

# Know-how transfer event: Modernisation of Danube fleet

## SUMMARY OF OUTCOMES

Summary is based on the discussion during the Know-how transfer event. In case of misinterpretation of certain statements, these shall be reported to [indanube@office.eu](mailto:indanube@office.eu) to be further corrected.

### DECISION MAKING PROCESS

- The lifetime of vessels and engines is long (40 years and more). For that reason, investments are done based on current information and long-term expectations. The ship-owner/operator needs to have certainty that the right choice is made for modernisation & greening of the vessel and for the drive train on a long term. However, nobody knows what will be the fuel or propulsion solution of the future and when some of the innovative solutions will be ready for market deployment (hydrogen, methanol, bio or synthetic fuels, fuel cells). Despite uncertainties, vessel operators are required to take a decision now for a long-term investment.
- As a result of significantly higher costs (CAPEX and OPEX) for Stage V engines, and no emission limits obligations from NRMM for existing engines, it is expected that many existing engines will remain operational (overhauling to extent lifetime) and existing vessels will hardly reduce their emission levels.
- On the other hand some (of bigger) vessel operators, like for example RHENUS, make pragmatic decisions and invest in currently proved solutions, like FLEX tunnel for energy reduction (about 9% energy savings based on real-life trials) and diesel electric propulsion systems using electric engine for the drive of marine shaft, power management system and using [EURO VI marinised engines](#) (truck engines) as generator sets. After life-cycle of the EURO VI engines (which is supposed to be shorter than marine engines), Rhenus can refit vessels with the newest solution at the time of refit is needed. Similarly, the planned [project Dunajbus](#), containing 6-7 inland waterbuses commuting between Bratislava and nearby villages, will use most probably diesel-electric propulsion. The electric propulsion can later run with different solutions & fuels that will be available when refitting / upgrading vessels (LNG, hydrogen, fuel-cells, batteries, etc.) therefore the solution is considered by vessel operators as more flexible.

### ALTERNATIVE FUELS & ENERGY CARRIERS

- Currently there are two fuels allowed according to the European Standard laying down Technical Requirements for Inland Navigation vessels (ES-TRIN) to be used in inland vessels: **diesel & LNG**.
- **LNG** can be used as **standard fuel** (see ES-TRIN) in inland vessels (as well for vessels carrying dangerous cargo incl. LNG) sailing on European waterways. **LNG** can be transported as **cargo** (see ADN). The use of LNG from the cargo compartment as fuel is however still not allowed. The main reason is not the technological but it is due to customs procedures, taxation and billing to the customers of cargo.
- **HVO**, which is pure hydrocarbon, (as a drop in fuel) can be immediately used in the current combustion engines with no compromise on fuel quality or vehicle performance. HVO is currently more expensive than diesel. HVO is produced commercially and emerging new players (ENI, TOTAL, PREEM or UPM) can contribute to its better availability & have impact on its price.

- Clean fossil fuels are just transition fuels to renewable fuels. As regards the impact on the climate (greenhouse gases), **methanol** produced from renewable sources is climate neutral, whereas the **liquefied gas (bio, synthetic or natural/fossil)** still counts with methane slip, therefore not totally climate neutral. Gas engine manufacturers are optimistic that with technology improvements, as well methane slip disappears.
- **Methanol** is still not allowed for inland vessels. Currently it can be used by way of **derogation** from Directive (EU) 2016/1629 issued for specific vessel. The first derogations are issues and tests are on-going e.g. passenger vessel “Alsterwasser” & passenger vessel [“Innogy”](#): both with methanol-water mixture (60:40%) as a fuel for the fuel cell system. There is enough **methanol** available on the market as it is used in industry.
- **Hydrogen and fuel cells** will be according to experts the fuel/energy carrier of the future. However, both are still not ready for wide market deployment and the regulatory framework is as well missing. **Hydrogen as fuel for the combustion engine**, produced from methanol, and capture of CO<sub>2</sub> will be tested in the [HyMethShip](#) system.
- When deciding about various types of fuels as well the storage shall be taken into consideration. From the **energy storage point** of view, diesel offers highest efficiency followed by methanol & LNG (methane), whereas H<sub>2</sub> and battery are behind in terms of **energy per volume of tank system**, therefore not suitable for long distances. Future (still not for wide-market deployment) use of H<sub>2</sub> in combination with fuel cells can be used for longer distances.

