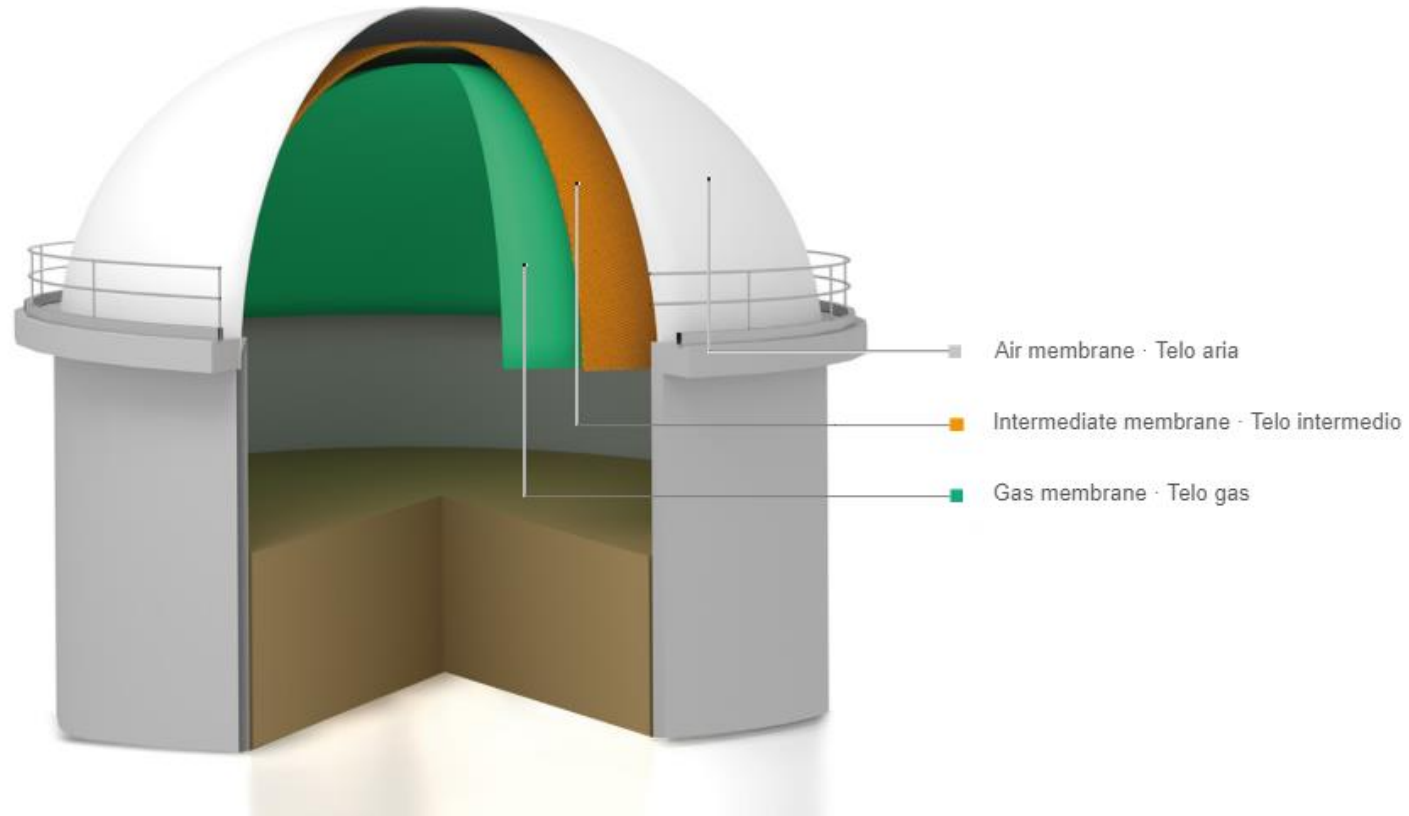




CUPOLA M3 Heat Shield



- ▶ The primary objective of CUPOLA M3 HEAT SHIELD is to reduce the heat loss from digester at its highest possible level.

- ▶ The CUPOLA M3 HEAT SHIELD is composed by three layers of membrane working as a roof on the top of the digester:
  - The external double-sided PVC coated polyester fiber fabric membrane; it is inflated with air.
  - The special insulated Heat Shield intermediate membrane, made by a triple layered ultra-shielded material to separate the inner biogas chamber from the air chamber.



