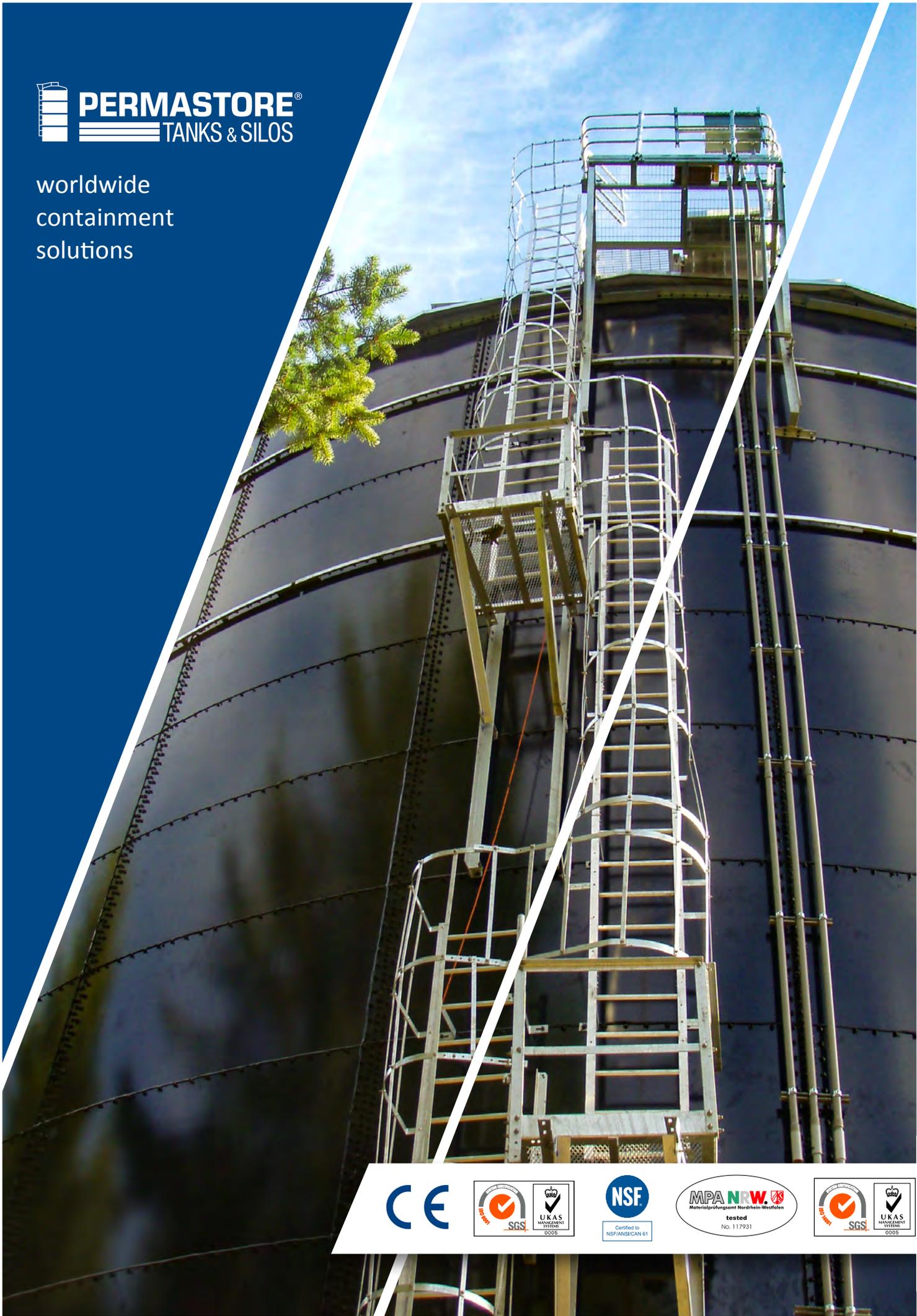




worldwide  
containment  
solutions



Permastore is the technical market leader in the manufacture and supply of Glass-Fused-to-Steel Tanks and Silos. For over 60 years the Company has been providing durable and cost effectively engineered containment solutions in Municipal, Industrial and Agricultural environments worldwide.

