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Two New Projects on Ammonia and Hydrogen at RISE Fire Research

AMAZE is an ammonia project aiming to develop and demonstrate a new multi-fuel, fuel-flexible, clean and efficient thermal power cycle for maritime propulsion and power generation. This project is coordinated by Bergen Engines and is funded jointly by the Research Council of Norway, Bergen Engines, and Equinor.

SH2IFT-2 is a hydrogen/ammonia project aiming to develop new knowledge on critical aspects of hydrogen safety to support its widespread use in the society. This project is coordinated by SINTEF and funded jointly by the Research Council of Norway and 19 industrial partners including Shell, Equinor, Air Liquide, TotalEnergies, BP, Grtgas, Eviny, Gassco, AkzoNobel, Safetec, Vipo, Gasnor, Møre og Romsdal Fylkeskommune, Ballard, Engie, Technip, Energies, and Greenstat Hydrogen.

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AMAZE

Project AMAZE aims to enable the efficient use of ammonia as the main fuel for ship engines to support a carbon-free solution for deep-sea shipping in the global shipping industry.

The maritime industry has experience with ammonia as a refrigerant and as cargo. However, the introduction of ammonia as the main fuel for different ship types creates new challenges related to bunkering, storage, supply and consumption [1].

The partners of AMAZE share the common goal to support the maritime industry with the implementation of ammonia as fuel, and each partner will contribute with research strengths in their respective areas of expertise.

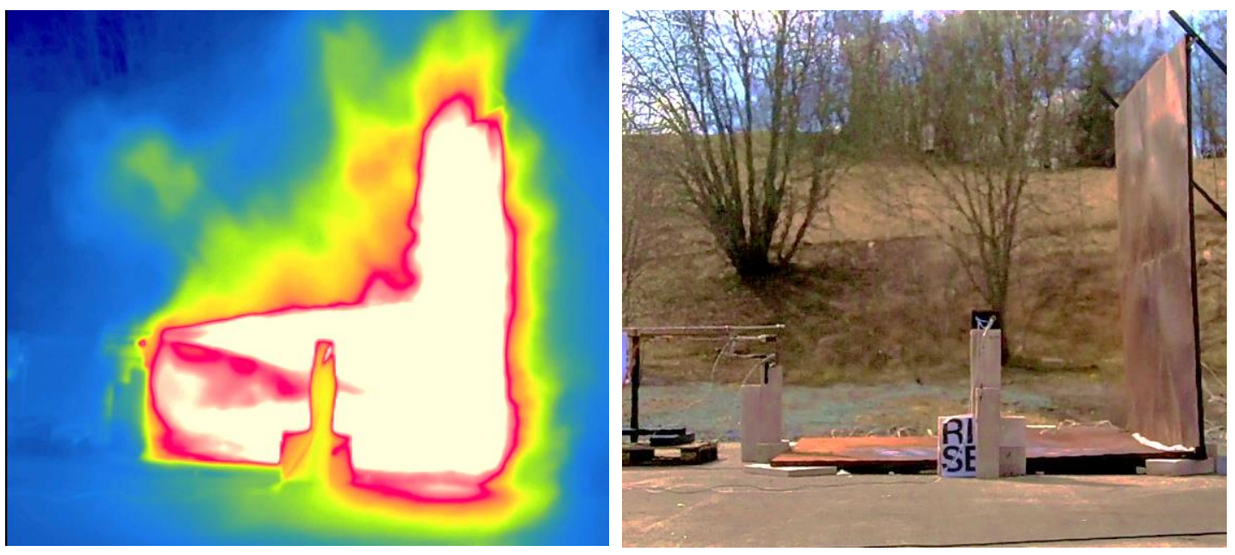
RISE Fire Research is responsible for the assessment of safety, toxicity, and the effectiveness of extinguishing systems in this project.

Comparison of basic properties of ammonia and methane [1]		
	Ammonia (NH_3)	**Methane (CH_4)**
Boiling temperature (1 bar)	-33°C	-162°C
Vapor pressure (45°C)	18 bar	–
Liquid density	0.68 ton/m^3 at -33°C	0.43 ton/m^3 at -162 °C
Flammability range	15-28%	5.3-17%
Auto ignition temperature	651°C	537°C
Minimum ignition energy	8 mJ	0.27 mJ
Solubility in water (at 20°C)	531 g/l	No
Main hazards	Toxic	Asphyxiating
	Corrosive	Cryogenic
	Explosive	Explosive
	Flammable	Flammable

SH2IFT-2

Project SH2IFT-2 aims to close critical knowledge gaps identified by industry and government stakeholders regarding the damage potentials from large accidental discharges of hydrogen/ammonia, the impact of accidental hydrogen jet fires, and degradation mechanisms related to hydrogen-metal interactions, among other safety aspects.

RISE Fire Research assesses damage from hydrogen jet fires with/without Passive Fire Protection (PFP). This work includes experimental evaluations of PFP products designed for hydrocarbon fires to see how they perform against hydrogen fires.



Footage snapshots (thermal on the left and regular on the right) from SH2IFT-1 with an open test setup with one vertical wall panel and one floor panel.

The need for the new hydrogen jet fire experiments was highlighted following the experiments done in SH2IFT-1 which included brief exposures of surfaces and enclosures to hydrogen jet fires at 300 bar [2]. In contrast, SH2IFT-2 will focus on longer and higher-pressure exposures with/without PFP products.

References

1 Ammonia as a Marine Fuel—Safety Handbook, Green Shipping Program, 2020.
2 Christoph Meraner, Reidar Stølen and Tian Li, Experimental Investigation of Impinging and Confined Hydrogen Jet Fires, Proceedings of the 10th ISFEH conference, University of South-Eastern Norway, Oslo, 2022.

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