ENGINEERED STORAGE PRODUCTS COMPANY

BIOENERGY

storage solutions

The Complete Storage Solutions Provider for Anaerobic Digester Applications

Meeting the Increasing Demand for Renewable Energy Worldwide

When you need components and options for state-of-the-art BioEnergy Storage Solutions, turn to Engineered Storage Products Company (ESPC), a division of CST Industries, Inc. ESPC is a global leader in the manufacture and erection of factory coated steel storage tanks, aluminum domes and specialty covers.

ESPC has been designing and manufacturing digester storage tanks and covers for more than 30 years and has hundreds of satisfied customers around the world.

Now, ESPC introduces BioEnergy Storage Solutions, a complete line of tanks, steel roofs, aluminum domes and flexible membrane covers for digester construction.

Our world-wide resources provide personalized service to meet our customers' needs including design and engineering, construction, customer service and support. ESPC and our Authorized Dealers work closely with BioEnergy customers to construct best-of-class, ultra-low-maintenance digester storage structures that provide longevity and a rapid customer return on investment.

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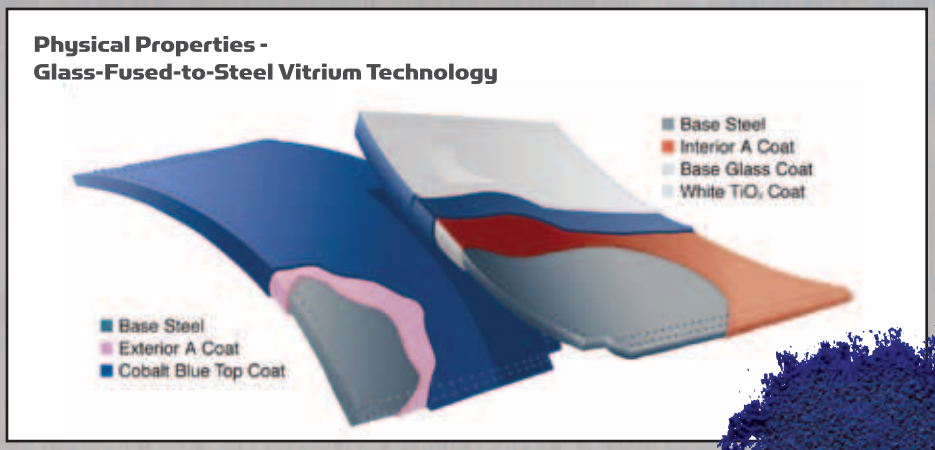
Coating Technologies for BioEnergy Storage Solutions Tanks

ESPC provides its customers with the data and information they need to make the right coating technology decision for their application. The only company that designs and manufactures multiple state-of-the-art coating technologies, ESPC provides our customers options in selecting which coating technology is best for each application – unlike companies with only one technology to offer.

Glass-Fused-To-Steel



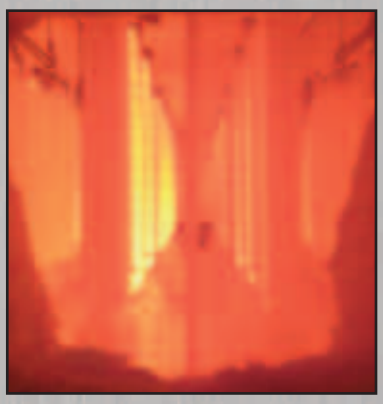
Vitrium™ glass-fused-to-steel is the premium coating in the digester tank market. It is a single, strong, integrated glass and steel material fused together at 1,500°F (816°C) in a controlled process furnace. The physical properties of Vitrium are specially suited for digester applications. The hard, inert barrier on both the interior and exterior tank surfaces guards against corrosion. Impermeable to liquids and vapors, it controls undercutting caused by corrosion and offers excellent impact and abrasion resistance.

Vitrium technology combines the outstanding chemical and physical resistant properties of titanium dioxide-enhanced (TiO_2) glass with a highly engineered, ultra-fine glass bubble structure for durability and flexibility. Our glass-fused-to-steel coatings range from 7-15 mils (175-380 microns) on the exterior and 10-18 (260-460 microns) on the interior. Interior sidewalls are tested to be holiday free using 1,100 volt dry testing method that exceeds the industry standard low voltage wet sponge testing method.

BioEnergy Storage Solutions tanks made with glass-fused-to-steel outperform other digester tanks, making them the best choice to contain the aggressive liquids found in today's BioEnergy facilities.

Anaerobic Digester Tank Design

ITEM	TYPICAL	OPTIONAL
Diameter/Height Ratio	1.0:1.0/1.2	1.0:1.0 thru 7.0:1.0
Pressure	5-37mbar (2"-15" WC)	Up to 60mbar (24" WC)
Vacuum	2.5-7.5mbar (1"-3" WC)	Up to 20mbar (8"WC)
Specific Gravity	1.05	Up to 1.8
Temperature	95°-105°F (35°-40°C)	140°F (60°C)
Fixed Roof Slope	20°	5°-20°
Mixers	Roof/Sidewall	Roof/Sidewall/Gas
Baffles	Yes	Yes
Ladder, Walkways, Platforms	Standard-Straight	Spiral
Concrete Floor	Flat	Up to 45° Conical
Steel Floor	Flat	Glass/Epoxy



Glass is fused to steel at 1500˚F (816˚C) in a state of the art furnace.