Permastore exports to over 110 countries and many thousands of structures have been installed worldwide, each with the ability to withstand local environmental extremes.

Permastore offers a complete range of diameter and height options with storage capacity solutions exceeding 50,000m<sup>3</sup> (13,200,000 US Gallons).

- ISO 9001:2015 - Certification of quality standards to guarantee Customer satisfaction.
- International Standards - Permastore's quality systems ensure that products meet or exceed the requirements of AWWA D103-19, EEA 7.20 and EN ISO 28765:2016 amongst others. PERMASTORE® structures are engineered with a predicted minimum 30 year design life in accordance with the requirements of ISO 15686-1:2011, ISO 15686-2:2012 and ISO 15686-3:2002 which provide the framework for determining and planning a service life of up to 50 years.
- International Bodies - Permastore Quality Standards are verified by MPA NRW. Certified to NSF/ANSI/CAN 61. Approved by the UK Secretary of State under Regulation 31 for drinking water and listed by the Drinking Water Inspectorate (DWI) in its List of Approved Products. CE Marking Accreditation for steelwork ancillaries associated with Permastore designed storage tanks. Welding management system complies with ISO 3854 part 4 EWF/IIW requirements.
- Environmental Management - Permastore holds ISO 14001:2015 certification which provides reassurance to customers of the importance we put on corporate, social and environmental responsibility.
- In-house Engineering Design and Contract Management - Reassurance that all structures provided by Permastore arrive on schedule and are fit for purpose.
- Production - All controlled at one manufacturing site, thereby simplifying the supply chain and providing a seamless service to meet Customers' requirements.
- Technical Support - An experienced team that interacts with our Customer base to ensure Customer demand is met.
- Modern Manufacturing Facility - A state of the art factory dedicated to the production of Glass-Fused-to-Steel and Fusion Bonded Epoxy products.
- Advanced Glass-Fused-to-Steel Technology - This provides the ultimate in corrosion resistance for the life of the structure.

## The Solution

### What is Glass-Fused-to-Steel?

Glass-Fused-to-Steel is a unique tank finish.

Two materials are fused together to achieve the best of both materials – the strength and flexibility of steel combined with the corrosion resistance of glass. Applied to both interior and exterior surfaces, Glass-Fused-to-Steel is able to provide many years of trouble free service in harsh environments.

- High performance and hard wearing
- As strong and flexible as steel
- Inert silica glass
- Colour fast / UV stable

### Features and Benefits of Glass-Fused-to-Steel



FEATURE	BENEFIT TO THE CUSTOMER
Modular Design	Site fabrication is not required simplifying build
Factory applied coating	Consistent quality not dependent on site conditions
Strong adhesion	Strength of steel with corrosion resistance of glass
Abrasion & UV resistance	Ensuring long term aesthetics and reduced maintenance costs
Lifetime coating, re-application not required	Reduced operational costs and downtime, improving the return on capital investment
Corrosion allowance not required	Reduced capital expenditure
Potable water compliant	Versatility at no extra cost

# Quality Standards

## Quality is independently Certified and meets or exceeds International Quality Standards

A philosophy enshrined in Permastore's procedures, which exceed the requirements of International Enamelling Standards. All industrial grade finishes are subject to 100% inspection and electrical testing of the contact surface. Any panel having a discontinuity is rejected. Permastore has earned this reputation by dedication to the highest quality and commitment to ZERO DISCONTINUITY (defect free at test voltage) glass fusion.



MPA NRW – Fully independent auditing of Permastore Quality Standards and product testing since 1986.



NSF/ANSI/CAN 61 – Certification for product quality and suitability for potable water storage.



ISO 9001:2015 – Certification of Quality Management Systems since 1996 to guarantee consistent customer satisfaction.

## Installation

The modular tank system allows very rapid installation when compared to traditional concrete or welded tank construction. The structures supplied and installed by Permastore's Distributors are constructed in accordance with detailed construction guides by trained crews to give rapid and high quality completion on-site.



