treatment, process water cooling, gas purification systems and industrial agricultural component sectors.

Our extensive design and operational experience enables us to offer the process design support our customers need to ensure compliance with effluent discharge standards, economic benefit and operational reliability.

We work with customers in many different industries, and with public service organisations ranging from prisons through housing projects and schools.

Customers include all UK Water Utility companies and large civil engineering contractors such as Black & Veatch, C2V+, Costain, Galliford Try, KMI and Imtech. We are the designated 'preferred supplier' for many of our customers.

## Our People

It's the quality, expertise and commitment of our people, many of whom are globally renowned, that makes 2H Water Technologies an innovative force in the wastewater management industry.

## 2H Water Technologies' accreditations include:

ISO 9001 Quality (Cert No. 19/1786)  
ISO 14001 Environment (Cert No. 19/1783)  
ISO 45001 Health & Safety (Cert No. 19/1785)  
Achilles UVDB (Supplier No. 89787)  
TüV (German Testing Agency)

### Potable Water Certifications:

KTW (Germany)  
ACS (France)  
NSF/ANSI 61 Regulation (US)  
EU Reg 10/2100 (Food Grade Material)  
DWI Reg 31(4)(A) of Water Quality Regulations 2000  
No 3184 (UK)





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**ENEXIO**   
**2H WATER TECHNOLOGIES**

Water Management Professionals