▶ The special layers of this membrane act as a protection against heat dissipation in the following way:

1- A layer of aluminum reflects 96% of the radiating infrared heat

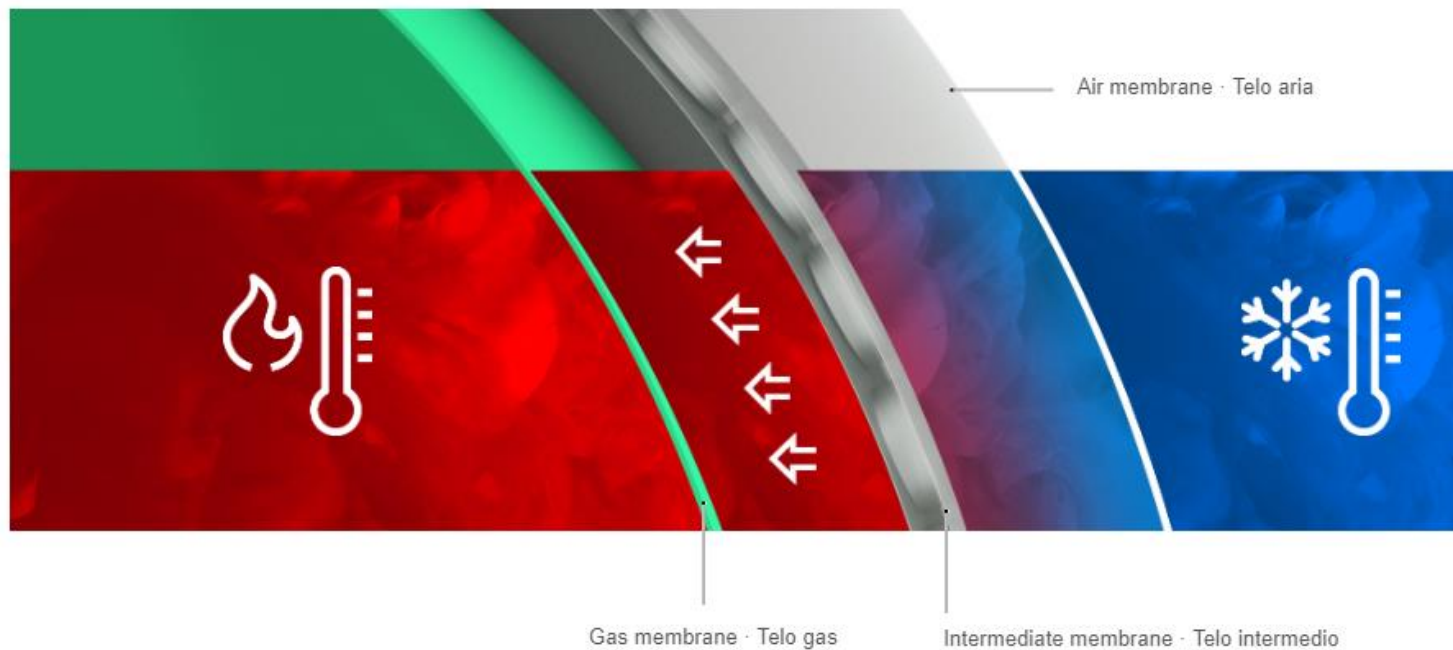
2- A layer of bubble polyethylene sheet reduces the heat loss through convection

3- A layer of pure polyethylene sheet gives an high gas tightness to the air chamber thus protecting the inner gas membrane from oxidation.

The inner double-sided PVC coated polyester fiber fabric membrane, with Eco-Safe layer.



- ▶ The CUPOLA M3 HEAT SHIELD is pressurized by a reduced power air fan running 24/24h and is regulated by a special valve that force the air to enter in the air chamber just in case the pressure in the dome is decreasing. Thanks to this combined system, there is a limited exchange of air in the air chamber with a reduction of heat loss due to less flow of cold air. This effect can be reached only in a triple membrane gasholder, because there is no need for a constant air exchange for safety reason, as a result of physical barrier by the intermediate membrane between the two independent chambers (air and gas).



## ADVANTAGE POINTS

### ✓ REDUCING OF 50% HEAT TRANSFER

Diminution of heat dissipation: consequently, energy costs for digester warming purposes are drastically reduced. Return on investment are considerably speeded up because of major energy saving.

