Ferry Shipping Summit

Malmö, September 20-21

RINA today

5300 colleagues

200 offices

70 countries

Our people

More than **90 nationalities**

80%+ educated to **degree level**

42 average **age**

Who we are

Energy

Energy solutions from O&G to renewables, taking care of sustainability and environmental impacts

Marine

Rules, technologies and innovative services to manage transport and pleasure vessels

Certification

Solutions to support products, people and processes on their way to excellence

Infrastructure & Mobility

The path to the next generation of infrastructure and buildings by ensuring their safety and efficiency

Industry

Accelerating clients' success with technology-driven strategies and solutions

Real Estate

Innovative value proposition of integrated services: Rina Prime Value Services is able to cover all the real estate lifecycle

Giving confidence to decarb solutions

Working on decarbonisation solutions and **alternatives including hydrogen, ammonia, carbon capture utilisation & storage, alternative fuels, cold ironing and nuclear**

Experienced in providing support services to a wide range of **markets** and **R&D projects**

Transferring technologies, competencies and experience **from R&D** and **from market to market**

Working all along the supply chain to assure **integration** and **sector coupling**

Main Achievements

315+ projects for decarbonization

135+ clients on energy transition

1 billion+ Euro in green funding collected by our customers through RINA support

Nuclear **Alternative Fuels (Bio & Syn)** **Ammonia** **Hydrogen**

Carbon Capture Utilization & Storage **Hydrogen derivates** **Cold Ironing**

TT-Line LNG RO-Pax Vessel

Investments in LNG dual-fuel vessels have been record high this year. Two major issues have been associated with LNG as fuel, the methane slip and its well-to-wake profile pointing to the fact that shipowners who have invested in the LNG pathway will need to shift to renewable synthetic LNG (e-LNG) in the long-term.

Shipyard: Nanjing Jinling

Ship: Nils Holgersson

Size: 239 cabins (800 passengers)

Special Feature: E-cars charging stations

Methanol

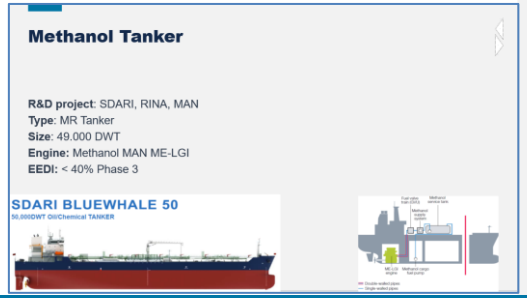
Advantages VS Challenges

Advantages

- Compared with conventional marine fuel oil, it offers no SOx emissions and reduction of NOx by 60% and reduction of CO2 by 20%. GHG production lower than LNG
- The marine sector already has knowledge of Methanol. There are commercially available marine engine technologies and fuel cells
- Widely available and extensively used in other industries with an established best practice. It can be stored in regular, non pressurized tanks and is more compatible with existing bunkering infrastructure
- Interesting for retrofit solutions

Challenges

- It is not totally carbon-free fuel
- Toxicity. Care is necessary during the fuel management (breathing, skin contact, etc.)
- Availability
- Low flash point / Flames difficult to see under light (pale blue color)



Current Status

- LNG is steadily becoming more used but methanol may also have potential and it has simpler handling and lower investment costs
- Currently being used on approx. 20 ships and others in orderbook (Currently 42 (Clarksons))
- It has been shipped since many years by tankers. It is available through existing infrastructures in several ports
- We are seeing concept projects for bio-methanol and e-methanol

Hydrogen: Strengths and Use

- Carbon Free
- Energy Vector
- Versatility
- Storability

H_2 for Grid Balance

Solutions for **innovative utilities and sector coupling**

- **Power-to-X**
- **Island H_2**

H_2 for Transport

Solutions for **Mobility**

- **H_2 for Marine**
- **H_2 for Rail & Truck**
- **H_2 for Urban transport**
- **H_2 for Material Handling**

