Biogas Storage Systems

OP Power – October 30, 2015

textile constructions GmbH
Tecon

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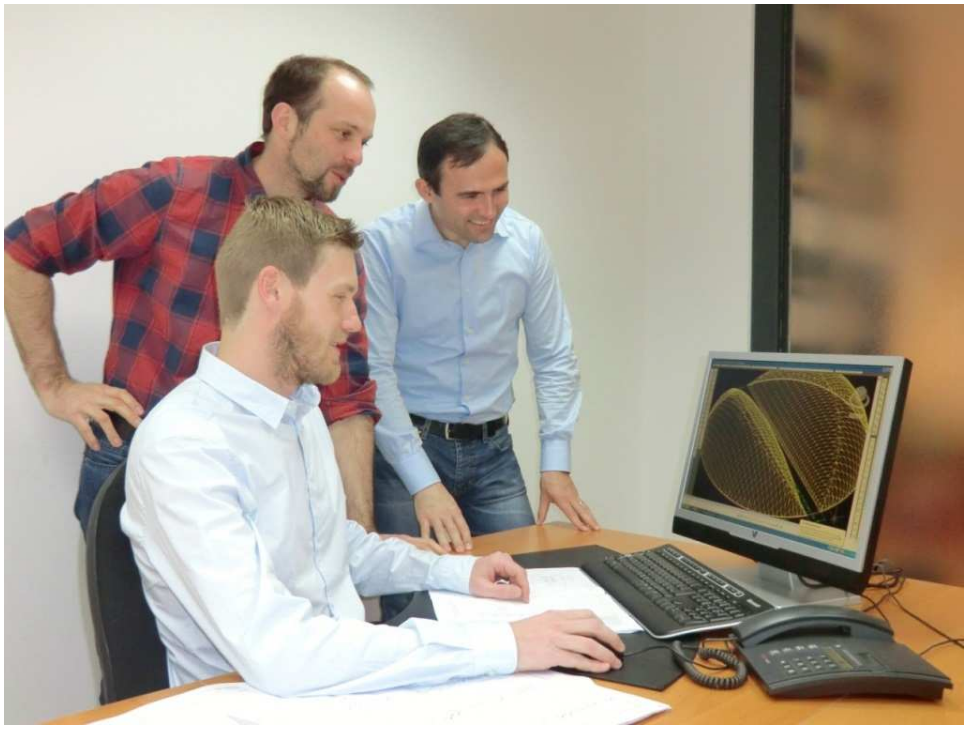
Company Overview



- **Tecon founded in 2000**
- **Focused on double membrane gas storage systems**
- **Founders are industry leaders for over 27 years:**
  - Christian Masswohl
  - Johann Riedl
- **Team committed to high standards of quality and service**

Earned Worldwide Leadership

- **Over 1,500 installations globally – all still operating**
- **100 projects a year**
- **Worldwide network of distributors**
- **Solve customer problems**
- **Responsive customer service**

Business Sectors

Municipal Wastewater Treatment Plants

Transforming wastewater biosolids into renewable energy

Industrial Wastewater Treatment Plants

Food and beverage sector including breweries, dairies, etc.

Municipal Solid Waste

Optimize use of landfill biogas

Agricultural Facilities

Dairy farm manure, harvest by-products, etc.

