LNG as ship fuel: How ports are moving towards an LNG future

Ive Braspenninckx
1. Port of Antwerp: Quick facts
2. Why LNG?
3. Port of Antwerp and LNG
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Port of Antwerp: Quick Facts
Integrated oil and chemical cluster of Antwerp*

1. BASF
2. Air Liquide
3. Solvay
4. IBR (part of Gunvor)
5. Ineos
6. Monsanto
7. Evonik Degussa Antwerp
8. Bayer
9. Lanxess
10. Total (Refinery + Petrochemicals)
11. ExxonMobil (Refinery + Petrochemicals)
12. Eurochem
13. Borealis
14. Dow
15. Praxair

4 refineries
- Total
- ExxonMobil
- IBR
- ATPC

40% of Port Area is permitted under SEVESO = 52 km²
Compare with worldwide largest site in chemicals BASF Ludwigshafen = 10 km²
BASF Antwerp = 6 km²

* Limited list of largest sites
Liquid bulk maritime traffic of oils and chemicals is fastest growing segment in the Port of Antwerp

- 59.5 million ton liquid bulk (GROWTH +31,4 % vs 2012)
- 11,2 million ton chemicals (GROWTH +10% vs 2012)

- Largest (petro)chemical cluster in Europe= important base load for service providers
- Integrated model:
  - refineries
  - steam crackers
  - independent tank storage
  - waste treatment
  - logistics
- Extensive pipeline network
Total maritime throughput vs. liquid bulk throughput

Total maritime throughput

Liquid bulk throughput
Nautical Accessibility: Gas and Liquid Bulk

ACCESS FOR ALL TYPES

- VLGC and LGC
- Crude tankers (to LR 2)
- Product tankers
- Chemical parcel tankers
- Chemical tankers
- ULCV of 18 000 TEU
Central location in the Western European pipeline network

Pipelines offer a fast, efficient and ecological supply chain
Evolution Liquid Bulk

Tank storage is driving the growth of liquid bulk:
- More outsourcing
- More distribution: port-centered logistics
- More trading

Between 2002 and 2012, the maritime throughput of the Antwerp tank storage sector grew by 151%
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Why LNG?
Drivers for Sustainable Shipping

1. New regulations:
   - SOx
     - IMO: 0.1% by 2015, 0.5% globally by 2020
     - EU: 0.5% in EU waters from 2020
   - NOx, Tier III limitations for all ships built after January 2016 (MEPC 66)
   - Directive Clean Power for Transport
     - LNG bunker infrastructure in EU core ports by 2020
   - CO2 emissions
     - Directive MRV

2. Ecological responsibility:
   - Green image
   - Customer demand

3. Port Incentives:
   - ESI – 10% reduction on harbour dues
ECAs – NECAs - SECAs
Main technological drivers

<table>
<thead>
<tr>
<th>LNG</th>
<th>Scrubber</th>
<th>SCR</th>
<th>Other</th>
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<tbody>
<tr>
<td>• LNG as a ship fuel would comply with all new regulations</td>
<td>• Residues to be delivered at port reception facilities</td>
<td>• Extra CO₂ emissions</td>
<td>• Exhaust gas recirculation</td>
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<tr>
<td>• NOx: 85-90%</td>
<td>• Extra CO₂ emissions</td>
<td>• Sensitive to SOx</td>
<td>• …</td>
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<tr>
<td>• SOx: 100%</td>
<td>• Cools down exhaust gasses</td>
<td></td>
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<tr>
<td>• PM: 100%</td>
<td>• Some technical issues need to be resolved</td>
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LNG is at the present the most complete short to medium term viable solution
Main hurdles

- **Safety concerns**
  - *Onboard vessels and in relation to port operations*

- **Vessel application**
  - *Added costs for a new build*

- **LNG price**
  - *Chicken-and-egg cycle*

- **LNG bunkering**
  - *Port regulations and impact thereof on operations*

- **Infrastructure**
  - *Development of supply chain*

Certain issues still need to be addressed

What can be done by ports?
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LNG in the Port of Antwerp
In 2015 pioneer shipping owners should be able to bunker LNG as a fuel for their vessels in the same way as conventional fuels are being bunkered today.
1. Develop bunkering procedures and assess the safety aspects of LNG in the port environment

Call for tender:
- Classification Societies only
- Assignment awarded to DNV

Trajectory:
- Start of assignment: February 2013
- Draft procedures: September 2013
- Finalization: Q4 2013
- Implementation: Q1 2014
Role of the Port of Antwerp

Safety first!

