The LNG bunker value chain

Presentation for the BSR LNG Cluster Meeting

Klaipeda, November 16th 2017
Nauticor: 100% member of the The Linde Group with full access to a strong network

The Linde Group – selected entities active in the LNG market

Comments

- Former Bomin Linde LNG was rebranded to Nauticor when Linde acquired Marquard & Bahls’ shares in the company
- The Linde Group, leading global player in industrial gases
- German Blue Chip Company (DAX 30)
- 135+ years of experience in gases, cryogenics and process engineering
- 18 bn EUR revenue with approx. 65,000 FTE
- Active in >100 countries
- Linde developed and built LNG plants worldwide
Increasing number of vessels running on LNG; diversity of operational profiles requires customized supply concepts

Examples for ships running on LNG

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<th>Comments</th>
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<td>• &gt; 200 ships running on LNG or ordered</td>
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<td>• The majority of vessels will be placed in North &amp; Baltic Sea</td>
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<td>• LNG tank sizes range from 12 m³ to 18,000 m³</td>
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<td>• Point-to-point services vs. changing routes</td>
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<td>• Pit-stop-bunkering vs. „staying overnight“</td>
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<td>• Spot contracts vs. Long-term agreements with fixed volumes</td>
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Source: Nauticor
Nauticor covers the LNG value chain from large-scale terminals to end-customers

The LNG value chain

Comments

• LNG value chain includes gas production, liquefaction, transport and supply to end-users
• Nauticor is active in medium- and small-scale LNG
• Nauticor sources LNG from large-scale terminals in Northwest Europe
• Storage in own mid-scale terminal in Nynäshamn (Sweden)
• Supply of LNG to end-customers with trucks and bunker vessels
Nauticor is a front runner in developing the downstream LNG supply chain in Northwest Europe

Nauticor in Europe

Stockholm (operational)
- 20,000 cbm LNG terminal in Nynäshamn
- World’s first LNG supply vessel: AGA’s SEAGAS
- Long-term supply of Viking Grace (AGA)

Baltics: Bunker Supply Vessel (operational from 2018)
- Charter contract and yard contract signed 2016 (Bernhard Schulte, Hyundai Mipo)
- Bunker vessel under construction in South Korea, delivery in 2018
- Nauticor (90%), Klaipedos Nafta (10%)

North Sea/Baltic Sea (operational)
- Spot LNG supply for ships & shipyards
- Rostock: first bunkering of a chemical tanker
- Bremerhaven: initial bunkering of the first retrofitted container vessel

Cuxhaven (operational)
- Long-term supply of LNG-fuelled newbuild “Helgoland” since Q3/2015

Emden (operational)
- Long-term supply of first seagoing LNG-fuelled vessel in GER “MS Ostfriesland”
Linde’s 20,000 cbm LNG terminal in Nynashamn (Sweden) is emphasizing Nauticor’s presence in the Baltic Sea.
Experienced ship-to-ship LNG supplier: The world’s first LNG bunker vessel “SEAGAS”

Operations in Stockholm and Nynashamn

- Experience: already 1500+ safe ship-to-ship bunkering operations
- Performance: fast fuelling operation to Viking Grace (45 minutes per refuelling operation)
- Quality: "State of the art" cryogenic technology manufactured by The Linde Group
Hundreds of truck-to-ship operations over the last years

Ferry bunkering operations in Germany & Denmark

Comments

• Long-term contracts for two vessels since early 2015
• Hundreds of truck-to-ship bunker operations in Germany & Denmark
• Recently: initial fuelling of the “Searoad Mersey II” RoRo ferry at the FAYARD shipyard in Flensburg
• Weekly LNG supply to the Port of Emden and Port of Cuxhaven
First bunkering of a chemical tanker with LNG engine in Germany

Truck-to-ship bunkering in the Port of Rostock

Comments

• First bunkering of a chemical tanker with LNG engine in Germany
• Largest LNG bunker operation in the Port of Rostock
• LNG supply with 4 trucks for the retrofitted „Fure West“ in February 2017
• Nauticor has obtained the necessary permits for the customer & the bunker and security guidelines for the operation
Largest truck-to-ship bunkering operation in the Port of Moerdijk (NL)

Truck-to-ship bunkering in the Port of Moerdijk

Comments

• April 2017: Largest truck-to-ship bunker operation for a chemical tanker in the Port of Moerdijk
• Delivery of approx. 140 tons of LNG with 7 trucks in 9 hours
• Preparation of bunker operation & obtained all permissions within 5 days
Europes fastest LNG TtS supply for the first retrofitted container vessel having an LNG engine

Bunker operations in the Ports of Moerdijk & Bremerhaven

Comments

• August 2017: Initial bunkering of the „Wes Amelie“ in the Port of Bremerhaven with 68 tons of LNG in September 2017
• September 2017: delivery of approx. 140 tons of LNG in ~ 5 hours
• Supply of LNG using the new parallel bunker equipment of Nauticor
• Preparation of bunker operation and obtaining all permissions within 7 days

Source: Nauticor
The next level: The world’s largest LNG bunker supply vessel will start operations in Q4 2018

**Vessel**
- LOA: 117 m
- Breadth: 18 m
- Draught: 5.3 m
- Crew: max. 20

**LNG**
- Capacity: 7,500 cbm (LNG)
- Pressure: 3.75 barg
- Hose diameter: 6 inch (4+8 opt.)
- Flow rate: 200 - 1,250 cbm /h
- Delivery height: 2 – 25 m

**Set-up**
- Speed: 13 knots
- Generator: 3 DF gensets
- Propulsion: 2 x azimuth thrusters, 2 x pump jets
- Dynamic Positioning 2 (DP2) ready
Nauticor’s Baltic Sea project: a unique LNG supply network and a blue print for roll-out to other regions

Klaipeda as Break-bulk hub for the Baltics

Comments

Nauticor will offer LNG to different types of clients:

1. LNG bunkering of maritime customers
2. LNG supply to small-scale terminals
3. LNG supply via truck to industrial customers
4. Option: LNG regasification to gas pipeline customers

LNG onshore storage in Klaipeda:

- LNG deliveries via truck
- Back-up solution for maritime customers