MENENS
Methanol Powered Shipping

NMT Article

MENENS: A Collaborative Effort Towards a Methanol-Powered Future

The Dutch maritime sector, known for its innovative and sustainable approach, is embracing a transformative shift towards methanol-powered vessels. Central to this change is the MENENS project—a collaborative initiative uniting leading maritime companies, research institutions, and governmental bodies to develop scalable solutions that positions methanol as a viable and sustainable alternative fuel.

Collaborative Expertise for a Sustainable Future

The MENENS project brings together a diverse consortium of partners, each contributing specialized expertise to various aspects of the initiative. Among the shipowners, **Fugro NV** leads the consortium, demonstrating the project's methanol capacity by converting their survey vessel Fugro Pioneer to methanol. **Koninklijke Wagenborg B.V.** supports with operational insights and vessel adaptations, while **Boskalis** and **Van Oord**, two major dredging companies, explore methanol's potential in dredging operations. **VT Group** provides expertise in tanker operations and methanol bunkering, and **COMMIT (Ministry of Defence)** ensures the research covers the application of methanol in naval and support vessels, which is essential for reducing reliance on fossil fuels and promoting sustainability in defense operations.

The consortium also features prominent shipyards and naval architects such as **Damen Shipyards Group**, which is dedicated to vessel design and development, and **C-Job & Partners**, known for their expertise in innovative naval architecture. **Feadship** contributes advanced designs for luxury yachts with sustainable propulsion systems, while **Van Oossanen Naval Architects** optimizes hull designs specifically for methanol. **Royal IHC** and **Thecla Bodewes Shipyards** bring extensive expertise in building research and cargo vessels, ensuring that methanol-powered systems are integrated efficiently and safely.

Key OEMs and suppliers such as **Marine Service Noord**, **NIM**, **RH Marine**, **EST-Floattech**, and **Wärtsilä Netherlands B.V.** are at the forefront of developing and integrating methanol-compatible engines and power systems. In collaboration with these firms, other partners like **Discom**, **DC Systems**, **LPS Twin Turbine**, and **Bakker Sliedrecht** provide essential components and system integration support, ensuring that the project's technological goals are met. Renowned knowledge institutions such as

MARIN, **TNO**, and **TU Delft** (together with **NLDA**) contribute cutting-edge research, covering areas from safety and power generation to design optimisation and system validation. The project's overall management and governance are handled by **TechForce Innovations BV**, ensuring seamless collaboration across the consortium.

Comprehensive Research for Methanol Integration

MENENS has adopted a broad research approach, covering all aspects of methanol integration, from energy generation to safety and application. Key areas of focus include:

1. **Power Generation Research**: Testing facilities at **MARIN**'s Zero Emission Lab, the **NLDA** lab (in collaboration with **TU Delft**) in Den Helder, and **TNO's** Power Trains Test Centre in Helmond are dedicated to evaluating methanol propulsion systems under realistic maritime conditions. The labs focus on optimizing engine performance, validating integrated power systems, and testing energy systems through computational fluid dynamics (CFD) simulations and engine trials. This comprehensive approach aims to develop efficient and scalable methanol technologies for various vessel types, highlighting methanol's potential to reduce emissions and improve combustion efficiency.

2. **Safety and Corrosion Assessments**: Extensive evaluations of methanol storage and distribution systems have been conducted in partnership with **TNO**. These include corrosion studies on aluminium storage tanks and crash simulations to assess collision scenarios and their impact.

3. **Component Integration**: Collaborations with partners like **Wärtsilä** and **EST-Floattech** have resulted in developing methanol-compatible components such as fuel injection systems and power management units. **RH Marine** and **Marine Service Noord** have also been instrumental in integrating these components into shipboard systems. **NIM** plays a role in developing and testing a methanol retrofit kit for existing diesel engines. **TU Delft, TNO** and **MARIN** are exploring the design, protection, optimization, and control of power, propulsion, and energy systems. Experts from RH Marine, MARIN and TNO are working on a virtual representation of a yacht vessel to serve as a platform for EMS development, topology optimalisation. The consortium work together on the platform with the shared models.

4. **System Validation and Field Labs**: Validation of methanol-powered systems takes place both in laboratories and field environments. Notably, the **Fugro Pioneer** has been demonstrating the project's capacity to retrofit existing vessels to methanol. Field labs established through partnerships with **TU Delft** allow real-world testing of methanol technologies on various vessels, including cargo ships and research vessels.

Technological Innovations and Achievements

MENENS has reached several significant technological milestones, further positioning the project as a leader in sustainable maritime innovation:

- **Model-Based Systems Engineering (MBSE)**: This approach, developed by partners like MARIN, C-Job, Damen, RH Marine, and TNO, improves traceability, predictability, design optimization and verification, ensuring safety and efficiency methanol-based power systems. MBSE also

facilitates seamless co-design by integrating hardware and software systems across the project. The designs are verified through digital models and validated through scaled lab tests at MARIN's Zero Emission Lab (ZEL).

- **Hybrid Turbocharging and Engine Efficiency**: Research by **TU Delft** and **NLDA** has led to the development of hybrid turbocharging systems, improving the efficiency and responsiveness of methanol-powered engines, showcasing a successful adaptation of advanced propulsion technology for methanol applications.
- **Solid-State Circuit Breakers (SSCBs)**: In collaborations with **DC Systems, TU Delfts**, **RH Marine** and other, MENENS has developed SSCBs for shipboard DC systems, ensuring operational stability and safety.
- **Underwater Venting Technologies**: **TNO's** research has validated underwater venting methods for methanol vapour, enhancing safety protocols for smaller vessels.
- **Methanol Injection and Spray Dynamics**: Advanced CFD modelling by **TU Delft** has optimized methanol spray injection techniques, improving combustion efficiency and reducing NOx emissions.

Funding and Support

The MENENS project is funded by the Ministry of Economic Affairs and Climate Policy (EZK), receiving a subsidy of approximately €25 million through the RDM program. This investment highlights the Netherlands' commitment to transitioning the maritime sector towards sustainable, methanol-based propulsion.

The Promise of Methanol

Methanol presents a promising and scalable alternative to traditional fossil fuels, with potential reductions in NOx and particulate matter emissions. However, meaningful greenhouse gas reductions depend on the use of green methanol, which is currently limited in availability. The MENENS project demonstrates methanol's feasibility and is paving the way for cleaner maritime technologies, helping to reduce the shipping industry's environmental impact.

Looking Ahead

As the MENENS project advances, it continues to deliver valuable insights and technological breakthroughs. With Dutch expertise and collaboration at its core, MENENS is positioning the Netherlands as a leader in sustainable maritime innovation.

For More Information, visit MENENS or contact John Cheung at TechForce Innovations BV (j.cheung@techforce.nl).