

Donau, the pusher that has been selected by Multronic to be equipped with after-treatment systems, was installed with selected pilot test applications. After completing the design and planning works, the installation took place in early February 2017. This vessel is also monitored for exhaust gas emissions during the test period that has started right after the installation.

More than ten vessels in the Rhine (2 by BAW & DST) and Danube Region (10 by NAV) have been equipped with measurement equipment. These instruments deliver flow data about the fairway (depth, bottom height, flow velocity) and the vessel (position, speed, engine performance etc.) towards the consolidated **PROMINENT** database. These data, in combination with dedicated model tests for some of the vessels, are the basis to set up the relevant models that will serve the on-board trip advisory tool, giving recommendations for the skipper during a certain voyage. The first prototype of the on-board tool is under finalisation. This includes the real time modelling and making use of fairway data received from waterway management organisations from Germany (BAW) and Austria (VIA) that are already being collected in the database. The extensive model tests for the pilot vessels Symphonie, Monika Deymann and Baden Wuertemberg are finished. The results are now being implemented in the ship performance model for the Efficient Navigation Tool (ENAT). Two tools are to be pilot deployed:

- ENAT, the on-board trip advisory tool predicting fuel consumption in relation to sailing speed and arrival time and a
- Land based tool for evaluation of ship efficiency and navigation performance

Both tools will be web-based applications that are available from all kind of devices.

The crews of the 12 equipped vessels are already making use of the installed equipment by means of receiving

the measurement data on dedicated output interfaces in the wheelhouse. Applications are also developed for the skippers and vessel owners that are real-time measurement data, such as position, loading conditions, fairway and engine data.

WP-LEADER

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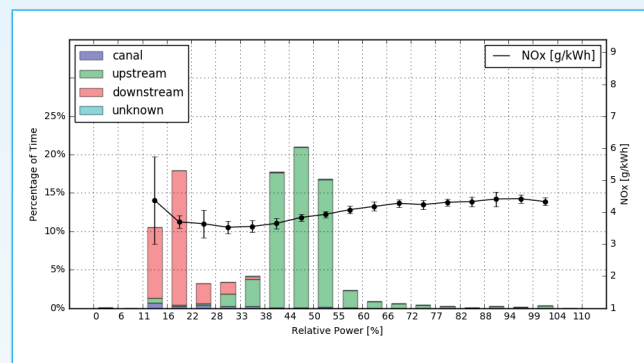
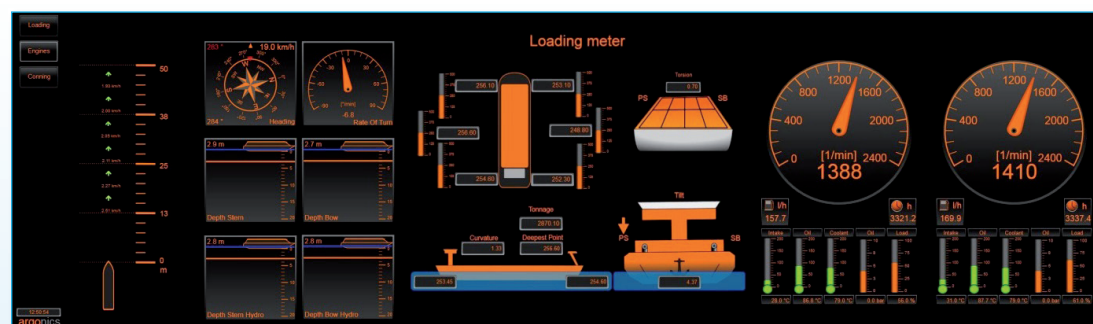


FIGURE 1. Specific NOx emissions and engine power distribution. Container ship Rotterdam-Duisburg

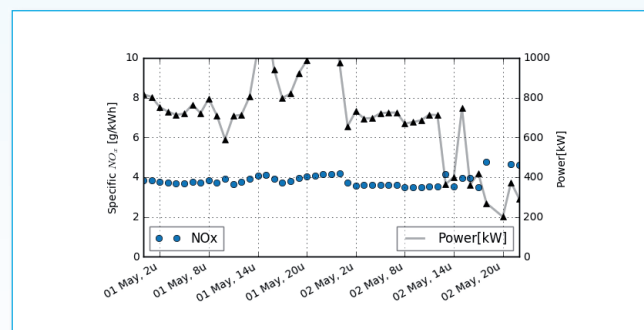


FIGURE 2. NOx emission and engine power during 48 hours. Container ship, Rhine, upstream.



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The **PROMINENT** project has almost closed the second year of the project, and significant results have been achieved. Building on the results of the work concerning the state-of-play, the work conducted in the area of Certification, monitoring and enforcement has been concluded at the beginning of 2017 as well. Following the research conducted concerning this topic, currently pilot deployment activities related to certification, monitoring and enforcement are being executed. In the area of Advanced Concepts for Mass Introduction, new research has recently been started. The first results in the area of digital education tools will be presented soon, and numerous pilot deployment activities are currently being executed. The modular approach of the **PROMINENT** project concerning research, pilot deployment activities and analysis of the pilots conducted will lead to the roll-out plan, of which the first draft is currently being prepared when it comes to the evaluation of the pilot deployment activities. In the meantime, the **PROMINENT** consortium has submitted the mid-term review report to INEA, which has been approved at the beginning of the year.

All these activities will lead to the finalisation of the products during the last year of the project duration during which, besides research and deployment activities, the focus on market uptake facilitation will be increased.

