

NEW, ADVANCED AND VALUE-ADDED INNOVATIVE SHIPS

This second edition of the Newsletter of the NAVAIS project, provides an overview of the activities executed since April this year. NAVAIS develops a platform-based modular product family approach supported by the **3DEXPERIENCE®** integrated business platform. This concept will increase efficiency in vessel design and flexibility in production networks. NAVAIS focusses on passenger/road ferries and multi-use workboats

integrating sustainability in the design of ships. NAVAIS supports the transfer from an engineered-to-order business model to an assemble-to-order business model, which allows shorter process lead-times, constant quality, reduced design and production costs and better integration of the SME supply chain, thereby increasing competitiveness of the European shipbuilding industry. Since the newsletter of April this

year, the project progressed in the execution of a number of aspects, like the execution of a market analysis regarding the worldwide workboat fleet, the existing regulations and limits for emissions from ships, model-scale tests of tools predicting underwater radiated noise (URN) as well as detailing the requirements for the platform-based modular product family design and production within the **3DEXPERIENCE** platform.

AREAS OF INTEREST

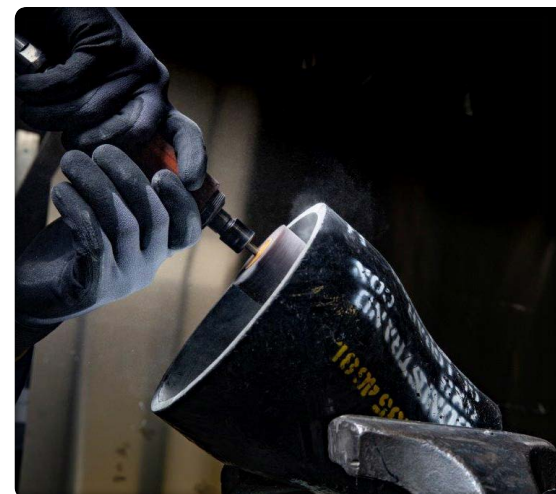
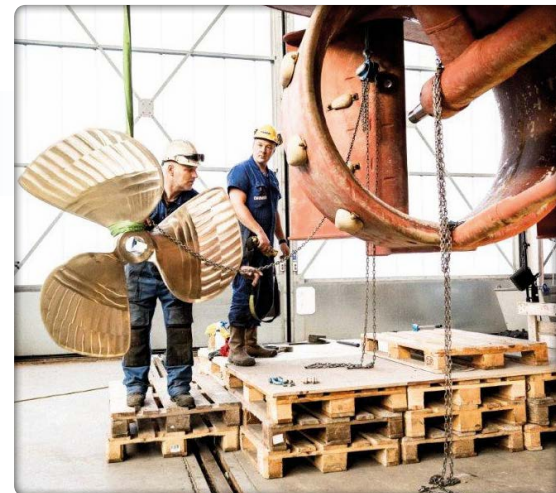
NAVAIS works on six areas of attention throughout the lifetime of the project to achieve its goals

1 REQUIREMENTS AND ASSESSMENTS

setting and aligning the detailed requirements, ensuring the different work packages remain aligned, validating and verifying the project results. Cost-benefit, including societal costs, are an important element for defining requirements in NAVAIS.

After the alignment of all project elements in the first period of NAVAIS, the focus of the recent period was on the creation of an economic assessment model to be used later on in the three assessments foreseen for the NAVAIS project. In July the Deliverable D1.2 was completed. With this deliverable an economic assessment model has been provided that is able to distinguish the impact of various impact reducing techniques on both the Capital costs, Operational Expenses and Environmental costs.

As NAVAIS develops a number of new tools, approaches and designs, validation and verification of these elements is crucial. The second part of D1.2 has been focussed on establishing the verification and validation processes to be applied during the assessments. This is direct input to other work packages as it indicates the information to be collected for a smooth assessment. As an example the economic assessment model was verified and validated using this process.



2 PLATFORM BASED FERRY PRODUCT FAMILY

creating a platform based modular ferry product family and creating a digital twin to verify simulations of the production process

As presented in the previous newsletter the main challenge of this workspace is to introduce a ferry product family, to be used in a platform-based modular product design method for double-ended ferries. One of the key conclusions of a detailed market study is that emission reduction and electric propulsion are indeed one of the most important properties of the

double ended road ferries that need to be implemented in the ferry family. All the work carried out in the past months is therefore related to electric propulsion, for which a first workshop was conducted with the aim to further detail the ambitions regarding the modular electric propulsion. This includes the high level system integration and architecture and high

and low level automation strategies for charging and sailing fully electric.