- Start from existing procedures and industry best practices
  - *Chosen timeframe should allow to take ISO recommendations into account*
- Includes assessment of risk profile of the Port of Antwerp
- Opened up for feedback from stakeholders before finalization and publication
  - *ISO, SIGTTO/SGMF*
  - *External stakeholders*
  - *MOU port of Singapore and Zeebrugge*
- Endeavor to be the standard, not the first
2. Develop required supply chain and needed infrastructure

1. LNG bunker terminal
2. LNG Feeder vessel
3. Liquefaction

LNG hub

LNG bunker vessel / barge

LNG transport trucks

LNG powered trucks

Inland Shipping

Seafaring Shipping
Role of the Port of Antwerp

Phase 1: LNG bunker vessel

• Kick-start market development
  – *Share the risks*
  – *Break the chicken-and-egg cycle*
  – *Non-discriminatory exploitation*

• Call for tender: Conceptualizing, build and operation of an LNG bunker vessel
  – *With participation of the Port of Antwerp*
  – *Awarded to Exmar Marine NV*
Port of Antwerp and EXMAR announce strategic alliance for LNG bunkering in Antwerp

As a result of a European public tender, the Antwerp Port Authority appointed ship owning company EXMAR as its strategic partner for LNG bunkering in the port of Antwerp. Both partners have teamed up for the development of an LNG bunkership as well as for the execution of several further required studies.

LNG as a fuel is an excellent solution for ship owners to meet the various emission regulations that will come into force as from 2015. Compared to traditional ship fuels such as heavy fuel oil and diesel, the use of LNG significantly reduces the emission of sulphur oxides, nitrogen oxides, CO₂ and particulate matter. LNG is therefore considered as the ship fuel of the future.

Through their strategic alliance, the Port Authority and EXMAR want to facilitate the use of LNG as ship fuel. Both partners plan to start with the actual construction of the LNG bunkership early 2014.

Mr. Eddy Bruyninckx, CEO of the port of Antwerp, states: “the Port Authority wishes to not only encourage but also to facilitate the use of LNG as ship fuel because of the associated environmental- and sustainable benefits. The Port Authority therefore wants to ensure that ships calling the port of Antwerp are able to bunker LNG as ship fuel as from 2015. By calling on the LNG expertise of EXMAR, LNG shall be offered as a ship fuel in a safe and efficient manner. The Port Authority’s ambition to position itself as a sustainable port is herewith put into action.”

Mr. Nicolas Saverys, CEO of EXMAR, adds: “EXMAR is very pleased to work together with the Port Authority on developing LNG bunkering in Antwerp. EXMAR considers LNG bunkering as a strategic target market for the coming years. Independent studies indicate that the LNG bunkering market has a worldwide potential of an additional tens of millions of tonnes of LNG per year by 2020. Given its unique LNG expertise in i.a. the transfer of LNG via flexible hoses, EXMAR is perfectly placed to position itself in this new LNG bunkering market and thus substantially contribute to the further reduction of ship emissions.”
Phase 1: Other bunkering solutions

- November 2012: LNG truck-to-ship bunkering is allowed in the Port of Antwerp
  - Port rules and requirements
  - Informative bunker checklist
  - Operational bunker checklist

- 05/12/'12 first LNG truck-to-ship bunkering in the Port of Antwerp by the Argonon

- 17/06/'13: Greenstream and Greenrhine are permitted to bunker LNG in the Port of Antwerp
Phase 1: LNG Masterplan for Rhine-Main-Danube