ESPC Epoxy Coating Technology

Our proprietary epoxy coating process provides maximum corrosion resistance and long tank life for the finest epoxy coating available in the liquid tank industry. In the process, parts are degreased and rinsed, hot air dried and pre-heated at an optimum temperature.

Part surfaces are then blasted with engineered grit material. This creates a rugged 3-D surface topography ideally suited for better powder coating adherence, increased durability and long-term coating performance. Then they are powder coated in a proprietary electrostatic booth with precise environmental controls, and cured at a tightly regulated temperature to maximize the cross-link bonding of the epoxy materials.

A uniquely engineered polyurethane topcoat is applied on exterior surfaces. This provides added UV protection and extends the coating life in tough outdoor conditions. A final curing stage through the oven is the last step in the ESPC process before our stringent quality control inspection – a high voltage defect testing procedure to identify any holidays, inclusions and thin areas in the coating.

Hybrid Tanks & Other Options

The unique design of ESPC's bolted tanks easily adapts for hybrid tank designs that utilize the strengths of multiple state-of-the-art coating systems. We can design tanks with different coating systems for the gas and liquid zones of a digester that create a unique storage solution that cannot be accommodated by concrete or field welded designs. ESPC also offers tanks constructed of stainless steel and uncoated steel when design specifications demand these options.

Component Comparison

PANEL TYPE	DIGESTER ZONE	DESCRIPTION
Vitrium™ Glass-Fused-to-Steel	Liquid Gas	- High Specification 3-coat Glass Coating - High Performance - Low Maintenance - Sidewall, Covers, Floors
ESPC Epoxy Coating Technology	Liquid Gas	- Proprietary Thermoset Coating - Exceptional Performance - Sidewall, Covers, Floors, Manway, Flanges, Baffles
Stainless Steel	Liquid Gas	- Grade 316 or 304 - Excellent Resistance Gas Zone - Sidewall, Covers, Manway, Flanges, Baffles
Uncoated Steel	Liquid	- Can be used as sidewall in non-corrosive liquid zones

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Bolted Tank Technology

Bolted Tank Technology offered in ESPC BioEnergy Storage Solutions tanks have numerous advantages over competitive tanks.

- All tank parts are factory coated for maximum protection and are easily transported to the job site.
- Bolted tanks can be erected in 1/3 of the time required to build a field-welded or concrete tank on-site.
- Tanks can be assembled in even the most remote sites, without large staging areas, and in every season of the year.
- Bolted tank construction is very conservation-friendly with little disturbance to the surrounding environment.
- ESPC bolted tanks are factory coated, so there is no in-field painting required which can expose the environment to harmful silica from sand blasting or paint overspray.
- Tanks are assembled at ground level using a unique jacking system that progressively elevates the structure to install the panels without the need for expensive cranes or staged scaffolding.

Choose Between Floor Options

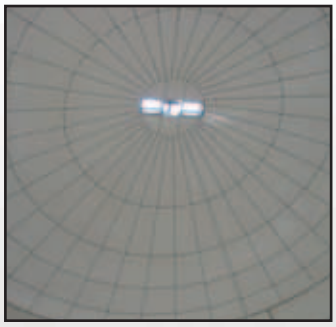
ESPC understands the complexity that can exist when providing floor designs for digester tanks. That is why we offer options for our customers depending on their digester need. The customer can select from Coated Steel (Vitrium Glass or ESPC Epoxy Coating Technology), or reinforced concrete. Concrete digester floors can vary from flat up to a 45° conical shape. Utilizing our worldwide regional offices and Authorized Dealer network we can work with the customer to provide the most economical floor design and installation that is required for the project.

Accessories – Optional Equipment:

- Nozzles
- Baffles
- Site glasses
- Roof walkways and railings
- Caged ladders and platforms
- Cross walks
- Sidewall manway ports
- Insulation
- Passive & active cathodic protection

