New fuels and seafarers' competences

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International Transportation Workers' Federation

Air pollution control and Zero emission

Emissions from ship exhausts which use fuel oil into the atmosphere can potentially be harmful to human health and cause acid rain and may also contribute to global warming.

New technology can be used to reach the goal – zero emission. The type of alternative fuel selected, and the proportion of conventional fuel substituted will have a direct impact on the vessel's emissions, including GHG, NO_x, and SO_x.

Battery ferries for short voyages. Automatic battery being charged every time they are loading and unloading.

New fuels and Challenges / technical constraints

Hydrogen

- Safety regulation needed.
- Storage technology needs to be improved. (e.g. heat insulation and larger fuel tank)
- Materials technology to manufacture the necessary systems and containment arrangements to handle and store liquified hydrogen.

- Materials technology to safely accommodate gaseous hydrogen in the marine environment.
- Engine room arrangements to safely manage risks associated with hydrogen.
- Storing enough fuel on-board for large ships making trans-oceanic voyages.
- Development of energy conversions systems (internal combustion machinery, fuel cells or other) of the required power output to be useful for large trans-oceanic ships.
- Consideration of local emissions from hydrogen fueled internal combustion engines (NOx, hydrogen peroxide).
- Developing crew training programs and ensuring crews are ready to safely operate hydrogen fueled ships.
- Development of classification society rules for the design and construction of hydrogen fueled ships.

Ammonia

- Safe management on-board of ammonia, which is a very hazardous substance.
- Fuel storage, handling and engine room arrangements to safely manage risks associated with ammonia.
- Development of energy conversions systems (internal combustion machinery, fuel reformers, fuel cells or other) of the required power output to be useful for large trans-oceanic ships.
- Consideration of local emissions from ammonia fueled internal combustion engines.
- Developing crew training programs and ensuring crews are ready to safely operate ammonia fueled ships.
- Development of classification society rules for the design and construction of ammonia fueled ships.

Biofuel

- Determination of differences in fuel properties between biofuels and fossil fuel equivalents, plus necessary changes to fuel storage and handling arrangements and engines.

Ethane

- Extreme danger of starting fire
- Flashpoint 12.8°C

Fuel cell

- A fuel cell consists of basic elements for electrodes and electrolyte. In technical terms, cell or single cell is more commonly associated with fuel cell.
- Heavy and extremely explosive
- Requires big tanks on deck and needs huge space with A60 isolation
- Needs under and over pressure ventilations
- Appropriate fire extinguishing equipment must be developed.
- Breathing apparatus and oxygen masks for all personnel must be onboard to protect extremely dangerous gas from battery.

Battery / Hybrid

- Appropriate fire extinguishing equipment must be developed.
- Breathing apparatus and oxygen masks for all personnel must be onboard to protect extremely dangerous gas from battery.

Nuclear

- Development of a complete regulatory framework needed

- Classification society rules needed to be developed for the nuclear island of a nuclear power and propulsion system, including secure control and recycling of nuclear fuels and spent fuels.

Carbon Capture and Storage (CCS) onboard

- Classification society rules for the design and construction of CCS systems on-board needed.
- Safe storage and handling provision needed for any substances necessary for the CCS system to operate on-board carbon storage arrangements
- Development of suitable safe and secure CO_2 storage wells, or alternatively a means of ensuring storage of the captured carbon needed.

The Energy types considered for enhancing safety and environmental soundness are as follows (Click to find more information on each fuel type):

- Liquefied Natural Gas (LNG)
- Batteries
- Ethanol, Dimethyl Ether (DME)
- Fuel cell
- Hydrogen
- Liquefied Petroleum Gas (LPG)
- Biogas
- Synthetic Fuels
- Nuclear
- Ammonia
- Solar panel
- Sail

Types of environmentally friendly systems, propulsion systems and education and training

The STCW 1978, as amended requires the basic education and trainings. Personnel on certain types of ships have to have specific additional trainings as well as familiarisation (where the ITF has participated in the development).

According to current regulatory provisions, it does not matter which fuel or energy bank a ship has. It is the propulsion power which determines the level of competences needed. A ship, with propulsion power of 750 kW or above, must have engineer officers on board with appropriate competences.

In fact, seafarers already are educated, trained and used to introduction of advanced technologies, but it is important to give personnel who operate functions of those ships sufficient support.

"The opportunities must be provided to constantly develop their knowledge and competences in dealing with ships with a variety of fuel types or regardless of energy sources." said Mr Odd Rune Malterud, ITF Maritime Safety Committee Chair.