### ✓ HIGH PASSIVE SAFETY AGAINST EXPLOSION DANGER

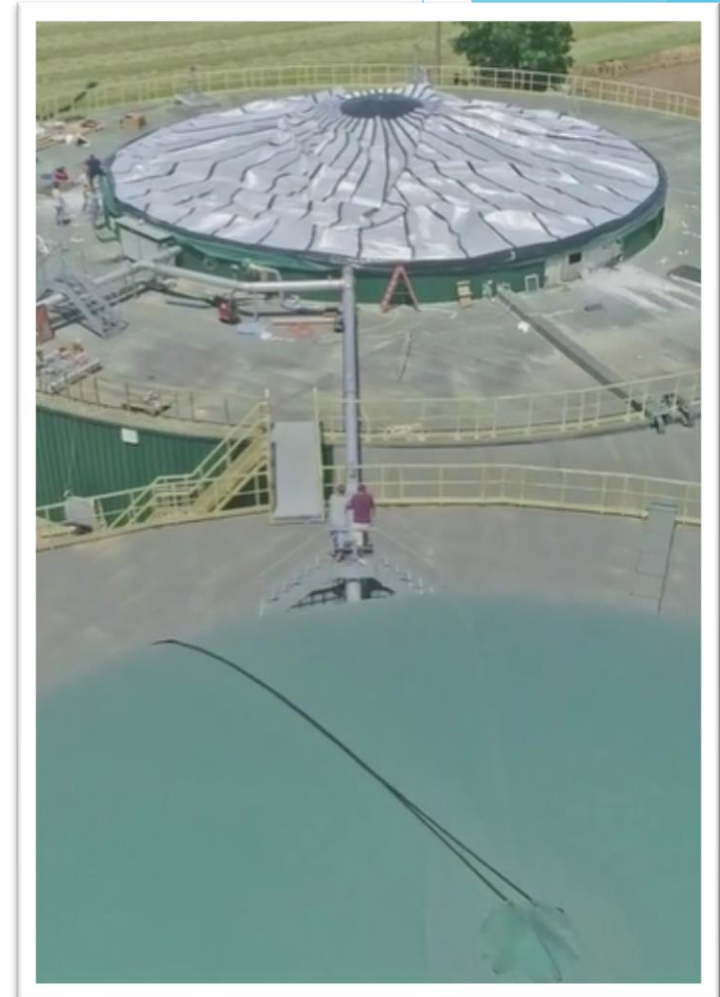
insulating membrane layer produces the complete separation between the air and the gas chamber. Any eventual gas leak cannot enter into the air chamber, and the formation of explosive mixture is prevented.

### ✓ REDUCED ELECTRIC CONSUMPTION

The "3-membrane" design, as a result of its self-functioning safety system, needs a reduced electrical power air fan.

### ✓ LONGER LIFETIME FOR THE GAS CHAMBER MEMBRANE

Since the gas membrane is completely covered by the intermediate one (opaque), we do achieve a protection from any ultraviolet light source and from explosion to direct oxidation by the air pumped by the blowers.



