SMALL SCALE LNG FOR SHIPPING

Go LNG Conference
Vilnius, 26th of April 2016
Managing Director Knut Førland, Liquiline LNG
Company Profile

• A Norwegian based gas technology company with history back to 2005. An independent provider of services and innovative solutions for transporting and storing of liquefied gases:
  ✓ Technical consultancy services
  ✓ Terminal construction company
  ✓ Specializing in the small-scale LNG market
  ✓ Strong focus on skip bunkering solutions
Company Profile

- Portfolio of innovative and flexible distribution technologies provided as part of our services
- Privately held and member of the Network LNG Norway (www.networklngnorway.com)
- Winner of the Norwegian Regional Innovation Prize 2013
- Technical cooperation re-located with LMG Marin AS (www.lmgmarin.no)
Company Profile

Strong focus on Small Scale Ship Bunkering Solutions
A Scandinavian based company with partner in Singapore

Bergen, Norway (HQ)

Singapore

- Head office
- Representative Office / Cooperation with GasPartners Pte Ltd
Some of our reference customers:
Both the old Liquiline and Liquiline LNG
An LNG Midstream partner

LNG Wholesale → LNG Sourcing → LNG Logistics → LNG Terminals → End user

- Bunkering solution
- Filling station solution
- Regasification solution
- Shipping
- Transport
- Power production & industrial processes

Wholesaler X ↔ Wholesaler Y ↔ Wholesaler Z
LNG bunkering Solutions

A. Loading from LNG truck

- Using tank container or semitrailer to bunker ships
- Ships can be bunkered at place of preference instead of having to detour to bunker somewhere else
- No need for quayside construction
- A flexible bunkering solution
- Early-bird solution to get started
- Good alternative in a start up phase, or when ships have small fuel tanks
B. Multiple loading from truck

- Bunkering solution where two or more containers/semitrailers can discharge simultaneously (max flow for 2 trucks 1200l/min)
- Reduces total bunkering time for the ship
- Minimal need for quayside construction
- Flexible and cost-effective
- This solution enables a quicker start-up for distribution of LNG. Can build a bunkering terminal with a storage tank later on
C. Stationary Bunkering Terminal

- Onsite storage tank (up to 1000m³)
- Cryogenic pump (600 l/min to 5000 l/min)
- PBUC
- Local control room (can be a 20’ container)
- Automatic loading and unloading process
- Fire, gas and leak detection
- ESD and Safety System
- CE and Authority approvals
- Civil work and cabling
- Demand for power
D. Flexible but stationary solution

- Flexible/ mobile
- Little civil work
- Can easily be expanded (stacking of ISO Containers or side by side solutions)
- Shorter bunkering time (can start cooling of pump from ferry)
- Installed pump on dock - no need for pump at trailer/ container
- Storage volume: 50m$^3$ × Y Containers/ trailers
- No use for external personal
- Demand for power
E. Ship to ship bunkering

- Bunkering boat
- Need facilities for bunkering the bunker boat
- Gives more flexibility in the harbor according to bunkering
- High CAPEX and OPEX
Construction of Danmarks first LNG Bunkering Terminal

Some key information:

- **Customer: Fjord Line AS**
- Two LNG-fueled cruise ferries
- 1,500 passengers - 600 cars
- 4 x 5,600 kW gas engines
- Trading between Norway and Denmark on daily basis

What was the alternative for bunkering?
1. Onshore terminal on the dock
2. Loading from trucks
3. Loading from LNG carrier (sea to sea)

Liquilines Feed study concluded that the best solutions for this customer was an onshore terminal on the dock.

The terminal was built in 2015:
- 500 m$^3$ horizontal storage tank
- LiquiStation™ Bulk bunkering solution
- High speed bunkering (3500 l/min)
- Automatically operations
- Possibility for truck loading to ship
- Possibility for loading storage tank from truck and LNG carrier

Photo courtesy: Fjord Line
Liquiline to Construct Denmark's First LNG Bunker Terminal

By George Backwell

Liquiline says it has entered into a contract with Fjord Line to design, construct and commission an LNG ship bunkering terminal for Fjord Line AS at the Port of Hirtshals, Denmark.

The terminal will be constructed at the Port of Hirtshals, where Fjord Line operates a daily service with one of its two LNG-fuelled cruise ferries MS Stavangerfjord and MS Bergensfjord. This will be the first LNG ship bunkering terminal in Denmark.
Pictures from the work on site
LNG Logistics

• By road

• By sea

• By rail
LNG Logistics
LiquiSys® (www.liquisys.com)

LiquiSys is a remote monitoring solution for the LNG industry and provide web access to terminals and containers.

Monitoring process values and equipment status
• Remote control of equipment
• Alarms displayed on screen
• Alerts sent by SMS or e-mail
• Historical data displayed as trends and digits
LiquiSys® - Flowchart
LNG training
THANK YOU

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knut.forland@liquiline.no
www.liquiline.no