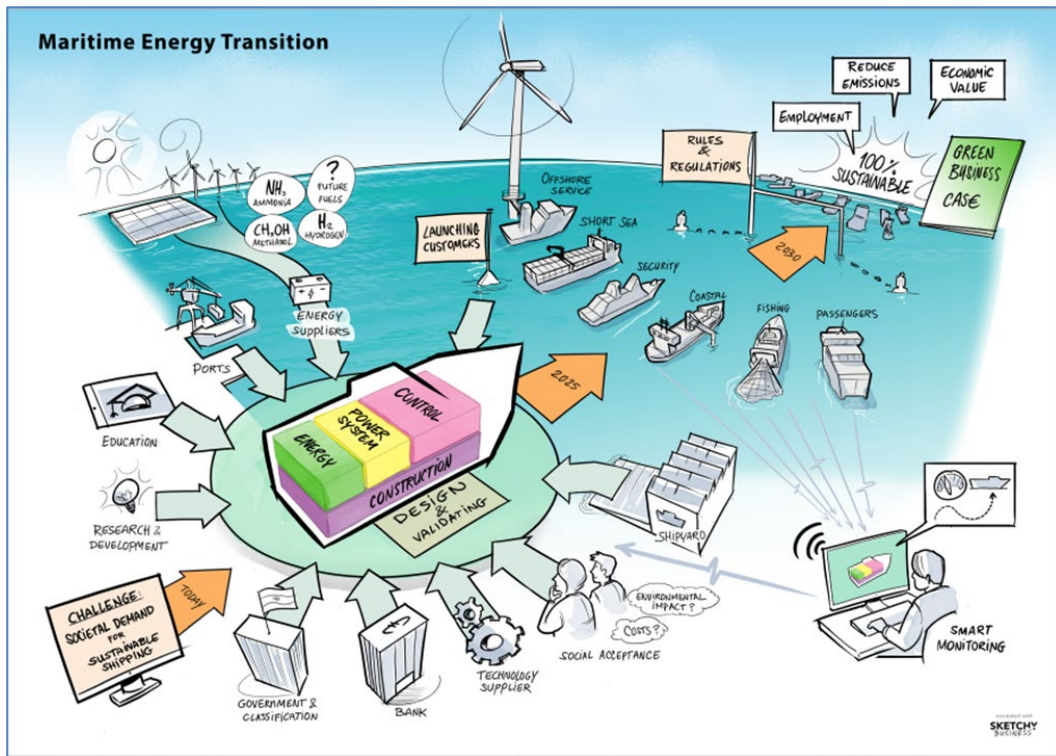


MENENS

Methanol as an energy step towards emission-free Dutch shipping



Progress report year 2 R&D Mobility Sectors project

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The project was carried out with a subsidy from the R&D Mobility Sectors scheme of the Ministry of Economic Affairs and Climate Policy, carried out by the Netherlands Enterprise Agency



MENENS

Methanol Powered Shipping





Project Title:	MENENS; Methanol as an energy step towards emission-free Dutch shipping
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MENENS is a joint project of the following parties:

Fugro NV, Koninklijke Wagenborg B.V., Damen Research Development & Innovation B.V., Damen Global Support B.V., Damen Workboats B.V., C-Job & Partners B.V., MARIN, TNO, TU Delft (including NLDA), RH Marine Netherlands B.V., IHC Holland B.V., Feadship (De Voogt Naval Architects B.V.), Baggermaatschappij Boskalis B.V., Van Oord Dredging & Marine Contractors B.V., EST-Floattech B.V., Wärtsilä Netherlands B.V., Van Oossanen Naval Architects B.V., Discom B.V., Marine Service Noord B.V., VT Group (Verenigde Tankrederij B.V.), Thecla Bodewes Shipyards B.V. and DC Systems B.V.