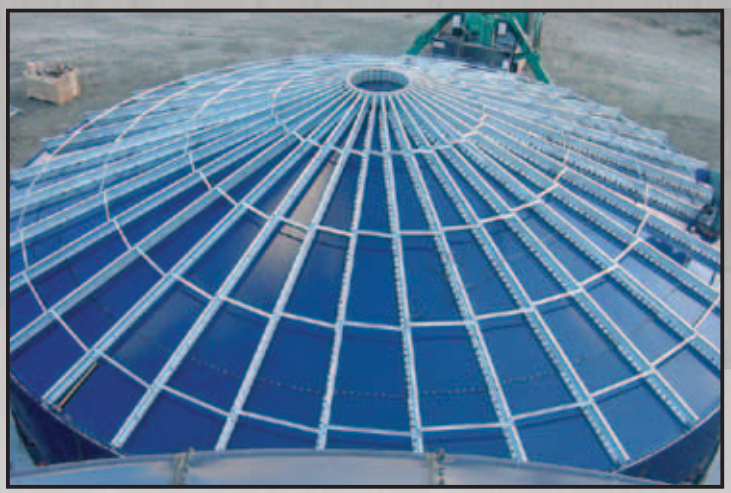







Multiple Tank Cover Options

BioEnergy Storage Solutions from ESPC include the industry's best cover options for digester applications. The gas zone of a digester is the most corrosive area and requires appropriate design. Along with this corrosiveness, there are many other factors (environmental, mixer loads, pressure, vacuums, ancillary equipment loads, etc.) that need to be considered in cover selection. ESPC can design and engineer the right solution from the multiple cover types in its portfolio.



ESR – Externally Supported Roof:

The most common roof design in the industry with a smooth internal roof surface and no rafters. Used when moderate to high pressure or vacuum design limits are anticipated. It is also preferred when there are heavy load conditions expected from mixers and/or other ancillary equipment is installed in the cover. Roof panels can be designed with Vitrium glass-fused-to-steel coating, ESPC Epoxy Coating Technology or stainless steel.

PD - Pressure Dome:

Geodesic dome design can be utilized in moderate pressure and vacuum designs and can accommodate light load conditions. All-aluminum design is lightweight, free-span and resists corrosion better than many other alloys.

KR - Knuckle Roof:

An option for smaller diameter storage tanks, a knuckle roof is best suited for lighter pressure and vacuum applications with no load bearing requirements. Fabricated from stainless steel to provide excellent gas zone longevity.

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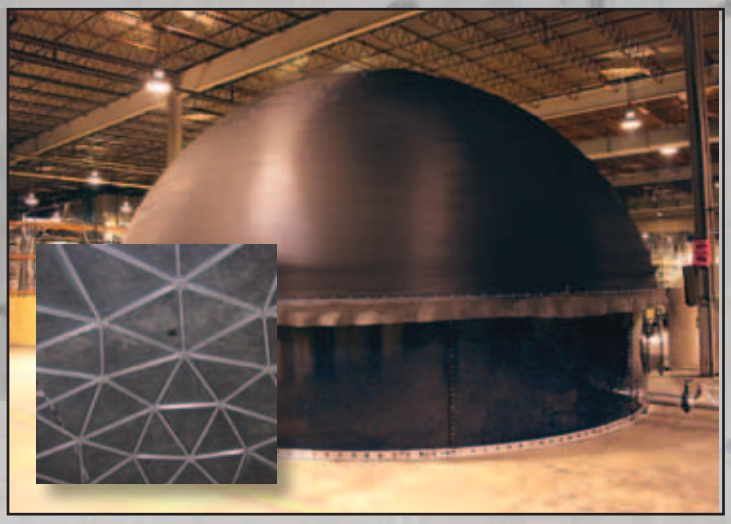
GSM - GeoFrame Supported Membrane Cover:

Unique proprietary design incorporating a geodesic aluminum strut support frame that provides a clear-span, obstruction-free cover which removes the need for center post and strap designs to support the membrane. Can be used in single and dual membrane configurations for low-medium pressure applications.



DMF - Dual Membrane - Foil Covers:

Designed to operate in applications with low to moderate gas pressures where there is not a design requirement for a fixed steel or aluminum cover. Multiple layers and optional center support structures are utilized depending on design considerations.

Roof and Membrane Options and Specifications

Roof Type	Max. Design Pressure	Max. Design Vacuum	Max. Diameter	External Loads	Coatings/ Material
ESR - External Supported Roof	60 mbar 24" WC	20 mbar 8" WC	25.9 (m) 85 (ft)	Accommodate heavy loads	Glass, Stainless Steel, Epoxy
PD - Pressure Dome	60 mbar 24" WC	15 mbar 6" WC	27.4 (m) 90 (ft)	Accommodate medium to light loads	Aluminum
KR - Knuckle Roof	20 mbar 8" WC	5 mbar 2" WC	9.5 (m) 31 (ft)	Limited	Stainless Steel
GSM - GeoFrame Supported Membrane Cover	10 mbar 4" WC	5 mbar 2" WC	30.8 (m) 101 (ft)	None	EPDM
DMF - Dual Membrane - Foil Covers	50 mbar 20" WC	7.5 mbar 3" WC	36.3 (m) 119 (ft)	None	Various Polymers

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Worldwide Network of Support
Bid and quotation services for BioEnergy Storage Solutions are available worldwide. Authorized Dealers and Factory-Trained Builders are located on every continent, providing construction and after-installation services.

Authorized Dealer Network
Authorized Dealers offer a complete storage solution for the life of the digester tank from specification to construction to service. No other tank company has the 60-plus years of experience and history of service that you only get from our dealer network. All design and engineering for BioEnergy Storage Solutions is done in-house for quality control and process efficiency.

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