Green Technology Innovation in Shipping from a Danish Maritime Authority point of view

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Outline

Focus on Innovation

Innovation in general
  • A Danish perspective

Green Ship of the Future

Blue INNOship II

Learnings
DMA 1/2

An authority within the Ministry of Industry, Business and Financial Affairs

Mission
- To promote health and safety on clean seas and to effectively strengthen the competitiveness of and employment in the maritime industries

Vision
- Denmark is to be a leading maritime nation, setting the direction for future quality shipping
DMA 2/2

Tasks

- Flag, port and coastal State authority
  - Compliance
  - Enforcement
- Seafarers’ certification, social and health issues
- Shipping policy
- Competitiveness of the Danish Maritime Cluster
  - Framework conditions – international, level playing field
  - Research and innovation

Where DMA seeks to make a difference on research and innovation

- Cross-cutting problems/possibilities
- Bringing stakeholders together
- Setting up structures
- **aiming at systemic thinking**

Business decides on and implements strategies
Danish innovation in general

The company spheres

Supporting Danish public/private measures
• Grants
• Loans

Public private partnerships

Five-year Danish research agendas
• Research2015, Research2020, Research2025
• The pipeline from research to innovation
• Tool for political prioritization

European Community
• Horizon 2020
• +++
Pipelines for maritime innovation

Education and training

Research
  • Maritime and generic

Employees

New value propositions from vendors
  • Maritime value chains

Operational experience
  • Documentation
  • Make it operational and share
    ➢ Within companies
    ➢ Within the industry!

External demands and compliance
  • New trading platforms

The defining environment for green technology innovation
The ship – a global building and operating environment
Green Ship of the Future

Formed in 2008

Vision
- Working towards emission free maritime transport
- Ambitious in the exploration and use of new technologies
- Enabling innovation across maritime value chains

Technical focus areas
- Machinery – production and consumption of energy
- Propulsion
- Operation and maintenance
- Logistics
- General design

Participants
- Industry
- Universities and maritime colleges
- DMA and industrial organizations
GSF - Concept studies for ships, e.g. 1/2

Low-emission RO/PAX study
• A Swedish Ro/PAX being phased out
• What can we do better?
• New-building from Guangzhou Shipyard International (GSI)

Tangible value
• Good makers list representation for the participants
GSF - Concept studies for ships, e.g. 2/2 RegionalECOFeeeder

Around 10 different technologies has been integrated in order to achieve highest energy efficiency performance.
GSF - 3D print in the maritime industry

Initial awareness track

4 subprojects

- On-board 3D print
- Large-scale 3D print
- 4D print
- Repair & reconditioning using additive manufacturing technology
Blue INNOship – background

A government initiative on innovation
- Grand challenges
- Investments in research and education must be transformed into innovation
- Societal partnerships on innovation, i.e. business, education and research

Two-step process
- 21 proposals were drafted and 5 were chosen by the government, including the “Blue INNOship” proposal
- Funding according to a call from Innovation Fund Denmark
  - “Blue INNOship” succeeded
- Project start-up April 2015
- Budget of DKK 120 million (USD 19 million)

Purpose
- Short term: Innovation activities aiming at emission reductions
  - Regulatory
  - Business driven
- Long term: Innovation model for the Danish Maritime Cluster
Blue INNOship overview

WP1 Ship design & propeller solutions
• Control pre-swirl fins
• Dynamic propeller speed control
• Trailer cat
• LightShip

WP2 Performance and monitoring
• Vessel performance decision support
• Monitoring and performance

WP3 Alternative fuel solution
• Gas valve train
• Multi-fuel burner
• Reduction of methane slip from LNG engine combustion
• Small-scale LNG/LBG liquefaction

WP4 Emission reduction technologies
• Scrubber size reduction
• Slow-steaming antifouling paint
• Selective catalytic reduction of \( \text{NO}_x \)
• Encapsulated biocides

Servitization & retrofit
• Servitization project
• Retrofit project

• 36 participants
Blue INNOship – results up to now, e.g. 1/2

Vessel performance decision system
• Two shipowners, a technological institute, a university and a vessel performance company
• Exploitation of existing systems and sensors on board ships
• Data from different sources
• Development of a data format
• Big data analytics decision support

Initial focus on hull and propeller conditions
• Savings of 3.5% and 5%, respectively

Next step main engine, auxiliary engines and boilers
Blue INNOship - results up to now, e.g. 2/2

Shore based small scale LNG/LBG (Liquified Bio Gas) liquefaction unit
- Two companies and a university
- A simulation model for small-scale liquefaction
- A mix of refrigerants depending of the gas composition

Verification process ongoing
- Small-scale liquefaction industry benchmark
  - Up to 40% energy cost savings
  - Not larger CAPEX because of standard components

Scale up via modules

LNG/LBG storage capacity and transport can be reduced
ShippingLab
Driving Future Maritime Innovation

Background
• A recommendation from the “Growth Team for the Danish Maritime Cluster” (April 2017)
  ➢ Blue INNOship success
• A government growth plan under preparation

Driving themes
• Digitalization and business models
• Under preparation
Learnings

A challenging maritime value proposition on green innovation must be set up

It is hard work to create projects

Projects must be collaborative

The maritime value chain must be represented
  • Companies
  • Research
  • Education
  • Business organizations
  • Authorities

Green innovation drivers
  • Regulation has a large impact
  • Commercial drivers have lesser impact
    ➢ The fuel prize
    ➢ Incentives do not always work for green innovation
Thank you for your attention