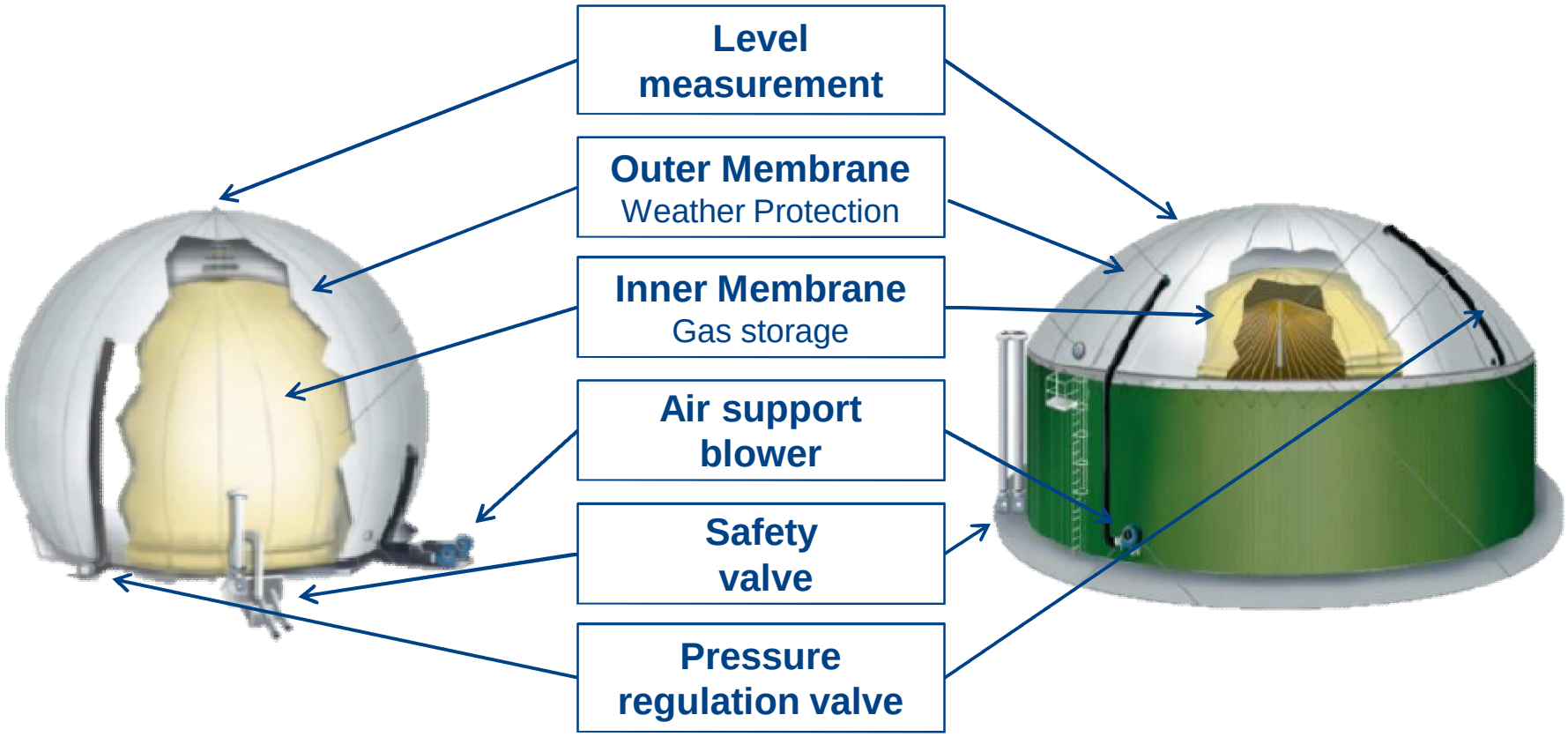
Benefits of a Gasholder

- **Supply energy when needed**
  - On demand at the plant
  - Shift of power production to peak pricing periods
- **Balance fluctuations in gas production**
  - Methods of mixing and sludge feeding
  - Inherent in the anaerobic process
- **Improves the efficiency of the plant**
  - Operability and reduces O&M costs
  - Essential for efficient engine generator operation

The Product – Components

Standard Gasholder

Top-Mounted Gasholder

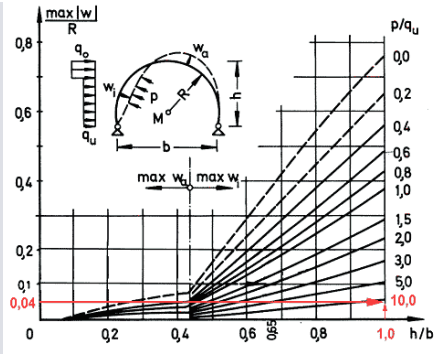


The Product – How it works

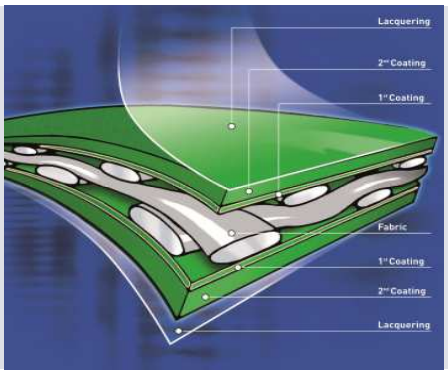
- **The biogas storage volume is between:**
  - Inner membrane and a third bottom membrane (standard gasholder)
  - Inner membrane and the tank (top mounted gasholder)
- **The blower provides the air pressure between the inner and outer membranes:**
  - Maintains outer membrane shape to withstand wind and snow loads
  - Sets desired system gas pressure within the inner membrane
- **Pressure regulating valve maintains system operating pressure**
- **Safety valve protects against excessive biogas pressure**
- **Filling level is measured through an ultrasonic measurement system or simple cable system**

Technical Highlights

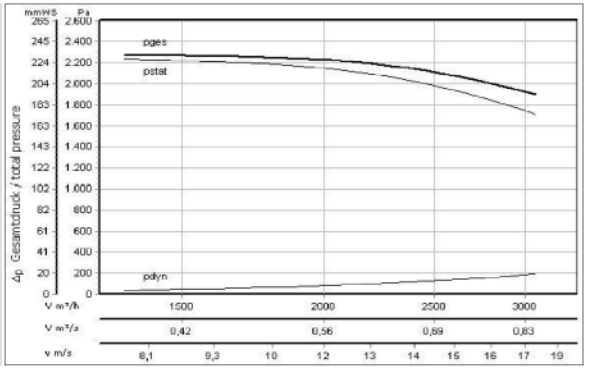
Structural design according to DIN 4134



PVC-coated membrane developed for biogas



Blower with linear performance curve



Unique positioning of air system

Maintenance free savety valve

Filling measurement

Technical Highlights of Tecon

- Every gasholder is tailored and calculated to customer's structural requirements
- Membrane fabrics specifically developed for the storage of biogas with strong Panama 2:2 or 3:3 weaving
- Air between the membranes is permanently replaced with ventilated new air
- Hydraulic safety valves are maintenance free
- Only stainless steel parts are used
- Maintenance free measurement systems with possible connection to the control center

