Advantages of Membrane Tanks

- Theoretically unlimited tank size (same panels and same membrane thickness can be used for all tank sizes)
- Most of the materials are standard materials which are available worldwide (local procurement and local manufacture)
- Less dependent on highly volatile nickel price (22 t Ni for one 320,000 m³ Membrane Tank << 360 t Ni for two 160,000 m³ Full-Containment Tanks); Reliability of cost calculation
- No welders with high qualification required (membrane is welded > 80 % automatically)
- High cool-down rate (less thermally-induced stresses due to low mass of metallic components)
- Less susceptible to seismic loads due to the fact that there is no free standing inner tank => no inner tank anchors required
- Significant CAPEX and OPEX savings to client
- Design is ready, Costing are accurate

TGE offers tailor-made solutions for your requirements.

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TGE Gas Engineering

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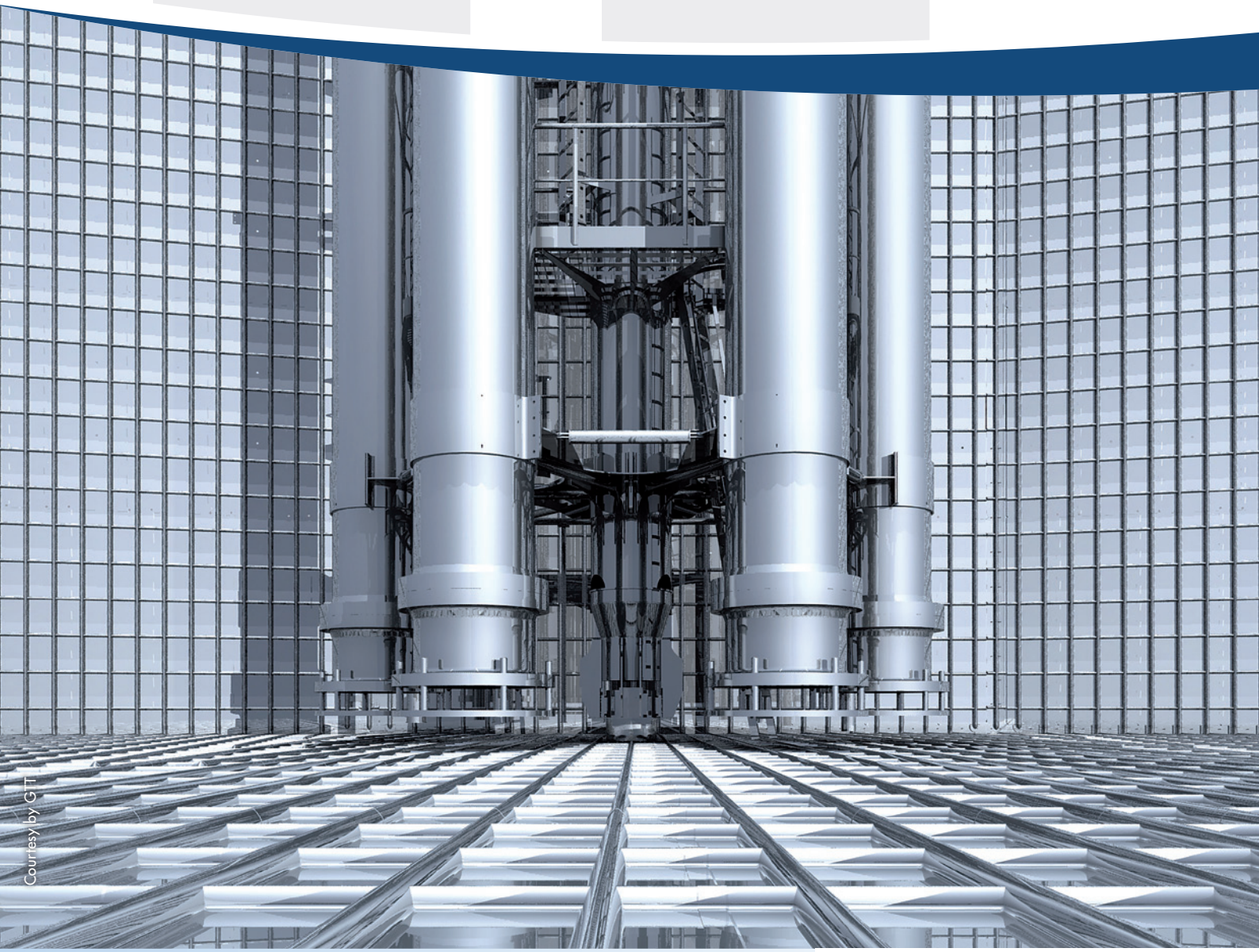
Big Size Membrane Tanks