Tanks and silos are each supplied as a complete kit of components ready for assembly. The kit design includes features to ensure that the build can take place in the optimum time and be "right first time".

Tanks are usually designed to be mounted on prepared concrete foundations. However PERMASTORE® structures can include Glass-Fused-to-Steel floors or cones where required.

This modular bolted system gives the flexibility of construction techniques to suit local conditions. For example, tanks and silos can be built with a jacking system which allows the build work to be carried out at ground level, giving build time and crew safety benefits.



## Potable Water



PERMASTORE® tanks are globally accepted for potable water applications.

The Company's Glass-Fused-to-Steel tank system has NSF/ANSI/CAN 61 certification and is approved by the UK Secretary of State under Regulation 31 for drinking water and listed by Drinking Water Inspectorate (DWI) in its List of Approved Products.

The hard, inert and hygienic surface of the Glass-Fused-to-Steel finish makes it simple to clean and disinfect water tanks.

A large range of water treatment processes can be accommodated within PERMASTORE® tanks, including borehole water, seawater desalination tanks, reverse osmosis (RO), permeate tanks, settling tanks, filtration tanks, disinfection tanks, coagulation/flocculation tanks, aeration tanks, activated sludge tanks, filter tanks, sedimentation tanks, chlorine contact tanks and dosing tanks, amongst others.

The bolted tank and silo system allows structural designs to be used in various configurations including water storage reservoirs, water standpipes, and elevated water distribution tanks.

Designs can accommodate secure tank storage for local environmental conditions, such as high wind speeds, snow or seismic loads.

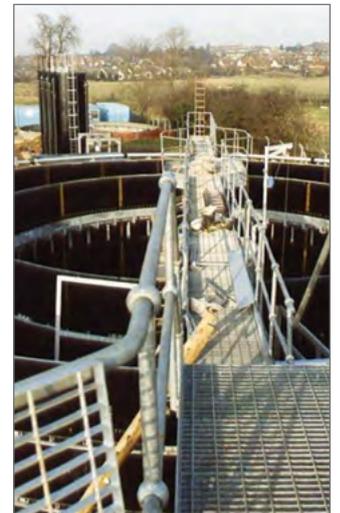
## Sewage Treatment



Glass-Fused-to-Steel tanks have a very high resistance to chemical corrosion and have excellent abrasion resistance properties, making them a suitable consideration in your sewage treatment application.

PERMASTORE® tanks have been successfully used for an extensive range of sewage treatment applications, including:

- Clarifiers
- Aeration
- Membrane batch reactors (MBR)
- Sequential batch reactors (SBR)
- Thickener tanks
- Sludge holding
- Sludge mixing
- Sludge treatment
- Equalisation tanks
- Trickling/filter media tanks
- Settlement
- Grey water
- Storm water
- Sludge cake silos



## Industrial Effluent

There can be a high degree of variability in the effluent from industrial sources. This can place a challenge on the process designer to select suitable storage and process tanks to withstand a range of aggressive liquids.

The PERMASTORE® Glass-Fused-to-Steel solution provides a high degree of protection for the tank for a large range of industrial processes from food waste to tannery effluent and leachate amongst others.

The advantages of the high corrosion resistance of Glass-Fused-to-Steel together with the modular nature of the tank build give customers significant benefits in containment security, project build times and life-time costs.



## Process Water

Process water tanks take advantage of the inert properties of the Glass-Fused-to-Steel finish and the fact that it does not require recoating, giving users the re-assurance they require for these critical applications.



With existing certification for potable water storage to NSF/ANSI/CAN 61 and approval by the UK Secretary of State under Regulation 31 for drinking water and listed by Drinking Water Inspectorate (DWI) in its List of Approved Products, PERMASTORE® tanks are proven to be ideal for process water applications.

For example, these can include food and beverage water requirements, or alternative water applications such as fish farms, or demineralised water storage for industry such as power plants.



## Bulk Solid Storage

PERMASTORE® silos with the hard, inert finish offered by Glass-Fused-to-Steel have exceptional resistance to abrasion and present a hygienic, low friction surface to the stored product.

