

PROMINENT May 2018

The **PROMINENT** project ended its duration on the 30th of April 2018. The concepts, technologies and prototypes as developed over the last three years, have shown that **PROMINENT** has executed its task in accordance with the expectations at the start. During the final event on the 17th of April, the consortium presented the first draft of the roll-out plan, in order to ensure the products developed by the project will grasp the attention of by the market. Although the products have reached the needed TRL-level, legal and policy actions, financing, additional research and development as well as support for promotion, training and education is needed in some areas on the route towards zero- emission inland navigation. Cooperation between all stakeholders involved is therefore a prerequisite for the uptake of the solutions developed by **PROMINENT**.

This newsletter is the final one of the **PROMINENT** project, and serves to stimulate the adaptation of the products developed. Over the next couple of weeks, the approved deliverables will be published on the website of the project (www.prominent-iwt.eu).

Personally, I would like to thank you for your interest in the project and its results, your participation in the Advisory Board, or advice and guidance in any other form of contact with the **PROMINENT** project partners.

TRA 2018



The **PROMINENT** project presented its results in the week of the 17th of April in Vienna, at various occasions. From the 16th until the 20th of April, **PROMINENT** participated in the Transport Research Arena 2018 (www.traconference.eu). On the 17th of April, the consortium organised the final event, where key stakeholders were informed about the most important results of the project and first concrete discussions concerning the roll-out took place. On the 18th of April 2018, the project was presented during a session on Achieving a Zero-Emission ship, as well as during a workshop on Modernisation of Danube Vessels Fleet.

If you would like to view a short summary of the project, a dedicated movie is available via the following link: www.youtube.com/watch?v=PYuWYpVG7T0.



WP 2

Advanced concepts for mass-introduction

*The aim of **PROMINENT** was clear. To come - with more standardised solutions, designs, models - to cost-efficient concepts for emission reduction. To come up with more standardised solutions, designs, models and to provide cost-efficient concepts for emission reduction.*

Energy-efficient navigation

The most easy way of reducing the fuel consumption of an inland vessel and achieving emission reduction is energy-efficient navigation. This was done by the development of the Efficient Navigation Advice Tool (ENAT). Due to the reduction in fuel consumption, energy-efficient navigation can result in a positive business case, even with the investment in support tools. This was shown in the analysis of the costs and benefits (available on the **PROMINENT** website).

NRMM Stage V: after-treatment and LNG

In **PROMINENT** also two concepts have been studied, which can directly result in achieving the new NRMM Stage V limits for particulate matters (PM) and NOx. The most effective solution for - also existing - diesel engine is the application of after-treatment. All the relevant components of an after-treatment system were assessed on the possibilities of standardisation and cost reduction, which resulted in a demon-

stration with an after-treatment system. The cost-benefit analysis for this technology showed that due to the investment and operational costs, it is difficult to achieve a positive financial business case. However, it is the most effective way to reduce NOx and PM emissions to Stage V level.

Because of the new NRMM Stage V standard, the focus for LNG was also on achieving NRMM Stage V. It is possible to achieve the Stage V levels for NOx and PM. The activities focussed mainly on designs to reduce the levels of particulate numbers and the hydrocarbons (especially CH4 emissions) to comply with NRMM Stage V requirements. This design is also used for testing in an inland vessel. The assessment of the costs and benefits on the application of LNG focussed mainly on the fuel price scenarios (in which LNG is cheaper than diesel) and the level of fuel consumption needed to achieve a return on the investment costs.

Optimisation of the driveline: Right-sizing of engines and hybrid configurations

The last (combined) concept was to gain insight into the optimisation of the engine driveline. For this, a ship energy model was validated with data from the monitoring pilot, and made available via a right-sizing tool. This optimisation focussed on a right-sizing of a diesel-direct configuration and various hybrid (right-sized) configurations. If possible, right-sizing can result in a positive business case. For hybrid configurations, this depends on a combination of factors, such as operational profile, the optimisation of the whole concept (gensets, propeller) and sailing behaviour.

WP-LEADER

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WP3

Is On-Board Monitoring an alternative to Type Approval for Stage V emission levels ?

