The Sustainability Revolution

The Maritime CIO Forum
Rotterdam
18 November 2014

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Content

Global trends shaping the shipping industry

Sustainability a game changer for shipping

Pathways towards safer, smarter and greener shipping

The way forward Shipping towards 2050
Sustainability will be a requirement in the future

- 9 billion people, 6 of them urban
- Digitalisation and transparency
- Resource constraints
- 80 % more energy
Sustainability
- a game changer for shipping
Shipping has an impact on the society, economy and environment

**Lives lost at sea**
- 900 ship accident fatalities per year
  - Average 2003-2012

**Freight cost**
- 7-11% of cargo value

**Insurance claim cost**
- 0.23% of insured value
  - Average 2010-2012

**Recycling**
- 90% of the ship recycled

**Introduction of invasive species**
- 20,000 marine organisms introduced per day

**Accidental oil spills**
- 5000 tonnes per year
  - Average 2010-2012

**CO₂ emissions**
- 900 million tonnes per year

**NOₓ emissions**
- 22 million tonnes per year

**SOₓ emissions**
- 12 million tonnes per year
Aspirations for sustainable shipping

90 % reduction in fatalities

60 % reduction in CO2 emissions

Maintain or reduce present freight cost levels
Reaching these aspirations require new technologies, systems and practices
A whole new safety mind-set
Major accidents are not of the past
We design systems and procedures for perfect human behavior – but can we expect perfect behavior?
Technologies and systems can either support, replace or train us humans
Enabling carbon-neutral shipping
Energy efficient design

- Energy harvesting and storage
- Innovative hull shapes
- New materials
- Inspiration from nature
Tank-to-Propeller (combustion) emissions assumed to be equal to CO₂ absorbed by the plant during its lifetime.
Digital technologies
- a catalyst for safer, smarter, greener shipping
Catalysing safer, smarter, greener shipping

Digital technologies and communication will open up new opportunities

Change established practices and behaviour in the supply chain

Standardise of data formats, improve data sharing and systems integration

Traditional competitive business models will be challenged
Digitalisation of shipping

- Internet of all things
- Real-time sensor condition monitoring
- Software algorithms to handle large amounts of data
- Worldwide coverage satellite communication

- Smart maintenance
- Automation and remote operations
From remote operation to fully autonomous ships?
Shipping is the most efficient means of transport

Transporting

44500 billion tonne-miles

Supporting or constructing

3525 offshore oil and gas fields

Contributing to

1.1% of world GDP

The most efficient means of transport

<table>
<thead>
<tr>
<th>Mode</th>
<th>CO₂ per tonne-km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road</td>
<td>300</td>
</tr>
<tr>
<td>Rail</td>
<td>150</td>
</tr>
<tr>
<td>Ships</td>
<td>60</td>
</tr>
</tbody>
</table>

Grams CO₂ per tonne-km
Thinking differently about logistics

Consolidating cargo
Contract structure, optimize for larger amounts of cargo

Frequency and efficiency
Daily schedule

Getting the right ship
Size, speed, cargo handling
The future is already here

- MF Folgefonn
- Ampere
- Viking Lady
The road ahead

A whole new safety mind-set

Enabling carbon-neutral shipping

Digital technology – a catalyst for smarter shipping
Read more and download the report at:

futureshipping.dnvgl.com

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SAFER, SMARTER, GREENER