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WP 2

Advanced concepts for mass introduction

In the last issue of this newsletter, we addressed the consequences of the new emission standards for engines used in non-road mobile machinery (NRMM Stage V) for the development of emission-reducing concepts. Under NRMM Stage V, new engines need to comply with extremely lower NOx and PM emissions compared to the current standards. It requires the alignment of the concepts in **PROMINENT** with these emission levels. The implementation of NRMM Stage V is therefore an important development to follow closely.

There are not only interactions with the developments regarding regulatory issues, but also with other initiatives aiming at the development of inland waterway transport. For example, the outcomes of **PROMINENT** have contributed to several other projects aiming at the emission reduction by inland vessels:

- The ex-ante analysis of costs and benefits is validated in the EICB Innovation Lab and also used in a Dutch study on the financing of greening solutions;
- The information on the fleet families and operational profiles is used for cost calculations in the Breakthrough LNG Deployment in Inland Waterway Transport project;
- The list of best available technologies (such as after-treatment, LNG, diesel-electric) is used as input for the tender for demonstration technologies in the CLINSH (Clean Inland Shipping) project and the development of an EU-wide strategy of the European Inland Barging Innovation Platform (EIBIP).



Two concepts

In the coming months, the work on advanced concepts for mass introduction will be focussed on the development of two concepts:

- LNG as an alternative fuel, focussing on meeting the required emission levels of NRM Stage V without exhaust gas after-treatment. This includes the development of technologies dealing with the emissions of methane slip and particulate matters. An ex-ante cost/benefit analysis will be performed to investigate the cost-effectiveness of these LNG configurations for ship-owning companies.

- Right-sizing and hybrid concepts, in which a tool box will be developed to compare different driveline configurations for each of the fleet families and operational profiles (as identified in **PROMINENT**). This includes an advice for the most energy efficient engine size for conventional, full electric and parallel hybrid configurations. The tool will use the outcome of measurements from the current monitoring pilot.

WP-LEADER

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WP 3

Certification and monitoring

The proposed procedures for Retrofit Emission Control Devices' and for 'Environmental Performance Monitoring' have been well received during two stakeholder meetings in Strasbourg and Brussels.

In Strasbourg, the 28th of November 2016 was specially reserved for a meeting with CESNI-PT. CESNI is the European Committee for drawing up standards in the field of inland navigation. Participants included specialists from member states administrations, EUROMOT, the industry and the European Commission. The proposal for Retrofit certification builds on UNECE R132, which was implemented for road vehicles and land-based mobile machin-

ery. For ships it would include a general laboratory type approval plus an on-board validation on each ship. Even though there were concerns about the costs, the general scope was well supported. Environmental Performance Monitoring is a form of continuous on-board monitoring for both NOx and CO₂ and operational parameters. EUROMOT expressed its interest to also use this methodology for the obliged In-Service Conformity Monitoring for the Stage V emission legislation (2019-2020 onwards).

During the **PROMINENT** Advisory Board meeting (14th of December 2016), the importance of retrofit emission control as

complementary option to OEM Stage V was discussed. There were concerns on the legal position of the ship owner in case of engine problems. Continuous monitoring and storage of key engine parameters could provide a solution for this, along with a good legal agreement between retrofit supplier, engine manufacturer and end-user. The procedures for certification and monitoring are reported in deliverable D3.2/3.3, which are available via the **PROMINENT** website.

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WP 4

Digital Education Tools

The project partners in this work package focus on the development of digital and electronical education tools such as an electronic service record book.

The E-learning modules Vessel Stability and Energy Efficient Navigation are currently under development. Both courses are developed by a team of Inland Shipping experts, E-learning developers and educational specialists. During the coming weeks the first courses will be finalized within the project team. When the final draft is completed the courses can be tested by means of a pilot. The pilots will be conducted as part of WP5 and thoroughly be evaluated in order to improve the e-learning courses.

European electronic service record book and logbook

In close cooperation with the Joint Research Centre the electronic service record book and electronic logbook will be developed. The tender procedure that was started based on

the product requirements set up by the JRC, has almost been completed. It is expected that the development of the e-SRB and e-Logbook will start in April 2017.

Integration of inland navigation in general logistics education

The capstone courses have been developed in the online Community of Practice (CoP). In October 2016 different Train the Trainer Workshops were conducted where teachers were informed about the possibilities with this CoP. The workshops were used as a starting point for the different pilots in which bachelor students in different institutes in Romania, Austria and the Netherlands will use the new materials and collaborate in the new CoP.

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WP 5

Key results and outlook

The activities of this work package have turned into a crucial phase: pilots are either already running or the preparations are in their last mile. The overarching PROMINENT consolidated database is up and running and collecting the data on air emission measurement from 10+ vessels, on engine performance and fairway data from authorities and the equipped vessels as well, both on the Rhine and the Danube.

With the lead of TNO and Multronic, the installation of monitoring equipment for exhaust gas emissions is pro-

ceeding on different types of inland navigation vessels. The physical data collection has started in the Rhine

Region. The experts have opened up the possibility to estimate air emissions based on the engine performance data being received from the NAVROM units being in operation in the Danube Region as well. The data of Rhine and Danube ships is now being processed in order to produce standard graphs for ship and driveline. This includes engine load pattern, NOx and CO₂ emissions.

With the involvement of the respective partners, new tasks have been defined for the LNG pilot by means of focusing on the compliance with the recently updated EU non-road mobile machinery regulation. Wärtsilä will install methane slip upgrade packages on existing and new-built vessels. These will be followed up by engine performance tests, including measurements and monitoring of fuel consumption and emissions on board. These new tasks will facilitate the EU-wide need to green the inland fleet by using alternative fuels in a controlled manner.



Exhaust at engines with the same load and start-up time

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