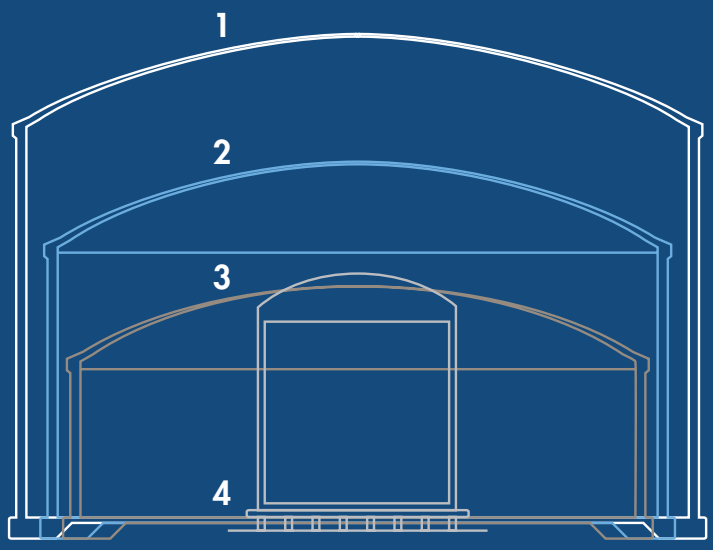
Courtesy by GTT

TGE Gas Engineering

TGE has more than 30 years of experience in design, procurement and construction of cryogenic storage facilities and terminals for liquefied gases.

TGE provides services in liquefied gas storage tank design by utilizing state of the art design tools and has broad experience in providing EPC service for storage tanks. TGE has experience in the design and construction of relevant tank concepts including:

- Cryogenic storage tanks for import, export, buffering or distribution of LNG, LPG, Ethane, Ethylene, Propane, Propylene, Butane, Butadiene, Ammonia and other liquefied gases
- Earth covered tanks (ECT) for pressurized storage of liquefied gases
- Horizontals bullet tanks and spheres for pressurized or semi-pressurized storage of liquefied gases



TGE is now ready to build up to 320,000 m³ tanks of membrane construction.

1 320,000 m³
2 160,000 m³
3 80,000 m³
4 10,000 m³

What is the advantage of bigger Tanks?

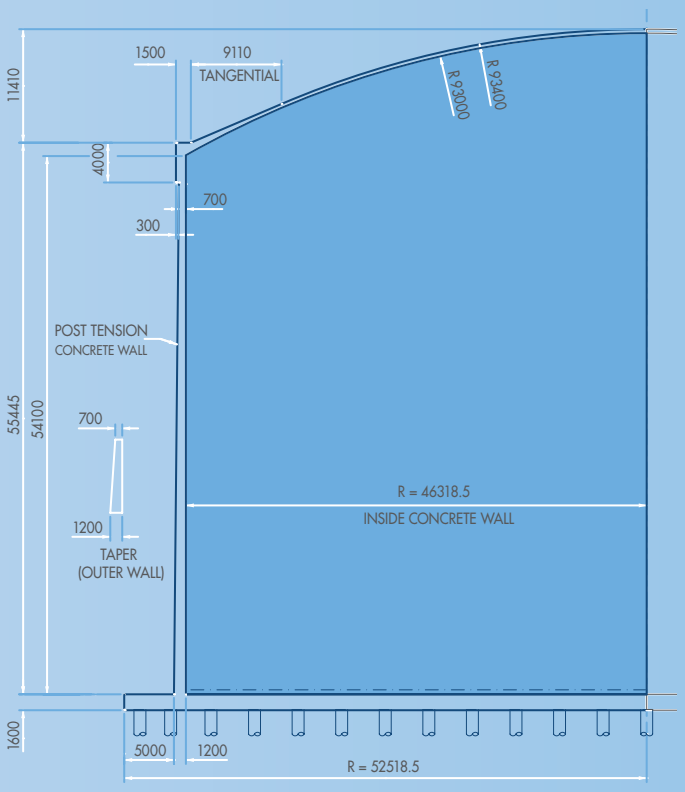
- Less Space Consumption
- Reduction of Process Cost
  - Reduced Piping
  - Reduced Instruments
  - Reduced number of Pumps
  - Reduced operations complexity, hence increased safety
- Receiving bigger Gas Carriers
- Strategic Storage in Areas which are not suitable for Under-Ground Storage
- Reduction of Construction Costs

What are the constrains for bigger conventional tanks?

1. No 9% Ni steel supply at higher thicknesses (~40 mm and more) available
2. Big thickness requires enhanced welding technology
3. Handling of thick plates requires special effort
4. High local stresses in corner area

Comparison of Tank Dimensions

	320,000 m³ Membrane	160,000 m³ Full Containment
Outer Tank Diameter	91 m	80 m
Cyl. Shell Height	54 m	39 m
Concrete Wall Thickness	1200 mm to 700 mm (tapered)	700 mm



Cost and Schedule Comparison

One Membrane Tank 320,000 m³ vs. two Full-Containment Tanks 160,000 m³ each

- Civil construction schedule is based on executed projects in China
- Civil construction costs are based on actual design for a 320,000 m³ Membrane Tank
- Insulation schedule is based on executed projects in South Asia
- Insulation material costs based on actual material inquiries for all parts of the insulation

=> High reliability of TGE's comparison

Result of Comparison

1

Construction schedule of 1 x 320,000 m³ Membrane Tank is comparable to 2 x 160,000 m³ Full-Containment Tanks

2

Cost savings between 15 and 22 %, depending on Nickel price and on number of tanks installed