H_2 for commercial use

Fuel Cells for **business continuity and heating**

- **H_2 for Power Supply**
- **H_2 per residential and commercial heating**

H_2 for Industrial use

Green transition in **Industrial Processes**

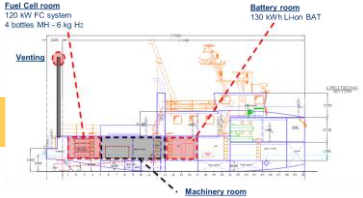
- **H_2 for Feedstock**
- **H_2 for High Temperature processes**

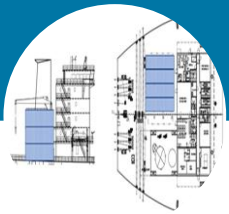
Currently 12 vessels in Orderbook (Clarksons))

RINA Projects

TecBIA Project

- Experimental ship for Fuel Cells testing and methane steam reforming ➡ H_2
- Hydrogen Fuel Cell prop Ship ZEUS
- Shipyard / Designer: Fincantieri
- Rules and Guidelines development



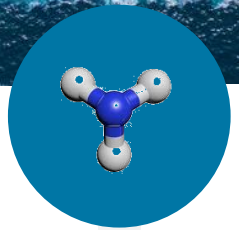


A scalable and sustainable proposal with hydrogen as fuel to meet IMO2050 targets

- RINA, together ABB, Helbio, the Liberian Registry, Wärtsilä and an Energy Major entered in a common effort to deliver a solution with hydrogen as fuel that would exceed IMO 2050 targets for 70% reduction of carbon intensity offering the shipping industry a low-carbon pathway in shorter timescales

ABB WÄRTSILÄ LIBERIAN REGISTRY Helbio Hydrogen & Energy Systems

Ammonia
Potential as fuel in shipping



- Zero Carbon Molecule
- Mass product since beginning 1900, high TRL
- Well known as LPG Carrier ships
- Liquified conditions much easier than hydrogen. Ammonia turns liquid at temperature below -33degC (patm) or 7.5bar (at 20degC)
- Hydrogen Vector (‘easy hydrogen’)

- Rich of N2
- Toxic & Corrosive
- Low Combustion Speed and low energy volumetric density
- Ammonia is mostly produced by chemical process from methane
- Users under R&D
- IMO guidelines currently under development

RINA Projects

ENGIMMONIA PROJECT

Sustainable technologies for future long distance shipping towards complete decarbonization across EU based on the number of participations

Ammonia Bunker Tanker

SEATECH SINGAPORE

Fratelli Cosulich Since 1857

SEATECH Trusted Solutions

PCTC Multipurpose Ammonia

Newbuilding by China Merchant, 9000 CEU capacity RINA “Ammonia Ready” Notation

Green Technology
Wind Foils

MV Ankie

- The 3,600 DWT general cargo vessel MV Ankie, was retrofitted with two wings for wind assisted propulsion.
- RINA carried out the design approval, foil production and construction supervision together with the commissioning protocol preparation.