## PROPULSION SYSTEMS & POWER GENERATION

- There is currently (March 2019) still no Stage V approved/certified engine. Few engine manufacturers stated that they are working on the **Stage V approval/certification** for their engines that already fulfil limits set for Stage V. For example Caterpillar & [Zeppelin](#) recently announced that as of beginning 2020 their engines shall be Stage V approved. As well Koedood (Mitsubishi engines) is working on the Stage V approval, so that the MTU with their gas engines.
- **Electric drive solutions** are highly interesting, despite the higher investment costs, as the energy carrier / fuel can be exchanged more easily as soon as the alternative fuels/solutions are available for the market deployment.

## AFTER-TREATMENT

- To address the emission limits and to reduce emissions and environmental harmful particles, the vessel operators can use **market-ready** after-treatment solutions. **The products are proved** and can be **immediately used in the current vessels**. For more details on the technology and the economics, see the [Factsheet #3 After-treatment](#).

## AUTONOMOUS VESSELS

The steps towards the automation of the vessel operation and fleet management are inevitable and come with the digitalisation of all areas of human lives. DAMEN presented its [first steps towards autonomous vessels](#). CCNR, during its plenary meeting in December, adopted a [first international definition of levels of automation in navigation](#).

## OTHER (DISRUPTIVE) TECHNOLOGIES

There is a variety of other solutions increasing the operational and energy efficiency, either already on the market or in a research phase (e.g. [ambient water transmissions and side-by-side propellers](#)).

## CALL FOR ACTION

- It is necessary to bring more business to the rivers, thus more cargo to rivers.
- If everyone is **charged by tonne/km pollution** eventually Europe will turn inland waterways for majority of their transportation because that is by far the best way of transportation
- **Better communication towards whole society** to make people understand that the CO2 avoiding costs we do not pay today will lead to high CO2 or climate change follow up costs in the future.
- **Europe wide approach is needed** – with commitments and clear actions from **all EU Member States**: CO tax on organisations, incentives for green vessels, pro-active (as well funding) support from governments & regions is required for “green” investments. It is not possible to change the whole system overnight; otherwise industry collapses (whole economy). It is necessary to do it on a mid-term pathway, reliable and transparent for anybody. And here the clear communication is absolutely necessary to go towards a more sustainable mobility.
- **Transparent comparison** between transport modes looking into air pollutants caused by different **transport modes** is needed (sooth from tires of road vehicles, particles from railway transport - steel to steel produce lot of particles, etc.)
- **Sector should become more active** and come up with “what we do want in the future” from governments and how the regulatory framework should look like.

## ABOUT INDANUBE

INDanube is run by Pro Danube Management GmbH. INDanube supports and advice vessel operators in the Danube region in all topics related to the greening and modernisation of the inland vessels. For more information, please contact: [office@indanube.eu](mailto:office@indanube.eu)

## OTHER LINKS

### [INNOVATION RADAR](#)

The Innovation Radar is a powerful tool mapping future-oriented, emerging and innovative technologies along with technical papers, publications and projects.

### [FUNDING DATABASE](#)

European Funding Database, maintained by EIBIP, is an online tool consolidating public funding opportunities relevant for inland waterway transport (IWT) sector. Through this tool the IWT users can search for various funding opportunities and calls either by country or by pre-defined policy areas.

### [GREENING TOOL](#)

The Greening Tool is an interactive tool designed for ship owners and policy makers looking for emission and fuel consumption reduction of inland waterway vessels. It contains the most recent information about costs and benefits of available greening technologies for inland shipping