For the next period additional work will be carried out so that also for the other functional modules the scaling ranges become available and that the development of those modules can get a similarly smooth start as for the electric propulsion module.

3 PLATFORM-BASED WORKBOAT PRODUCT

to develop a platform-based workboat family for a wide range of customer demands. The concept is based on the analysis and redesign of standards and scalable functional modules often present in the workboat industry.

At month 15 of the project the activities are well on track. Having completed the first two tasks of the work package has led to some interesting results making a solid foundation for next steps to be taken. An extensive market analysis of both performances and dimensions of the worldwide

workboat fleet, consisting of more than 8,000 vessels, has been carried out. This resulted in a first workboat product family consisting of three vessels. Furthermore, a first detailed workboat functional decomposition has been introduced and in the next steps a consolidation of each function

with the respective measure of performance, and its scaling range, will be carried out. The consolidation will establish a connection between the functions and the ship systems, with their own sizing procedures and calculation.

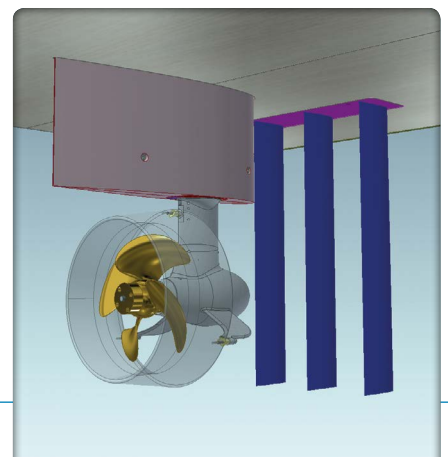
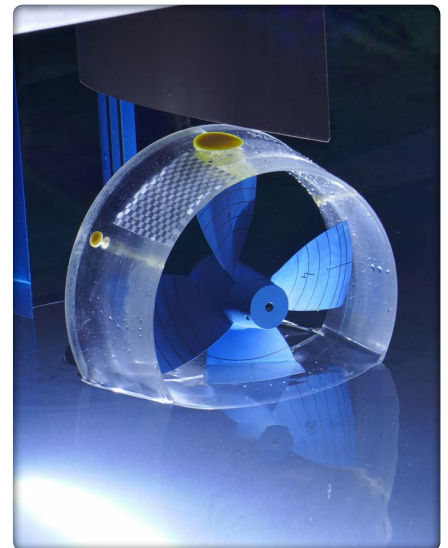
4 LOW-IMPACT DESIGN & OPERATIONAL PRINCIPLES

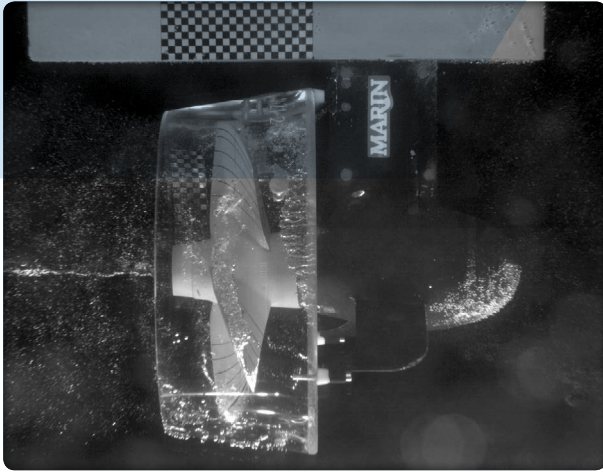
to provide guidelines and goals for low-impact design of vessels.

An overview of the various existing regulations and limits for emissions from ships has been compiled. This information was used as input for the creation of a tool that can assist a ship designer in selecting the optimal combination of emission-reduction technologies for a specific ship design. In addition, the tool can be updated with future technological developments or with new emission regulations. The next step is to test the tool on a number of design cases and then connecting it to the other tools in use in NAVAIS such as the **3DEXPERIENCE®** platform.