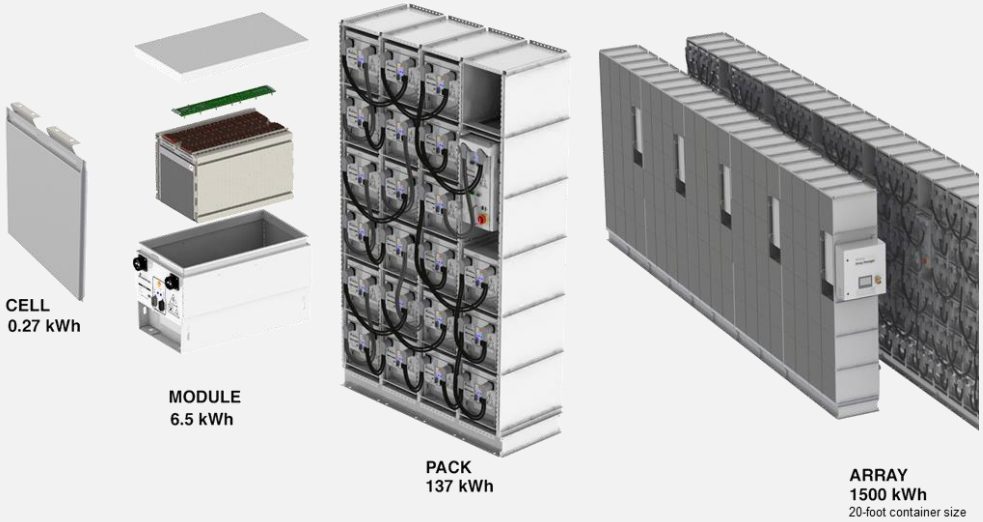
M/V Tharsis

- RINA followed the design approval and supervision of the installation of two retractable wing sails on the M/V Tharsis
- The vessel is owned and operated by the visionary Tharsis Sea-River Shipping company that has a firm commitment of becoming zero-emissions.

Green Technology

Battery

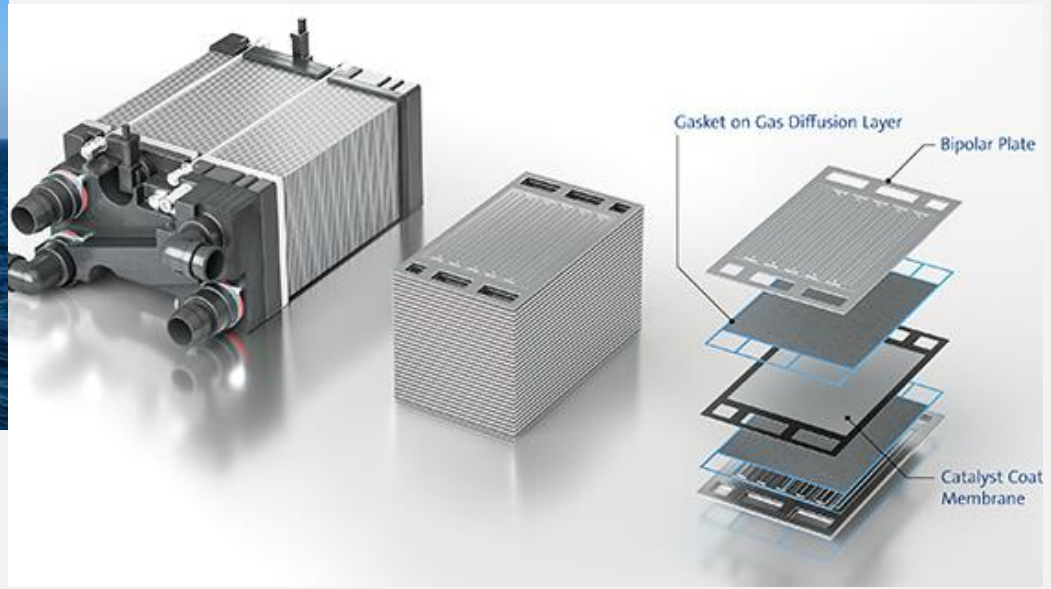
Shipyard: China Merchants Jinling Shipyard (Jiangsu)
Shipowner: Grimaldi (Finnlines)
Type: RO-RO Ship
Size: 67000 GT
Special Feature: Battery Powered Ship 750kW/h
Notations: SYS NEQ, Green Plus



Green Technology

Fuel Cell

In 2021 (COVID delayed), AIDA Cruises has been the world's first cruise company to test the use of fuel cells on AIDANova classed by RINA.



RINA Projects

Newcleo, Fincantieri and RINA Project

- Newcleo, Fincantieri and RINA working together on feasibility study for nuclear naval propulsion
- Companies sign agreement to explore closed mini reactor design application for use on large vessels, with potential to decarbonise shipping industry
- The deployment of newcleo's innovative LFR (Lead-cooled Fast Reactor) for naval propulsion would involve placing a closed mini reactor on vessels as a small nuclear battery producing a 30MW electric output. This would require infrequent refuelling (only once every 10-15 years)

Future developments and RINA thoughts
- Impossible is not an option!

- There is still no silver bullet
- Each trade, operator and related infrastructure is unique and offers it own solution
- Biofuel has an intermediary role
- E-ammonia and e-methanol are promising green hydrogen-based fuels for 2050
- Nuclear is returning
- Also energy efficiency has a key role – less consumption, less emission

For more info:

Thank you for your attention

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