67 years in the Gas Business

We are "GAS PEOPLE"
LPG, LNG, Industrial Gas
Worldwide References

- More than 3,500 plants/larger installations supplied since 1951
- We deliver infrastructure and solutions
- We do not sell gas
Wherever you are, we are
LNG Bunkering
Methods of LNG Bunkering

1. Terminal Tank to Vessel
2. Truck to Vessel
3. Vessel to Vessel
4. Portable Tank Transfer

Source: ABS, USA
## Advantages & Disadvantages

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Source: SSPA, Sweden
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Source: SSPA, Sweden
The "Samsø" Project

Project partners:

Q8

SAMSØ REDERI
The Samsoe Project
Prinsesse Isabella
Tender for the Bunkering facility

- No permanent tank on quay-side
- Maximum bunkering time <15 min
- No permanent staff on shore
- Entire facility has to be moved to Samsoe in less than 5 year
- Green Profil = No Emission
- Turnkey
https://www.youtube.com/watch?v=yUAR5h83KUo
Source of the LNG

GATE Terminal

Port of Hou
Logistic Supply Chain
LNG Bunkering Unit
Operation
Zero Emission

- As the ferry leaves the remaining liquid in the lines will be vaporized and displaced to the road tanker through the vapour line due to thermal expansion and lower pressure in the road tanker.

- Economizers will lead the gas around the safety valves just a bar below the limited before the valve opens.

- The Global warming from Methane has been estimated to be 25 times greater than CO2.

Danish Patent No. PR 178151
The system – Cool down
Data Tracking

PT1: Suction line pressure before pump
PT2: Discharge line pressure after pump
PT3: Tank trailer pressure (source tank)
Pumpattemps: When the transfer pump is started
Ship pressure: Pressure inside the ship tank (receiving tank)
The system - Connection
Flexible & Movable
Exchange of trailers

1. Parking ramp for semi-trailer
2. Connection to the LNG bunkering unit
3. Empty semi-trailer to be removed
4. Hoses disconnected from the semi-trailer
5. Empty semi-trailer, hauled away
6. Loaded semi-trailer pushed onto parking ramp
7. Hoses connected to semi-trailer
8. Kosan Crisplant LNG bunkering unit

https://www.youtube.com/watch?v=rBrskWt-HBM
Bunkering Data

- Feb. 2015 – Aug. 2017
- 232 truck loads (5.44 days between shifts)
- 10.092 m3 transferred
- 786 bunkerings
Advantages

► Less fixed assets

► Bunker fast and safe – 1,000 litre/min

► Fully automatic

► No methane emission

► Very low operational costs – no fixed staff
Limitations to the original concept

Volumen

Flowspeed
Bunkering from Multi Trailers
Multiple Trailers

- 2 Tank Trailers
- Serial or Parallel Connections
- Flow rates from 40-80 m³/h

- 4 Tank Trailers
- 2 Pumps each with 60 m³/h
- Flow rates 40-160 m³/h
Bunkering from Y-piece
Y-Piece

- Connection of 2 trailers
- Bunkering volume per. trailer < 45m³
- Total volume for two trailers = 90 m³
- Bunkering flow 1000-2000 l/m

Project partners:
Bunkering from Manifold
Bunker manifold

- Bunkering with on-board trailer pumps
- Bunkering volume per. trailer < 45m³
- Total volume for 4 trailers = 180 m³
- Bunkering flow 1600-4000 l/m

Project partner:
Bunkering from Movable Multi Trailers
Movable Multiple truck to ship (Movable MTTS)

- 100% autonomous and movable
- Bunkering directly from multiple tank trailers
- 2 - 6 trailers connected
- 40 - 240 m³/h bunkering flow.
- Bunkering of 5-300 m³ per bunker operation

Project partners:
Bunkering with Intermediate storage tanks
Stationary tank

- 2 x 300 m³ fixed tanks on shore
- Flowspeed 24-160 m³/h
- One truck loading point
- Bunker assisted crane
Bunkering with Intermediate storage tanks + Multi trailers
Stationary storage tank with multiple trailer

- 40 - 320 m³/h bunkering flow
- Volume up to 450 m³ per bunker operation
- Optionally equipped with PBU for fast bunkering
- Ideal to achieve high flow and maximum flexibility
- Possible to increase capacity and flow rate in phases
LNG Bunkering Solutions Overview

Total volume m³

- 500 m³
- 400 m³
- 300 m³
- 240 m³
- 160 m³
- 120 m³
- 80 m³
- 60 m³
- 40 m³

Flow

- 40 m³/h
- 80 m³/h
- 120 m³/h
- 160 m³/h
- 240 m³/h

LNG Bunkering Solutions

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