Short summary of the project

The starting point of this project is to carry out an application-oriented research and development project by means of verification (in research labs) and validation (in field labs) of new power and energy systems based on methanol, taking into account the wide variety of ship applications (future use cases): from yacht building to offshore work vessels and from inland shipping to high-power dredging vessels. This involves gaining directly applicable knowledge in the field of engine performance of various combustion systems, fuel cells, and mechanical, electric and hybrid propulsion and energy systems under the typical dynamic loads in the maritime sector.

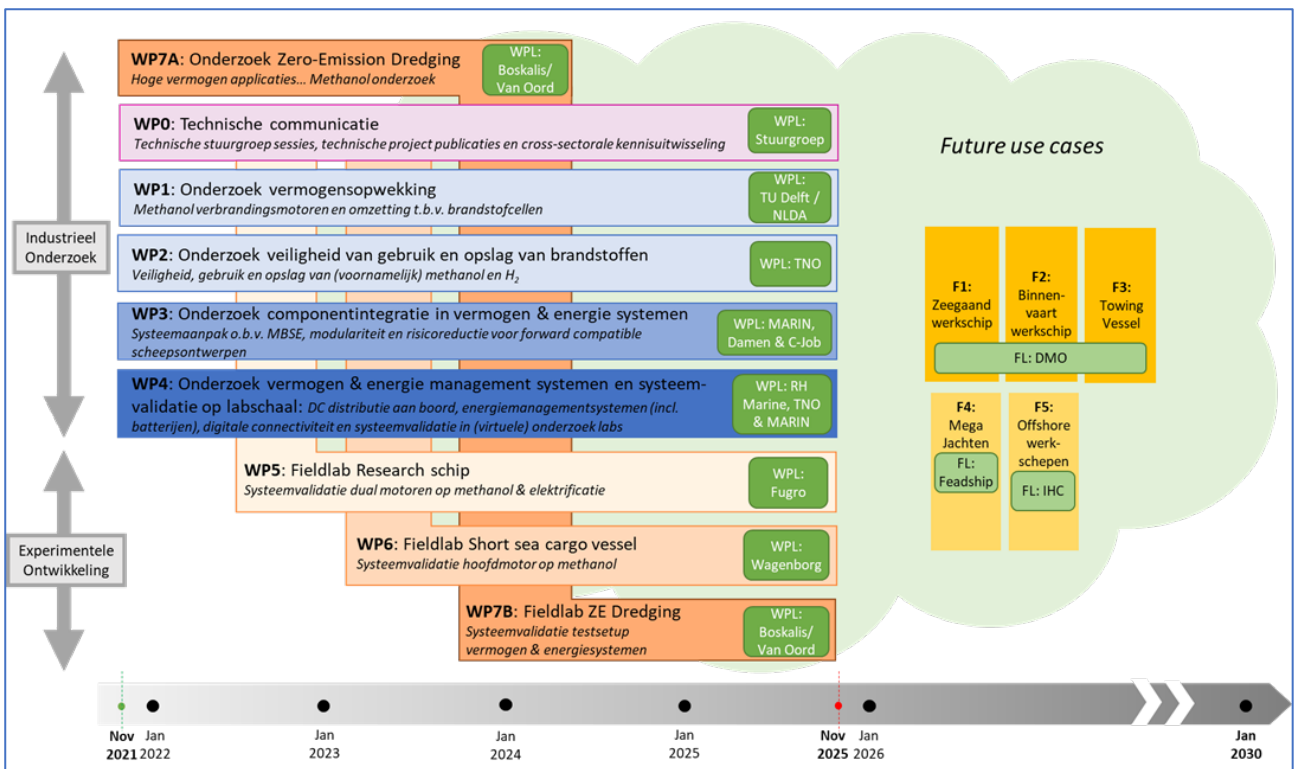
The aim of the MENENS project is to develop safe, modular and forward-compatible power and energy systems based on methanol.

The MENENS consortium consists of 21 partners, supplemented by 6 in-kind partners and represent the Dutch maritime sector across the board, from shipowner to designer and from shipbuilder to (specialist) supplier. Together, the aim is to accelerate the path to truly zero-emission shipping through the development of adaptive system solutions based on methanol.