Standard and Top-Mounted

Bottom Membrane

Inner Membrane

Standard Gasholder

Support Structure

Membranes

Top-Mounted Gasholder

A Solution for Every Challenge

Logo

Rectangular

Covered Lagoon

Pressure less

Service Platform

Service Bridge

Competitive Advantages

- **Reliable, fully developed and proven system**
  - No need of sophisticated electronic control devices
- **Customized structural design**
  - Meets or exceeds international standards and provides resistance against wind and snow loads
- **Know-how and experience of Tecon in all business sectors**
  - Experience to meet the increasingly strict standards of municipal and industrial wastewater projects
  - One competent partner for all business sectors
- **Low initial investment, fast installation and low maintenance**
  - Low initial and running costs compared with steel storage tanks

Our Promise and Our Goal

Our promise:

- Most reliable product with a mature technical design
- Knowhow of the leading experts for double membrane gasholders
- Experience of more than 1,500 built and successfully running projects
- Commitment of a team with the proven ability to handle any project anywhere in the world

Our goal:

- A successful partnership
- Establishing the Tecon Double-Membrane Gasholder as the market leader in the Columbia

Appendix

Selected Case Studies

Various Projects in America

Acapantzingo / Mexico

Wastewater Treatment / Volume: 2,040 m³

Ribeirao Preto / Brasil

Wastewater Treatment / Volume: 2,250 m³

Osorna / Chile

Wastewater Treatment / Volume: 590 m³

Nanaimo / Canada

Landfill / Volume: 1,150 m³

Mercedita / Puerto Rico

Destillery / Volume: 20 m³

Maple Reinders / Canada

Composting Plant / Volume: 2 x 260 m³

Wastewater Treatment / Brasil

Year of erection:	**2009**	**Storage volume:**	**540 m³**	**Gasflow:**	**225 m³/h**
Installation time:	**2 days**	**Diameter:**	**29 m**	**Electrical Output:**	**0,2 MW**

Tequilla Distillery / Mexico

Year of erection:	**2008**	**Storage volume:**	**1.840 m³**	**Gasflow:**	**1.000 m³/h**
Installation time:	**2 days**	**Diameter:**	**29 m**	**Electrical Output:**	**1,0 MW**

Wastewater Treatment / China

Year of erection:	**2009**	**Storage volume:**	**7.080 m³**	**Gasflow:**	**2.500 m³/h**
Installation time:	**2 days**	**Diameter:**	**25,2 m**	**Electrical Output:**	**2,2 MW**

Wastewater Treatment / Hungary

Year of erection:	**2008**	**Storage volume:**	**2 x 3.500 m³**	**Gasflow:**	**3.000 m³/h**
Installation time:	**5 days**	**Diameter:**	**20 m**	**Electrical Output:**	**3,0 MW**

Wastewater Treatment / USA

Year of erection:	**2012**	**Storage volume:**	**2.000 m³**	**Gasflow:**	**600 m³/h**
Installation time:	**3 days**	**Diameter:**	**24 m**	**Electrical Output:**	**1,6 MW**

Palm Oil Plant / Indonesia

Year of erection:	**2011**	**Storage volume:**	**18.000 m³**	**Gasflow:**	**6.000 m³/h**
Installation time:	**9 days**	**Size:**	**3 x 45x35x8 m**	**Electrical Output:**	**6,0 MW**

Dairy / Israel

Year of erection:	**2012**	**Storage volume:**	**1.200 m³**	**Gasflow:**	**300 m³/h**
Installation time:	**1 day**	**Diameter:**	**23 m with bridge**	**Electrical Output:**	**0,5 MW**

Municipal Solid Waste / Germamy

Year of erection:	**2006**	**Storage volume:**	**1.850 m³**	**Gasflow:**	**900 m³/h**
Installation time:	**6 days**	**Size:**	**2x27x6x6m +1x d22m**	**Electrical Output:**	**1,50 MW**

Landfill / Spain

Year of erection:	**2006**	**Storage volume:**	**660 m³**	**Gasflow:**	**650 m³/h**
Installation time:	**1 day**	**Diameter:**	**11,5 m**	**Electrical Output:**	**0,6 MW**

Agriculture / Slovenia

Year of erection:	**2011**	**Storage volume:**	**15.000 m³**	**Gasflow:**	**8 x 1.000 m³/h**
Installation time:	**12 days**	**Diameter:**	**6x24 m + 2x28 m**	**Electrical Output:**	**4,8 MW**

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