This work package does not only deal with exhaust emissions, such as CO₂ and NO_x, but also with underwater radiated noise (URN) because of a growing concern that URN has a negative impact on marine life. Within this activity, the tools for predicting URN during dynamic positioning and during deceleration will be developed. Model-scale tests have been carried out to obtain input and validation data for these tools. During these tests, the URN of a thruster setup, which is a typical propulsor for dynamic positioning, has been measured at various conditions and with two different

propeller designs. A drawing of this set-up is shown below along with a photo of the actual set-up in the test basin.





During the first test campaign, the noise of thrusters in bollard pull condition has been measured. The analysis thereof will be conducted in the coming weeks. The cavitation pattern has been recorded using four high-speed videos (see picture on the left). This provides the input for the model for noise during dynamic positioning.

A model for the noise of propellers operating at off-design conditions will also be developed. The focus of that model will be on noise from pressure-side cavitation, which can occur when a ship is decelerating. The conditions for those tests have already been determined during the recent test campaign but the actual noise measurements will be carried out in following test campaigns later in 2019.

5

PLATFORM-BASED MODULAR PRODUCT FAMILY DESIGN & PRODUCTION

will develop the principles and guidelines for modularization (design process and re-use library), for platform-based product families definition, for modular production concept and simulation and finally for approval thanks to the **3DEXPERIENCE**® platform added value.

An important activity consisted of detailing the requirements for the key tools related to the NAVAIS main ideas. Then, based on functional ship system requirements the functional and logical decomposition of the product architecture of the workboat family has been prototyped in the platform (fig. 1)

This functional and logical decomposition takes place within a RFLP framework, which is the native Model-based System Engineering of the **3DEXPERIENCE** platform (fig. 2). "RFLP" is a unified system definition providing a unique data referential with four fundamental facets (requirements, functional, logical and physical views) that allow describing the core elements of Systems Engineering.

Based on the RFLP decomposition, the Logical view adding dynamic and/or static behavior models from various engineering fields has been enhanced to the components describing a system. Simultaneously, some behavior modeling templates have

been prototyped using the Modelica language from the **3DEXPERIENCE** CATIA Systems dedicated application (fig. 3).

Modelica is an object-oriented modelling language for modelling of complex systems. Together with the logical data, it should allow the classification societies to approve "in principle" each module which composes the entire ship product family structure (figure 4) earlier in the design stage.

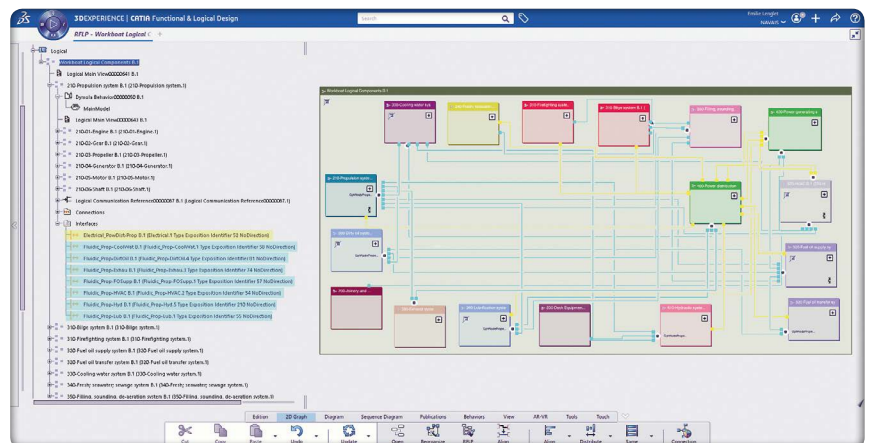


Figure 1: Logical high-level architecture of the workboat family modelled in the **3DEXPERIENCE** platform

