Kosan Crisplant

LNG Solutions
65 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

• Clients in more than 130 countries
Project Areas - know-how & know-why

**PROJECT SOLUTIONS**
Systems and turnkey

**SERVICE & SPARE PARTS**
After-sales, and facility management

**GAS COMPONENTS**
A one-stop shop for gas equipment
The Kosan Crisplant Group
Around 750 employees plus freelancers/partners worldwide
LNG Solutions
LNG Solutions

Liquefaction
- LNG from gas grid or LBG from Bio Plant

Bunkering
- Ferries and vessels
- Ad hoc

Industry
- Off-the-grid areas

Road Transportation
- Busses
- Garbage trucks
- Municipality cars
- Trucks
LNG Bunkering
LNG Supply in Baltic Sea Region

Source: GIE.eu
LNG Supply in Baltic Sea Region

► Terminals – terminal projects

► Bunker barges – present and coming

► Market development

► CAPEX / OPEX balance

= We foresee a large demand for flexible truck-to-ship bunkering
Liquefaction plant
Port of Frederikshavn, Denmark

- Operational by end of 2017
- Ready to supply LNG/LBG to the maritime industry in Scandinavia
- Modular design allowing you to grow-as-you-go
- Fully automatic facility
- The plant can be started or stopped in less than one hour and set to run with variable output to accommodate short-term demands
- Limited footprint > Approx. 10,000 m²
- Low OPEX combined with high efficiency (0.6 kWh/kg of LNG)
- Versatile solution > Excess heat can be used in the district heating network
Methods of LNG Bunkering

Source: ABS, USA
## Advantages & Disadvantages

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<th>Tank to ship via pipeline</th>
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Source: SSPA, Sweden
### The 4th Option

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Source: SSPA, Sweden
The "Samsø" Project
LNG Bunkering Unit

Points of difference (What did we do)

- Zero Emission
- Automatic
- No permanent staff on shore
- Fast
- Flexible
- Turn-key

Danish Patent No. PR 178151

https://www.youtube.com/watch?v=ztKihOp18Uk
Bunkering from Multiple Tank Trailers
LNG Bunkering – Multiple Tank Trailers

2-4 Tank Trailers
Serial or Parallel Connections
Flow rates from 40-240 m3/h
LNG Bunkering – Multiple Tank Trailers

4 Tank Trailers
Serial or Parallel Connections
2 Pumps each with 60 m3/h
Flow rates 120 m3/h
Movable Multi Trailer Solution

40 - 240 m³/h bunkering flow

Optionally equipped with PBU for fast bunkering

Up to six trailers connected simultaneously
Bunkering with Intermediate storage tanks
LNG Bunkering – Intermediate tank on quay

2 x 300 m³ tanks

Pump unit

2 x 65 m³/h pumps

Flow rates from 40-130 m³/h

One truck loading point
Bunkering with Intermediate storage tanks + Multiple tank trailer
LNG Bunkering – Stationary storage tank with Multi Trailer

40 - 320 m³/h bunkering flow

5-450 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
Multiple Fuel Station
Multiple fuel station

400 m³ & 30 m³ LNG storage tanks

LNG transfer pumps

LNG measurement system

LNG bunker system on the quay

LNG and CNG filling station for road transport
LNG Bunkering Solutions Overview
Advantages

► Less fixed assets

► Bunker fast and safe – 200-250 m³/hour

► High volumes of LNG

► No methane emission

► Very low operational costs – no fixed staff
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