The project is being carried out with a subsidy from the R&D Mobility Sectors scheme of the Ministry of Economic Affairs and Climate Policy, administered by the Netherlands Enterprise Agency.

1 Activities carried out in the project

The project started at the end of 2021 and in the 2nd year various activities were carried out within the various (8) work packages of the MENENS project. The figure below shows the different work packages and their coherence. In the next chapter, the state of affairs for each work package is explained in more detail.



2 State of play by work package (2022)

The table below provides more information with regard to the partial results achieved per work package, the possible bottlenecks and the perspective for application of the work package results

WP No.	WP description	Result	Bottlenecks	Perspective (for application)
0	Technical communication	A project steering committee has been set up and technical consultations have taken place between partners regarding partial results per work package	Due to the start-up phase, involvement of support partners has been limited within this part	A communication plan is currently being drawn up to further promote unambiguous external communication
1	Power Generation Research	Sub-studies started in the field of: advanced methanol concepts, dual fuel injection, system dynamics and research spark ignition	Sub-studies started a bit late, which means that the progress over year 1 is somewhat less than expected. This was due to the limited availability of researchers.	There is a good perspective for the application of research results.
2	Research into the safety of use and storage of fuels	Inventory & safety assessment for storage and use of methanol in shipping carried out	Challenge to include all the different usage profiles in the safety investigation; Different usage profiles have different requirements	Research results will be used for future designs
3	Research into component integration in power and energy systems	Model Based System Engineering approach clarified to the parties involved. Started with sharing activities in the field of different use-cases, updating green technology database regarding methanol, integration solutions for different components and sub-studies energy saving	Capacity problems, resulting in less progress on sub-aspects for the time being	The application perspective is as positive as ever

WP No.	WP description	Result	Bottlenecks	Perspective (for application)
4	Research into power and energy management systems and lab-scale system validation	Insight into requirements and initial building blocks for methanol engines almost ready	Capacity problems lead to delays on partial routes: limited availability of staff	The expectation is that capacity problems can be solved in cooperation between partners
5	Fieldlab Research vessel	Basic design developed	High costs of converting to a field lab due to sharply increased prices	Fugro is looking for optimisations in design and execution, which may result in cost savings
6	Fieldlab Short sea cargo vessel	Basic design developed	High costs due to increased prices and uncertainty about how methanol will be included in future regulations and guidelines (e.g. ETS cost system)	Wagenborg is researching optimisations and is working with other shipowners to bring methanol more emphatically to the attention of policymakers as a green alternative
7	Fieldlab Zero Emission Dredging	Start of research into digital twin models for the dredging process, engines and power management are being developed	Delay in sub-activities due to waiting for test data from engines (e.g. dynamic loading).	Positive; expect to be able to make good progress in project year 2.

3 State of play by work package (2023)

The table below provides more information with regard to the partial results achieved per work package, the possible bottlenecks and the perspective for application of the work package results

WP No.	WP description	Result	Bottlenecks	Perspective (for application)
0	Technical communication	A MENENS steering committee has been established, and technical consultations between partners occurred regularly throughout the year to discuss progress and results. The key outcomes of WPO are the 1st General Assembly and a formalized communication plan.	One of the 22 partners has formally left the MENENS consortium. Although this is not critical to MENENS objectives, it has caused delays.	The steering committee has identified a replacement party with a similar scope. It is expected they will join soon. The 2nd General Assembly is planned for 2024.
1	Power Generation Research	There is strong cooperation among parties, and initial results have been achieved in advanced methanol concepts. The first conference paper has been published (including the MOSES 2023 Conference and the Transport Research Arena Conference), with more to follow.	Methanol storage and test facilities in Den Helder require additional approval from stakeholders such as RWS and the Municipality of Den Helder, causing unforeseen delays.	Measures are being implemented to reduce delays. The partial results are promising, building sufficient trust for MENENS partners to start additional commercial methanol projects.
2	Research into the safety of use and storage of fuels	Assessment carried out for storage and safe use of methanol have contributed to at least 2 so-called " Approval-in-Principle " for ships. This is a crucial and necessary step for the roll-out of methanol vessels.	Limited lab availability has caused slight delays in combination tests for methanol, ethanol, and nitrogen.	A step-by-step approach has been adopted to enable quick and safe testing.
3	Research into component integration in power and energy systems	The Model Based System Engineering (MBSE) approach is progressing well in multiple use cases and is increasingly utilized in various tasks. Initial papers have been published (e.g., MOSES Conference).	One of the concept models for ship shapes proved unfeasible.	An alternative concept model, developed in parallel, is now being pursued.