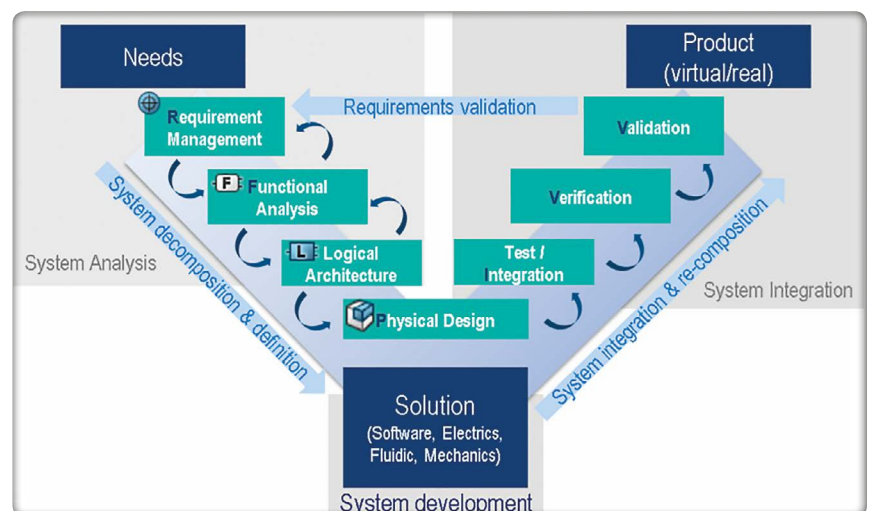


Figure 2: The RFLP framework decomposition of systems in the **3DEXPERIENCE** platform

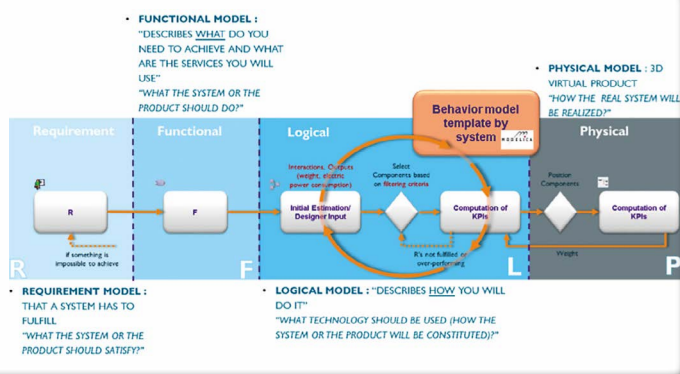


Figure 3: RFLP module architecture definition and behaviour modelling integration

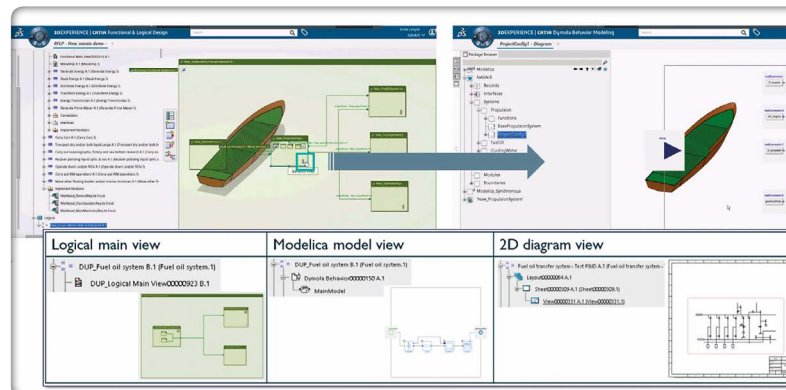


Figure 4: Logical data architecture with system behaviour modelling integration

As next steps, the full advantage of platform based modular ship product family concept will be further elaborated, in close cooperation between the shipyards and the classification societies.

6 DISSEMINATION AND MARKET-UPTAKE

are key to maximize the impact of the NAVAIS project, involve the SME supply chain and to pave the way to market uptake of the project results.

The activities in the framework of dissemination and market-uptake are executed in four interrelated domains:

- ① The development of a strategy for dissemination and exploitation of the project results, which has been completed in the previous period.
- ② The development of dissemination and communication measures and tools, the organisation of events, and the facilitation of the involvement of the SME supply chain are key to ensure a proper dissemination and exploitation of the project results. In the past couple of months, amongst others, a [LinkedIn account](#) has been developed, a newsletter prepared, the participation to TRA 2020 and ICASS executed, and the NAVAIS website has been continuously updated;
- ③ Implementation, monitoring and assessment of the implementation of the strategy and tools developed to ensure the strategy and tools meet the expectations of the target audience, thereby ensuring the maximization of the impact of NAVAIS;
- ④ The set-up of the involvement of the (SME) supply chain, to facilitate the adaptation to new business models. An SME forum will be created to ensure the supply chain of shipbuilding companies is aligned during the execution of the project.

Any relevant stakeholder that would like to participate in the SME-forum that will be initiated, please contact the project by sending an e-mail to: info@navais.eu

For next issues of the NAVAIS newsletter, please register by using the link on the NAVAIS website:

<https://www.navais.eu/news>

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