The quite stringent Stage V emission requirements for inland shipping will enter into force soon: January 2019 for engines up to 300 kW and January 2020 for engines larger than 300 kW. The Stage V engines will need advanced NOx control systems (such as SCR catalysts) and for engine above 300 kW also a Diesel Particulate Filter. The availability of OEM Stage V engines - even in prototypes - is still very limited, if not almost absent. This is due to the small series in combination with the complex technology and also the complex type approval. The business cases are apparently tough for the engine manufacturers.

Within **PROMINENT** alternative Stage V certification options have been investigated and proposed. This includes a 'Stage V' Type Approval method for retrofit after-treatment systems and also permanent On-Board Monitoring (OBM). These options are especially meant to clean up the existing fleet, which is necessary since the renewal rate of inland shipping is very slow. Ship owners who are investing in Retrofit Stage V technology should make sure that they receive equal benefits as ship owners with OEM Stage V engine. So these alternative options can only become successful if they are formally accepted on a European level, or at least by a number of European countries. This is the main challenge for Retrofit to become successful.

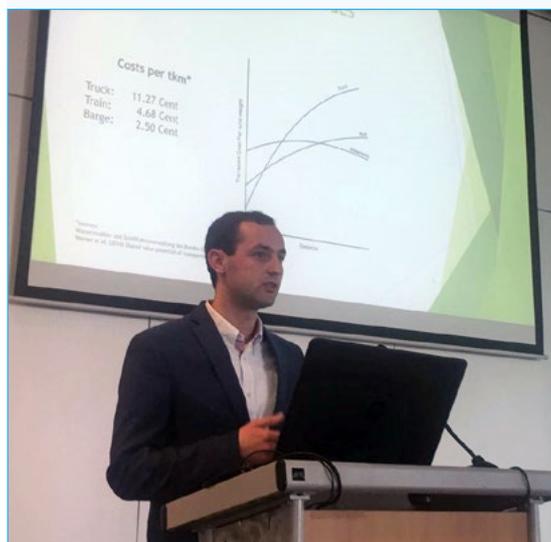
OBM, with continuous broadcasting of the emissions performance to a central 'emission control centre' is mainly proposed as additional security to proof the low emissions performance. It is thinkable that OBM replaces a Type Approval, but then the OBM should be combined with an independent engine test on board of the ship (and also a simpler periodic test). In this test all Stage V components should be addressed, as well as the proper working of the OBM system.

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WP 4

Digital Education Tools



European electronic service record book and logbook

The user experiences of the stakeholders, developers, inspection and crew using the prototype of the e-SRB and E-Logbook were gathered and described in the pilot evaluation report. With this prototype **PROMINENT** proved the technical possibilities and usage of a vessel unit to be used as an Electronic version of the current paper Service Record Book and Logbook. With some technical improvements and considerations outside

WP 5

Usage of liquefied natural gas (LNG) in inland waterway vessels

An extensive measurement campaign on board the vessel RPG Stuttgart was carried out in April of 2018. This measurement campaign aimed to quantify the total hydrocarbon (THC) emission reduction achieved by upgrading the gas engine control system with an advanced software package. The THC emissions contain 90 % methane.

Some difficulties were experienced during the baseline measurement, necessitating the use of an earlier baseline measurement conducted on the same engine during factory acceptance. The comparison of speed load, fuel consumption and NOX emissions between both baseline measurements showed that the alternative (pre FAT) baseline was valid to be used as basis for the comparison to be carried out.

Significant THC emission reductions were measured, up to 3.9 g/kWh in the most important load point in practical operation, which is during upstream operation of the vessel. Total greenhouse gas emission reduction of the upgrade per vessel over the vessel lifetime is expected to be equivalent to over 3688 tons of CO₂. An indicative calculation of the actual greenhouse gas reduction showed that the upgrade of one single vessel has an impact similar to removing 132 cars from the road.

More in detail, the following conclusions can be drawn:

Baseline and post-modification measurements were valid for use in comparisons.

- The upgrade has no adverse impact on NO_x emissions.
- The upgrade has no adverse impact on fuel consumption.
- The upgrade has a big positive impact on THC emissions, with a 2.9 g/kWh reduction over the E3 cycle and a 3.9 g/kWh reduction at the most important load point in the real operation of the vessel.
- Although an impressive reduction in THC was achieved, meeting the THC limit of the NRMM Stage V in all four measuring points of the E3 cycle could not be achieved. However, taking into account all improvements of **PROMINENT** on the design (Wp2 and WP5), full compliance of the engine with the NRMM Stage V requirements can be achieved, even without usage of any after-treatment. The results



elaborated in **PROMINENT** allow Wärt-silä to deliver an LNG propulsion solution till 2020 which will be fully compliant with NRMM Stage V requirements.

