Green Shipping from a class perspective

CIMAC Circle Nor-Shipping 2017

Stine Mundal
31 May 2017
Agenda and Motivation: Safe and sustainable future

- Increasing Energy Efficiency ↔ Reduction of CO\textsubscript{2} Emissions
- Reduction of NO\textsubscript{x} and SO\textsubscript{x} Emissions
Green Ship Designs - Decisions, decisions...

- External factors
- Ship factor: Different choices, Different challenges
- Other: Investment, Off-hire, Etc.
Different choices
Different challenges

Green Ship Design

Resistance reduction
Efficient Propulsion
Efficient Systems
Efficient Operation

A1: Design for 10% lower speed
- Reduces total resistance
- Improves propulsion efficiency

Cost (5 years)
Gains

B2: Tip modified propeller
- Larger propeller area allows further pressure distribution

Cost (5 years)
Gains

C3: Wind assistance
- Harnesses wind power to generate additional thrust

Cost (5 years)
Gains

D4: Optimum maintenance
- Monitors engine performance
- Maintains high efficiency

Cost (5 years)
Gains

Green Ship Designs - Decisions, decisions...
Emission to Air

Regulations

SOx and NOx
Regional "(D)ECA" in China: Currently only SOx
Present and possible future NOx-ECAs are also subject to the 0.1% Sulphur cap. Hence it is important to consider a total compliance strategy when choosing technology solutions.

**SOx compliance strategy**
- SOx Scrubber
- Low sulphur fuel
- Alternative fuels (LNG/Methanol/etc)

**NOx compliance strategy**
Main technology alternatives
- Selective Catalytic Reaction (SCR)
  - High Pressure
  - Low Pressure
- Exhaust Gas Recirculation (EGR)
  - High Pressure
  - Low Pressure
SOx Scrubbers

Number of ships with installed scrubber - cumulative

- Newbuild: 221; 75%
- Retrofit: 118; 43%
- Hybrid: 125; 46%
- Open: 22; 11%
- Closed: 79; 25%

Year:
- 2000: 1
- 2001: 2
- 2002: 2
- 2003: 2
- 2004: 3
- 2005: 4
- 2006: 5
- 2007: 8
- 2008: 12
- 2009: 20
- 2010: 36
- 2011: 85
- 2012: 225
- 2013: 295
- 2014: 316
- 2015: 326
- 2016: 329
- 2017: 350
- 2018: 329
- 2019: 316

Options
Low Sulphur Fuels

- **Need for Low Sulphur Fuels**
  - In the ECAs
    (30-50 Mt/year today)
  - Globally after 2020
    (≈ 300 Mt/year)

- **Consideration of alternative fuels**
  - availability
  - safety
  - cost
LNG as fuel: Ships

Operating area of the 102 ships in operation
- Norway: 56
- Europe: 11
- America: 8
- Asia & Pacific: 8
- Middle East: 19
- Global: 17

Operating area of the 108 ships in the confirmed orderbook
- Norway: 59
- Europe: 17
- America: 11
- Asia & Pacific: 11
- Middle East: 17
- Global: 17

Number of ships by year of delivery:
- Ships in operation
- Ships on order
- LNG ready ships

Year of delivery:
- 2000: 0
- 2001: 0
- 2002: 0
- 2003: 0
- 2004: 0
- 2005: 0
- 2006: 0
- 2007: 0
- 2008: 0
- 2009: 8
- 2010: 21
- 2011: 25
- 2012: 35
- 2013: 45
- 2014: 56
- 2015: 67
- 2016: 75
- 2017: 77
- 2018: 77
- 2019: 77
- 2020: 77
- 2021: 77
- 2022: 77
- 2023: 77
- 2024: 77
NOx reduction technologies

**SCR**
+300 installations (but mainly for 4-stroke)

**EGR**
Relatively new technology for marine use

SCR has been the preferred NOx reduction technology so far however..

EGR orderbook is increasing
## Expected outcome of MEPC 71 (July 3-7 2017)

<table>
<thead>
<tr>
<th>Regulations</th>
<th>Expected Outcome</th>
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<tbody>
<tr>
<td>Adoption of Baltic Sea and North Sea as NOx ECAs</td>
<td>Start of next EEDI review, and consideration of EEDI requirements for ro-ro cargo and ro-ro passenger vessels</td>
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<td>GHG draft strategy – intersessional meeting to be held the week before</td>
<td>Consideration of ballast water implementation dates – uncertain outcome</td>
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<td>Finalization of fuel consumption data collection verification guidelines</td>
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<td>0.5% sulphur implementation and enforcement</td>
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Regulations on the horizon?

Increasing societal and regulatory pressure will force shipping to lower its environmental impact, resulting in a more demanding operational framework with higher expectations.

- Emission Control Areas
- Hull Bio-fouling
- Particulate matter (PM) “Black Carbon”
- Underwater noise
How to get ready?

- Business case development
- Concept development
- Contract
- Basic design
- Detailed design
- Installation
- Inspection Sign-off
- Commissioning
- Operation
- HAZID for installation
- Special risk workshops
- Emission Testing
- Automation testing (HIL)
- Conclusions
- ECA compliance option
- Selection of maker
- Technology qualification
DNV GL Rules and Class Notations for
- CLEAN and CLEAN DESIGN Notation
- LNG READY Notation
- SCRUBBER READY Notation
- Exhaust Gas Aftertreatment NOx and SOx
- Recycling
- Shore Power
- Underwater Noise
- ...
Find more information in our DNV GL Brochures
DNV GL @ Nor-Shipping 2017

- **DNV GL stand**
  Hall D: D02-12

- **DNV GL goes virtual**
  Disruptive hall A1-39

- **DNV GL Forum @ Nor-Shipping**
  Thon Hotel Arena, Room Rogaland
  31 May and 1 June 2017
  11:00 – 16:00
DNV GL offering the Broader View on Green Ships

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