The designs of the silos are tailored to suit specific material properties and allow for a range of loading (filling) and unloading (discharge) systems. They also can incorporate roofs, cones and connections for pipework or sensors.



Some of the bulk storage applications include:

- Food production
- Coal
- Carbon black
- Fishmeal
- Limestone
- Powders
- Plastics
- Road salt
- Soya meal
- Grains or other whole or milled food stuffs

# Market Sectors - Biogas & Anaerobic Digestion

Permastore's history of anaerobic digestion (AD) tanks exceeds 40 years, and the Company's experience has expanded considerably over the decades. Glass-Fused-to-Steel tanks are utilised for mesophilic digesters, thermophilic digesters, pasteurising digesters and enhanced enzymic hydrolysis (EEH) digesters amongst various other processes and applications.

In the industrial sector using anaerobic digestion to create biogas is increasingly recognised as a valuable method to utilise waste streams to create renewable energy.

Almost any organic waste can be digested, opportunities have developed to utilise food processing waste, domestic waste and restaurant waste. Increasingly combinations of waste streams are being processed along with co-digestion of municipal sludge effluent and farm waste such as animal slurry to generate "green" renewable energy.

Biogas produced can be cleaned and introduced directly into the grid, or converted into electricity in combined heat and power engines (CHP). This also gives the opportunity to generate heat energy in the form of hot water.

At the end of the process the digested material can be considered for use as fertilizer, which increases the potential revenue streams.

Modular design allows the flexibility to accommodate various aspect ratios, process pressures and temperatures to suit a variety of AD processes, designs and applications as specified by your process designer.

Glass-Fused-to-Steel is not only utilised for the tank walls but also in the roofs on tanks such as digesters. This gives the high degree of protection of Glass-Fused-to-Steel throughout a digester, especially in the highly aggressive gaseous zone.



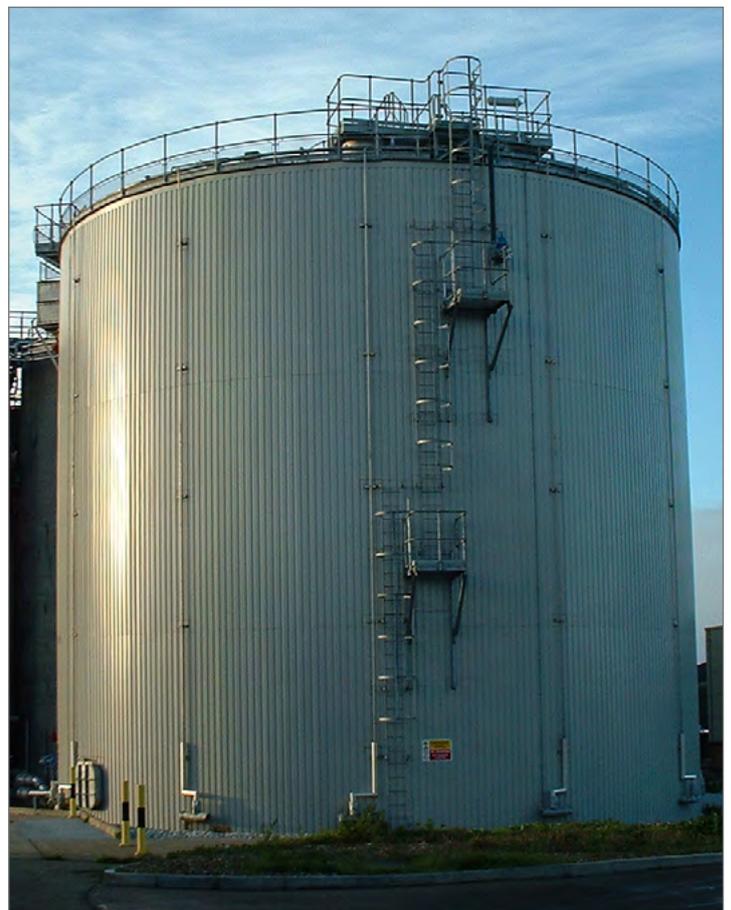
These roofs are structurally designed to allow for local environmental loading and can also support centrally mounted mixer systems.