WP No.	WP description	Result	Bottlenecks	Perspective (for application)
4	Research into power and energy management systems and lab-scale system validation	Progress aligns with the initial building blocks for methanol engines, and the corresponding models are being integrated. An EMS update has been developed, along with a demonstrator of the digital infrastructure based on IIOT.	Intensive collaboration with sensitive (IP) information can cause delays.	Agreed standards ensure models can be shared without significant delays. The recent update on the EMS has a positive outlook.
5	Fieldlab Research Vessel	"Class approval" for the methanol design has been obtained from a classification society. Two methanol engines have been purchased, and a new partner has started integrating another engine type (a conversion kit) into the field lab.	Longer delivery times for methanol engines and rising costs are causing delays.	MENENS parties are collaborating on tasks (e.g., HAZID test design) to reduce costs and optimize processes.
6	Fieldlab Short Sea Cargo Vessel	The concept design and an initial HAZID test for the Wagenborg sea cargo vessel have been completed.	High costs have rendered some tasks unfeasible for this Fieldlab.	Measures have been taken to maintain objectives: basic and detailed design tasks are planned for comparable vessels, such as the general cargo vessel and a similar vessel design for the Rijksrederij.
7	Fieldlab Zero Emission Dredging	The test program for dredging processes has been successfully executed, with several tests across multiple cycles. Different models have been integrated into a single digital twin model.	Further test data is required to validate the digital twins, particularly from intensive dredging processes.	Collaboration among test program parties is positive and continues to improve, ensuring a positive outlook for obtaining the necessary test data.

4 Description of the project's contribution to the objectives of the scheme

The aim of the RDM scheme is to mitigate the negative impact of the corona crisis on the R&D expenditure of the Netherlands at the time, but also to maintain the earning capacity of the mobility sectors and to facilitate a transition to climate-neutral mobility.

The MENENS project focuses specifically on the maritime mobility sector and, through its extensive R&D programme, provides innovations within one of the fuel routes of the maritime mobility sector. The MENENS project is therefore planning concrete results for future-proof and climate-neutral mobility solutions. These results will take the form of new propulsion systems based on (green) methanol, with which the Dutch Maritime mobility sector can maintain its earning capacity and thus also (partially) mitigate the negative consequences of the corona crisis. The implementation of the project also contributes to maintaining a strengthened knowledge position and distinctive competitive position for the Dutch maritime sector, including knowledge infrastructure. The objectives of the MENENS project are in line with the goals set out in the Maritime Master Plan (by NML in 2020/2021), which aims to establish the Netherlands as a world leader in sustainable shipbuilding and shipping.



Figure 1: RDM scheme within the Maritime Master Plan as drawn up by the sector (NML) in 2020/2021.

5 Spin-off within and outside the sector

The project is now in its 2nd year of the project. Some partners within the consortium seem to have made significant decisions for their own strategy. It is still too early to say whether there are any concrete spin-offs as a result of the MENENS project.



6 Publications

The project has now drawn up a broad communication plan for external project communication, including www.MENENS.nl is part of it. The purpose of this website is, among other things, to keep track of publications of research and current developments and to publish them clearly on <https://menens.nl/research/> and <https://menens.nl/news/>. For example, we expect papers that have been accepted and published at recognized conferences and articles from departments on the MENENS website, such as from <https://www.moses.community/> and <https://www.dredging.org/>

7 Contact us for more information

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