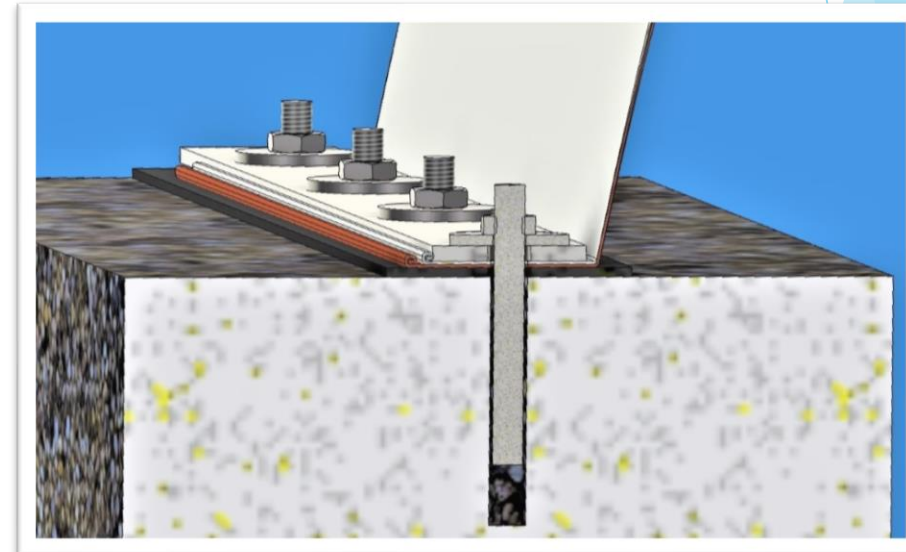
## MAIN COMPONENTS

### ► Anchorage System:

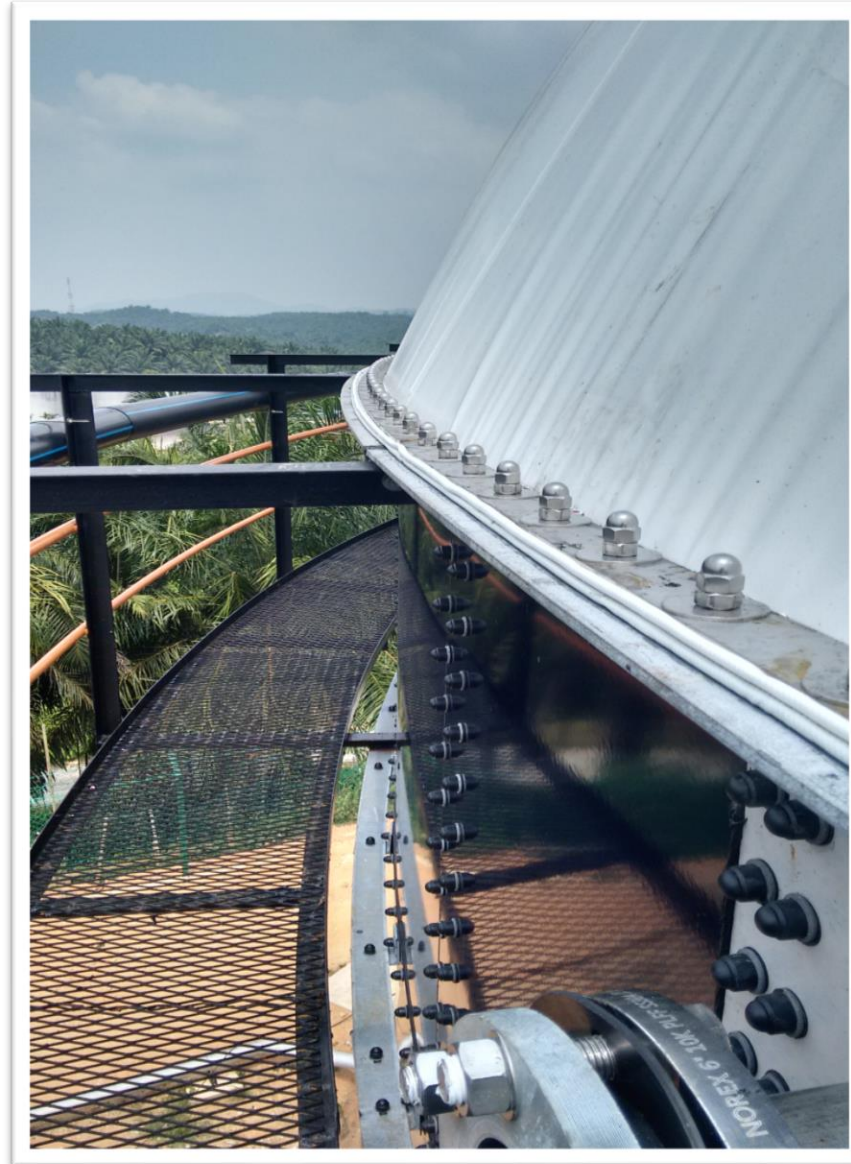
Our anchorage system is made in house with specially designed stainless steel anchoring plates that together with the action of the anchoring bolts manufactured by Hilti keep the membrane fixed on the ground concrete slab.

This well proven system with hundreds of installations done is able to keep the stresses acting from the membrane in any weather and pressure scenario.

To achieve the perfect gas sealing there are special butyl made gaskets and silicon sealant that secure the gas tightness on the perimeter of the gasholder.



- ▶ In case of steel tanks there will be simple anchoring bolts.





► **Centrifugal Air Fans:**

Our air fans are carefully selected only from the best suppliers and only in EX class execution.

