How to kick-start the deployment of zero-emission vessels

Online presentation at “How to decarbonise shipping by 2050?”
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July 2021, Roy Campe, CTO CMB.TECH
Presentation Topics

1. Introduction CMB Group & CMB.TECH
2. Zero carbon pathway from CMB
3. Why ports can play a crucial role
4. Dual fuel combustion technology
5. Key takeaways
6. Q&A
The division’s activities can be summarized in 4 focus areas:

**ENGINEERING**
A fast growing highly skilled engineering team with >15y of experience with hydrogen systems

**INDUSTRY**
Design and retrofit of industrial applications to run on the clean fuel of hydrogen

**MARINE**
Design, building and operation of a future proof fleet powered by hydrogen and ammonia

**H2 INFRA**
Technology and infrastructure to produce and distribute the clean fuels of the future
CMB has paved the pathway towards zero emission shipping with concrete and tangible projects.

- **Hydroville** (16pax ferry)
- **Hydrocat** (CTV)
- **Hydrobingo** (80pax ferry)
- **Maritime Hydrogen Refuelling Station**
- **Hydroville** (16pax ferry)
- **HydroPhoenix** (50TBP)
- **Hydrocat** (3800dwt)
- **Chemical Tanker** (25k DWT)
- **Dry Bulk Carrier** (205k DWT)
- **Container Vessel** (6000 TEU)

CMB.TECH is also working on large scale production of green H₂ and NH₃ in Namibia.

In operation
Construction phase
Design phase
Ports will play a key role in kickstarting zero emission ships

• Shipping is standardized, meaning what works for Antwerp will work in Rotterdam, Hamburg, Marseille, etc.
• By equipping 200 ports worldwide with H₂ technology, an unparalleled emission’s saving can be established
• Europe can be key player developing the H₂ technology:
  ➢ **Port equipment**: difficult to electrify (when vessel is in port, cargo operations do not allow long battery recharging)
  ➢ **Shore power solutions**: CMB.TECH developed in the JV BeHydro hydrogen powered cold ironing genets and the concept of a power barge, to provide clean power to ships.
  ➢ **Power barge**: can also be used to refuel barges or other ships: “The station comes to the vessel, instead of the vessel sails towards the refuelling station.”
  ➢ **Port vessels**: most port vessels can operate on compressed H₂ without the need for disruptive technology
Combustion engines will have a major role for heavy industries such as shipping

- There is no golden bullet that can replace diesel, but batteries, hydrogen and ammonia will have a major role as future fuels:
  - Batteries for low power and short-range applications with high idling times
  - H₂ for local heavy-duty equipment where quick refuelling is required
  - NH₃, where H₂ storage does not offer a viable solution
- Fuel Cells (H₂ & NH₃)
  - Not proven in harsh conditions
  - Expensive & limited lifetime (degradation)
- Combustion engine (H₂ & NH₃)
  - Reliable
  - Affordable
  - Known technology
  - Dual fuel capability
Ships do not have that many choices to offer zero emission transport

- **Batteries**: ships require a large energy buffer, resulting in a battery size which is too large, too heavy and too expensive. There are no means to charge this battery during port call;

- **Photo-Voltaic panels**: the ship’s surface is not big enough to even provide 10% of the required power;

- **Wind energy**: more interesting for slow sailing vessels. Deck space is challenging, but with a projected saving of 10-30% the IMO limit of 50% GHG reduction can not be reached;

- **LNG**: due to methane slip during production, storage & combustion, net GHG effect saving is far from any IMO target. The high investments required are not justified in this respect;

- **Bio-fuel**: not enough biomass available and the supply is very seasonable. Should only be used locally.

- **Methanol**: DAC technology will remain a costly and an energy consuming technology;

- **E-fuels**: H$_2$ and NH$_3$ are carbonless fuels, each with its own challenges but offer the best perspective.

- The wide variety of technologies is withholding many ship owners, shipyards, OEMs and technology providers to invest massively into H$_2$ and NH$_3$ technology which could create the boost required to achieve the emission targets.

- Investments should accelerate and focus mainly on Hydrogen and Ammonia:
  - H$_2$ for port/local vessels (tug, pilot vessel, patrol vessel, etc), inland water vessels (barge, ferry, etc) and short sea vessels (coaster, CTV, CSOV, feeder, etc)
  - NH$_3$ for deep sea going ships.
Key takeaways from a ship owner’s perspective

- Hydrogen technology will be used by the early movers which will kickstart zero emission technology for local and short sea shipping.
- Dual fuel technology is key to allow the infrastructure to grow and mature.
- Combustion engines will play a key role in supplying an affordable and reliable platform for zero emission technology.
- Ammonia is regarded as the main clean fuel for deep sea shipping.
- Clean ammonia production is to be accelerated to allow the maritime sector to make the shift.
- Fossil fuel will remain cheaper, so regulatory incentives (reduced port fees, support for infrastructure) or a global carbon tax should provide an economic justification.
- Public tenders should enhance the selection of clean propulsion designs. Low emission cars/busses/ferries/ships should be ordered/chartered, despite the higher costs and unknowns.
- CMB.TECH believes that net-zero shipping is possible and necessary.
Q&A

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