As a secondary benefit, engine loading response was improved which leads to more stable gas operation. In practice, this means that the vessel will trip less often to diesel operation. As emissions are much lower when the vessel is running on gas, this means that the actual real-world emissions are lower also because of this.

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the project scope, the pilot test results will be used within the development program of the Electronic Vessel Unit by the Joint Research Centre of the European Commission.

Pilot CoP Logistics Education

During the final event in Vienna, on the 17th of April 2018, six students presented the outcomes of their case study. The students from education institutes in the Netherlands, Austria and Romania worked together for a couple of weeks by using the Community of Practice (CoP) and a practical Case study. This group of students learned during their case study to make use of the advantage of Inland Shipping as a transport modality. Besides they showed the industry how a group of students can become familiar with working out different scenarios on real-life transport problems. The learning materials and case studies are free available and we invite educational institutes to make use of this opportunity and implement this lesson material and method in the Logistics Management study.



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WP 6

Roll-Out Strategy is completed

*The Roll-Out Strategy is completed and consists of identified barriers and recommended follow-up actions for the four **PROMINENT** areas. A package of actions is needed to achieve the goal to reach 90% reductions of air pollutant emissions as well as at least 10% of CO2 and energy savings. Furthermore, actions are needed to improve the skills of the workforce and the attractiveness and accessibility to work in Inland Waterway Transport.*

It was concluded that in total around 850 million euro of external costs can be saved per year, which is a reduction of around 80% compared to the current annual external costs of emissions. To grasp this potential it is recommended to the EC DG MOVE to update the policy on emissions in inland navigation and to set clear and ambitious targets in the field of emission limits which are to include the existing fleet and engines. An EU policy is required with pathways to accommodate the need for CO2 reduction towards zero-emission in view of the Paris agreement on limiting global warming.

For cost effective greening it is needed to have an EU-wide regime and monitoring systems for existing engines, including certification and on board monitoring to make sure low emission levels are reached in real sailing conditions. Another legal action is to develop the framework for requirements and certification of ship handling simulators, electronic service record books and e-logbooks. Furthermore, it is needed to include a mandatory provision of detailed information on waterway conditions in the frame of River Information Services and reaching Good Navigation

Status of the TEN-T waterways. Such information will enable more energy efficient sailing.

An important issue to address is the business case for greening, notably for the air pollutant emissions of the existing fleet. In order to reach the targets, **PROMINENT** recommends developing a EU-wide Greening Fund to finance a large scale uptake of proven solutions, dedicated to reducing air pollutant emissions and greenhouse gas emission. The fund shall be technology neutral and guarantees a level playing field.

The fund can be filled by means of grants from EU, Member States and regional governments as well as by a contribution from the sector. For the latter, it is recommended to introduce a differentiated environmental surcharge on the Inland Waterway Transport fuel, providing a strong incentive for clean vessels. Revenues from this environmental surcharge shall be earmarked to the Greening Fund. In addition, EIB funds (EFSI) shall be used to facilitate investments in LNG. The total volume of investments was estimated at around between 1 and 2 billion euro. It was calculated that an

average surcharge of 4 cents per litre fuel over a period of 10 years brings together a sector contribution of 500 million euro. This alone should be sufficient to compensate investments resulting in 73% reduction of external costs of emissions by Inland Waterway Transport in Europe.

Other actions address the need for further research and development (H2020, FP9) as well as deployment (CEF). Topics to be further elaborated are the expansion of energy efficiency tools, ship handling simulators for training and education, further technological research on promising fuel and engine room solutions (e.g. electrification, biofuels, renewables) as well as digitization in the framework of the Digital Inland Navigation Area (DINA).

The last category of actions concerns promotion, training and education. One of the deliverables is the I-Steer App, which is the tool for the ship-owner/operators to make a first assessment on the feasibility of greening technologies. The I-Steer App tool is available via the link: www.inlandwaterways.nl. This tool is the instrument to reach the huge number of companies in the (fragmented) sector.

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