Additionally, Glass-Fused-to-Steel tanks can also be used for biogas storage by incorporation of double membrane covers.

The combination of Permastore's inert Glass-Fused-to-Steel finishes, combined with the strength of steel and the flexibility of modular construction give significant benefits over other types of digester structures.

These include:

FEATURE	BENEFIT
Long life span	Reduced replacement costs and improved return on investment
Modular bolted tank construction	Rapid and cost effective site installation – Reducing project timescales, costs and requirement for on-site equipment
Flexibility to remodel and relocate	Tanks can be extended, dismantled and resited giving long-term asset value
Optimum corrosion resistance of Glass-Fused-to-Steel	Safe and secure storage with minimal maintenance costs
Complete range of diameter and height options with storage capacity solutions exceeding 50,000m <sup>3</sup> (13,200,000 US Gallons)	Most cost effective solution to meet customers' needs



## Slurry

Farm pollution control has become important and effective and secure slurry storage is a critical part of the solution.

Local environmental agencies around the world are using legislation and support schemes to encourage farmers to upgrade their slurry management systems. This includes drivers such as the European Commission Nitrates Directive and the US Natural Resources Conservation Service Environmental Quality Incentives Programme (EQIP).

To safeguard the environment, slurry is required to be stored at certain times of the year. This is where the high level of security of the PERMASTORE® Glass-Fused-to-Steel tank system is particularly suited. Permastore have been successfully supplying slurry tanks since the late 1960's, demonstrating the durability and longevity of the product in this harsh environment.



The ECOFUSION® agricultural grade finish is subject to Permastore's stringent manufacturing, inspection and testing regimes in accordance with BS and EN ISO standards.

ECOFUSION® is used for:

- Livestock effluent tanks
- Moist grain silos

## Silos



With a product history dating back to 1948, PERMASTORE® Glass-Fused-to-Steel silos provide clean and efficient storage of grains and forage. The secure sealed system of storage with capacities from 250 to 1400 metric tonnes (275 to 1540 US tons), gives significant benefits to livestock producers:

- High quality feed grain
- Maximised nutrient value of the feed with lower moisture loss
- Natural conservation without use of chemicals
- No drying costs
- Exclusion of vermin and birds
- Natural suppression of diseases and weeds by the dark, oxygen limiting environment
- Suitability for organically grown produce
- Traceability of inputs for accreditation schemes
- Permits earlier harvesting to eliminate drying costs
- Harvesting flexibility and buffer storage for existing grain storage systems
- Greater palatability for livestock
- High digestibility for livestock
- High animal growth rates and feed conversion efficiency



## Mining

The mining industry requires treatment tanks which must resist the highly abrasive nature of the contents and the corrosive environment of mining processes.

PERMASTORE® Glass-Fused-to-Steel tanks are ideal for this application. PERMASTORE® tanks are suited to tough environments where dependability is a vital characteristic. They can withstand the extremes of the environment in these remote locations, and the modular design principle of the tank kits offers ease of transport and assembly at site.

The bolted nature of the tanks allow them to be built very quickly when compared to welded structures. It also allows the existing tanks to be unbolted and moved on to new locations when required, significantly increasing asset value.

Both process and effluent treatment can be carried out in PERMASTORE® tanks in most applications which can include mines for gold, silver, coal, copper, diamonds, iron ore, cobalt, nickel, platinum, potash, rare earth metals, uranium, zinc and many other minerals.



## Biofuels

The biofuel industry is growing around the world as an environmentally acceptable renewable energy source generated from biomass. Biofuel use can reduce emissions of green house gases, lower the demand for fossil fuels and is often supported by government subsidies.

The main biofuels are, bio-ethanol or alcohol made from fermentation and bio-diesel produced by transesterification. They are both derived from organic biomass.

The plants manufacturing these biofuels therefore have requirements for tanks and silos for the input ingredients, from sugar and starch crops such as sugar cane to vegetable oils or animal fats. Also storage is required for the finished product as well as for feed water and fire water tanks on-site. BIOTANQ® modular tanks and silos can be utilised in these areas giving significant benefits over traditional welded structures.