• Focus on LNG for inland shipping
• Consortium of 33 European Partners
  – TEN-T Subsidies
  – Construct a Masterplan for Europe
  – Dissemination of results & liaison with relevant organizations

• Actions lead by the Port of Antwerp
  – Study on concepts and cost-assessment of a LNG bunker-terminal for barges
  – Construction of LNG bunker-terminal for barges
  – Feasibility study on LNG as a fuel for port equipment
Role of the Port of Antwerp

Phase 2: Intermediate storage

- Evaluate the potential for LNG storage
  - Market consultation of SEVESO II terminals
  - Facilitate knowledge build-up of terminal operators
  - Left bank vs. right bank

- Call for tender
  - Risk analysis of potential LNG storage areas and locations for LNG truck-to-ship bunkering
  - Assignment awarded to Fluxys LNG
  - Finalization of assignment Feb 2014
Role of the Port of Antwerp

3. Influence public awareness
   • WPCI LNG Working Group of IAPH
   • European Clean North Sea Shipping project scientifically illustrate the benefit of LNG
     – Scientifically illustrate the benefit of LNG with models
     – Compare impact on emissions of different clean technologies
     – Cleantech website: www.cleantech.cnss.no

4. Support LNG pioneers
   • BlueCargo Project
     – LNG as a fuel for trucks
   • LNG new build project(s)

The Port of Antwerp endeavors to play a proactive and pioneering role in the development of LNG as a fuel for shipping.
WPCI LNG Working Group
WPCI Mission Statement:

• **Raise awareness** in the port community of need for action
• **Initiate studies, strategies and actions** to reduce GHG emissions and improve air quality
• Provide a **platform** for the maritime port sector for the exchange of information thereon
• **Make available information** on the effects of climate change on the maritime port environment and measures for its mitigation

“A working group on LNG is needed!”

(IAPH meeting, Busan 2011)
Harmonization of the approach of ports towards developing rules and regulations regarding LNG as fuel and creating LNG awareness.

This is one of the crucial factors for the success of LNG as a fuel!
1. **Bunker checklists**
   - Create bunker checklists to reflect the *extra requirements of ports* with regards to LNG bunkering operations in a port environment.
     - *Draft truck-to-ship, ship-to-ship and shore-to-ship bunker checklists*
     - *All checklists opened up for feedback in Q3 2013*

   - Some ports might choose the *method of accreditation* for LNG bunkering companies based on certain conditions. A guideline for the content of these conditions will be developed in this group.
     - *cfr. Current accreditation system in Port of Antwerp*
     - *Focus on minimum safety requirements*
2. Risk perimeters

- Create guidance to harmonized approach of risk perimeters of the different possible LNG bunkering scenarios within a port environment.

- National differences with regards to fail frequencies will determine the outcome.
  - A guideline towards a harmonized approach
  - Recommendations to enable a harmonized approach
3. LNG Awareness

• Get ports moving towards an LNG fuelled future through clear and unbiased information.

• Provide guidance for ports who could face issues with public awareness concerning LNG
  – Target groups are: port operators, general public living near ports and policy makers, emergency response organizations, authorities, environmental organizations, NGOs, …

• Sharing knowledge between ports will help to ensure that all ports start from a common ground, which is the earliest possible onset towards standardization between ports.
### WPCI LNG Working Group: active & consulting ports

**Active**
- Amsterdam
- Antwerp
- Bremen
- Brunsbuttel
- Fujairah
- Gijon
- Gothenburg
- Hamburg
- Le Havre
- Long Beach
- Los Angeles
- Rotterdam
- Stockholm
- Wilhelmshaven
- Zeebrugge

**Consulting**
- Broome
- Flinderports
- La Spezia
- NY and NJ
- Singapore
- Taranaki
- Valencia
- Tallinn

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**Leadport: Port of Antwerp**

*All ports are welcome to join!*  
*Industry partners are also be invited to join!*
Thank you for your attention.