The air flow is chosen to secure the perfect gas pressurization while also keeping washed the air volume between the gas and the outer membrane to reduce the risk of minimal gas mixtures.

They are furnished always with stainless steel made check valve that secures the maintenance of the pressure for enough time even during temporary power shut off.



▶ **Air Pressure Control Valves:**

Our air valves have been designed and utilized by Ecomembrane since 20 years to be able to achieve the best performances available for our specific work on the membrane gasholders.

In fact they present the following features and relative advantages compared with the standard weighted clapet-style valves used by our competitors.

They are directly attached to the external air membrane avoiding the use of any flexible pipe that could cause pressure drops and even break after some time.

The valve is totally covered by a aluminum box that protects the air flux from the action of wind, snow and icing that in the other models can change the working pressure of the gasholders.

The system use an Ecomembrane designed unique mechanism that with the use of leverages ensures the increment of the sensibility of the air valve to the pressure changes letting an enhanced control of the flows with the possibility to regulate the working pressure from 3 to 50 mbar without changing the valve.

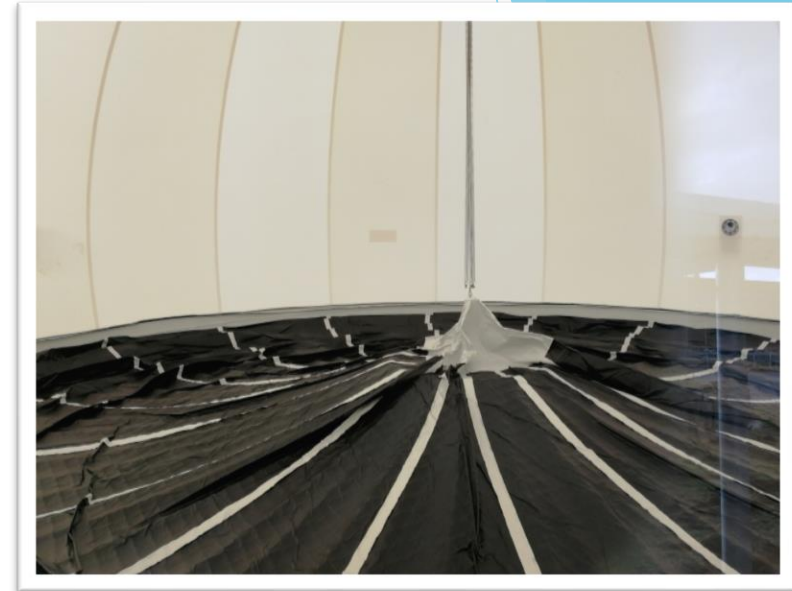


▶ **Level Sensor 4-20 mA:**

Our patented level sensor system is the only one that ensures the following two main goals:

- 1) achieving a constant and reliable level signal independently from the shape variabilities of the gas membrane during the filling-emptying cycles.
- 2) controlling the shape of the gas membrane to secure the complete usage of the geometrical volume of gas storage.

Our system control and diminish the weight of the top center part of the gas membrane letting it drive the direction of filling. In other terms with the aid of the special Ecomembrane level sensor the center top of the gas membrane will be the first part to rise up during filling time and the last one to go down during depleting time. In this way all the volume stored inside the gas membrane will be usable for the clients. In all the competitor's products the volume usage can reach no more than the 80% of the stored volume due to different level sensors.



► **Overpressure and Anti-Vacuum Valves:**

Ecomembrane produces his own biogas controlling valves. They are available in two working principles:

- 1) Pure hydraulic safety overpressure gas valves
- 2) Water sealed mechanical safety overpressure valves

The anti-vacuum valve is available only in the water sealed mechanical model.

All our valves are made in stainless steel and have an automatic refill system that ensures the reduction of the maintenance time of the end user.



► **Special Shape for Balconies Location:**

Ecomembrane is able to design and realize its own membranes in order to be adapted to any kind of balcony for human access box located on the perimeter of the digester and equipped with mixers and accessories for sewage or gas management.



- ▶ Based on customer requirements, Ecomembrane suggests the most appropriate form for membrane integration in order to not create stress on any of the surfaces. Ecomembrane is also skilled of studying and manufacturing dedicated stainless-steel balconies and supports so as to fully respond to the customer's accessibility requirements.