International Standards – For biofuels storage, Biotanq's quality systems provide a credible alternative to the API 650 standard for welded tanks and to the 12B specification for bolted tanks.

## Benefits For The End User:

The BIOTANQ® Glass-Fused-to-Steel finish combined with its modular design and build concept, offers an array of benefits to contractors and end users.

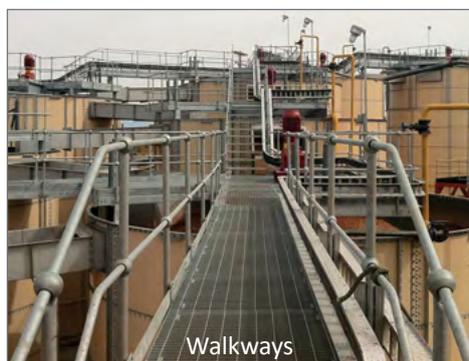
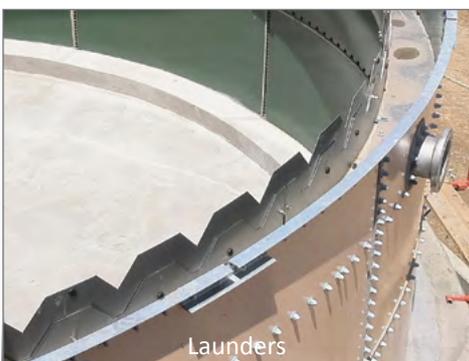
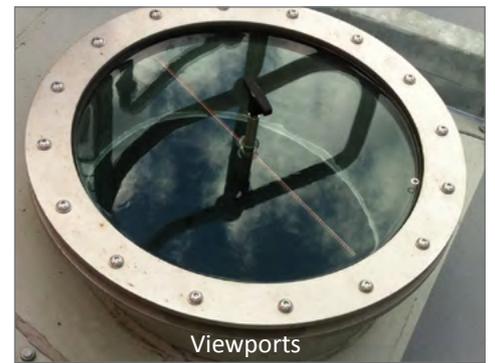
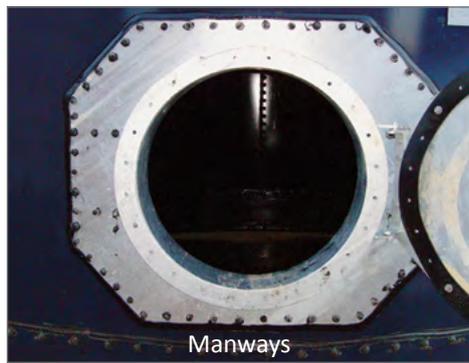
- Long Life
- Low Capital Cost
- Low Maintenance Costs
- Rapid more economical Site Installation Times when compared to welded structures
- Economic Worldwide Shipments
- Flexible to Remodel, Extend, Dismantle and Resite
- Optimum Corrosion Resistance



## Roofs & Covers



## Ancillaries



## TRI FUSION® PLUS

TRIFUSION® PLUS finish takes Permastore's acclaimed TRIFUSION® standard to an even higher level, for use in the most extreme of environments.

Aggressive chemical and high temperature processes can be considered with this high quality contact surface finish, offering zero discontinuity when tested to 1500 Volts.

- Application: pH 1-14
- Type: 3 coat, 2 fire
- Thickness: 340-500 microns
- Test Regime: Zero discontinuities at 1500V
- Exceeds quality requirements of EEA 7.20
- Meets or exceeds the glass coating requirements of AWWA D103-09 – Section 12.4
- Meets or exceeds quality requirements of EN ISO 28765:2016\*

## TRI FUSION®

TRIFUSION® has rightfully become the standard by which all other finishes are assessed. This proven high quality contact surface finish sets the benchmark for use in the more demanding areas of industrial effluent treatment and sludge digestion. An additional protective layer, together with the zero discontinuity finish tested at an exacting 1100 Volts, provides exceptional security and continuous protection.

- Application: pH 2-11
- Type: 3 coat, 2 fire
- Thickness: 280-460 microns
- Test Regime: Zero discontinuities at 1100V
- Exceeds quality requirements of EEA 7.20
- Meets or exceeds the glass coating requirements of AWWA D103-09 – Section 12.4
- Meets or exceeds quality requirements of EN ISO 28765:2016\*

## ISO FUSION® V700

ISOFUSION® V700 is the primary industrial contact surface finish generally used for bulk solids, storm water, filter tanks and sludge storage.

An established low cost solution delivering security and protection through Permastore's 100% inspection, high voltage zero discontinuity coating specification which is defect free at test voltage.

- Application: pH 3-9
- Type: 2 coat, 1 fire
- Thickness: 200-360 microns
- Test Regime: Zero discontinuities at 700V
- Exceeds quality requirements of EEA 7.20
- Meets or exceeds the glass coating requirements of AWWA D103-09 – Section 12.4
- Meets or exceeds quality requirements of EN ISO 28765:2016\*

## ECO FUSION®

ECOFUSION® is the agricultural contact surface finish which delivers a low cost functional solution for the storage of farming products, including animal slurry.

The ECOFUSION® solution is established as the product of choice for the agricultural market place.

- Application: pH 4-9
- Type: 2 coat, 1 fire
- Thickness: 180-360 microns
- Test Regime: 9V low voltage test using sampling procedure in accordance with ISO 2859-1
- Meets or exceeds requirements of BS 7793-1
- Exceeds quality requirements of EEA 7.24 & 7.25

\* Note: EN ISO 28765:2016 Vitreous and porcelain enamels – Design of bolted steel tanks for the storage or treatment of water or municipal or industrial effluents and sludges, covers both the glass coating requirement and the tank structure design and as such is the first dedicated international standard specifically created for the Glass-Fused-to-Steel product applicable for water and waste water applications.

A Zero Discontinuity policy applies to ECOFUSION®, ISOFUSION® V700, TRIFUSION® and TRIFUSION® PLUS for the tests shown. All applications are subject to concentration and temperature considerations. All specifications relate to the contact surfaces only. A detailed specification is available on request.

# Application Guide

APPLICATION	ECOFUSION®	ISOFUSION® V700	TRIFUSION®	TRIFUSION® PLUS	INTERNAL COLOURS
Farm Digesters using Agricultural Waste	✓				
Farm Digesters using any other Waste Streams		✓			
Edible / Vegetable Oils		✓			
Dry Bulk Solids		✓			
Storm / Fire Water		✓			
Potable Water (NSF/ANSI/CAN 61)		✓			
Drinking Water (DWI, Reg 31 Approved)		✓			
Filter Tanks		✓			
Municipal Sludge Storage (Open Topped)		✓			
Municipal Sludge Treatment (Open Topped)		✓			
Municipal Mesophilic Digester (Liquid Zone)		✓			
Municipal Backwash Effluent		✓			
Municipal Sludge Cake Storage		✓			
Farm Digesters (Roof & Rings Exposed to Gaseous Zone)			✓		
Municipal Sludge Storage (Roof & Rings Exposed to Gaseous Zone)			✓		
Municipal Sludge Treatment (Roof & Rings Exposed to Gaseous Zone)			✓		
Municipal Mesophilic Digester (Roof & Rings Exposed to Gaseous Zone)			✓		
Thermophilic Digester (Liquid Zone)			✓		
Industrial Effluent and/or Aeration Process			✓		
Food Process Washings			✓		
Liquid Leachates			✓		
Borehole / Brackish / Seawater			✓		
Thermophilic Digester (Roof & Rings Exposed to Gaseous Zone)				✓	
Aggressive / Chemical Industrial Effluent				✓	
Aggressive / Chemical Industrial Effluent				✓	

## Standard External Colours



## Optional External Colours



Further external colours are available on request.  
 All colour identification numbers are the closest visual match only.  
 All panel exteriors are Glass-Fused-to-Steel environmental specification.  
 Optional colours at additional cost.



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