

Neo Orbis, the first electrical propelled hydrogen powered vessel on sodiumborohydride from Port of Amsterdam



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Neo Orbis



Assignment: build a new port vessel: zero emission and as circular as possible.

Purpose vessel : trips with potentials clients and dignitaries

Sailing area (range): canals of Amsterdam, IJ, Amsterdam Port Area, North Sea channel up until IJmuiden (about 26 km)

Challenge: range is too big and ship is too small for solely electrical propulsion

Solution: electrically Propulsed, Hydrogen Powered

The project was accepted in the H2 Ships program as demonstrator/ pilot project



H2 SHIPS

Purpose H2 Ships: demonstrate technical and economical feasibility of hydrogen propulsion. Currently close to a 100% of the inland vessels are fuelled by gasoil. This results in the emission of large amounts of GHG (Co2, Nox, Sox en PM's).

One of the pilots is:

Neo orbis, a hydrogen powered port vessel, zero emission



Deliverables

Activity/ Del.	Partner	Task
Design of ship	PoA/Wijk Yacht Creation	2021-2022 Design of an zero emission vessel
Design H2 unit	H2 Fuel BV/ TU Delft	2021-2023 Technical design of H2 unit (bunkering, storage, extractor and electrolyse). Detail engineering finished 31st of July 2023. Start build september 2023.
Build of the vessel	NGS/PoA	Q 1 2023 keel laying at NGS , 15 september 2023 sailing test at NGS.
Building H2 Fuel installation	PoA/University of Delft/ Marin/ NGS	Build mock up 2023. building installation 2023. Testing Q 1 and Q 2 2024. Then building installation into the vessel.
Next phase: making NaBh4 circular	Maritime Hydrogen BV, Universities of Amsterdam and Delft	2021-2024

Neo Orbis



Milestones:

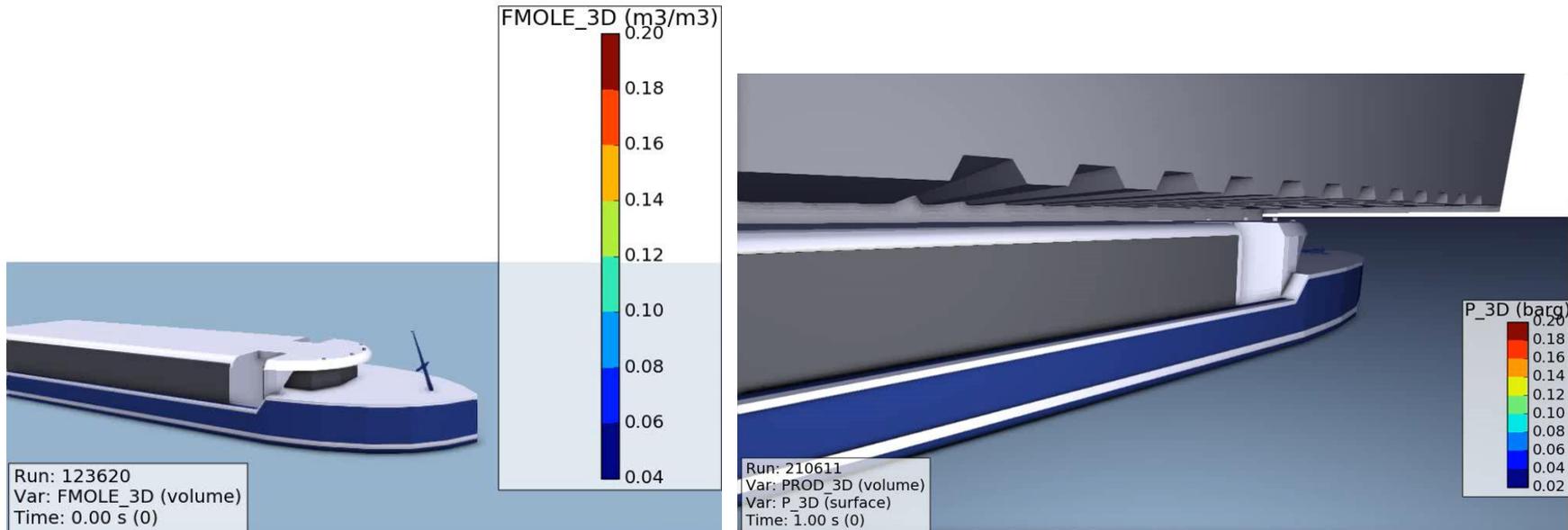
- Interview users current vessel
- Functional Requirements
- Power test current vessel
- Power calculation

Sailing time [hrs]	Speed [km/hr]	Energy Use /hr [kWh]	Energie use [kW]
7	12	48	336
3	15	95	285

- Research battery power plus additional demand for energy (fi hotel function, fuel cells).
- Design proces in multidisciplinary team (WYC, PoA, H2 CIF, Marin, Baumüller, Lloyds , all in TEAMS!!!!)
- Risk Based Certification installation by Lloyds: pre scan, Hazid, Hyex, HAZOPS (3) pre-engineering installation
- Detail engineering with closing HAZOP
- Designing and writing software: TCPM
- Building electrical installation: Eltec
- Building the extractor at KLIP, FAT,SAT
- Testing the installation in the full scale mock up before building it into the vessel
- Certification Lloyds en IL&T (flag)
- Sailing to Amsterdam and HAT

CFD: Flacs – Hyexsafe (Norway)

Advice about vent openings, safety in case hydrogen gas is vented under the longest bridge in Amsterdam. Currently being reviewed because of increased amount of hydrogen gas.



Lloyds RBC



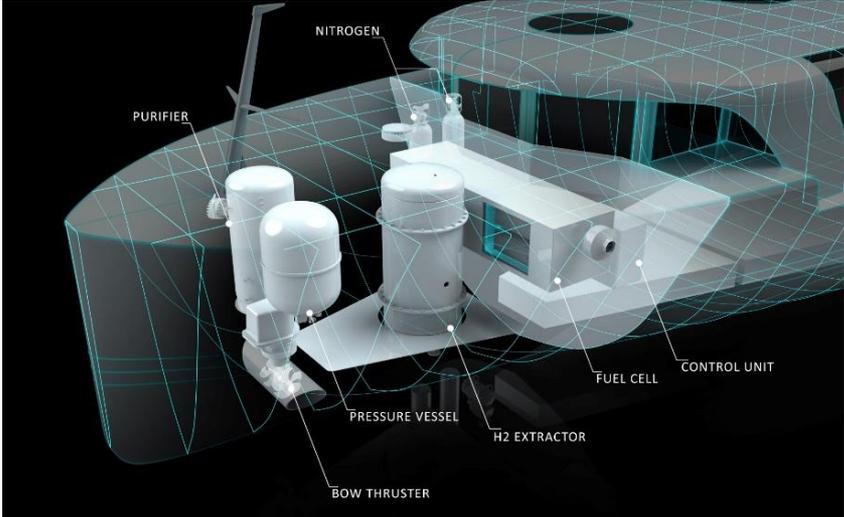
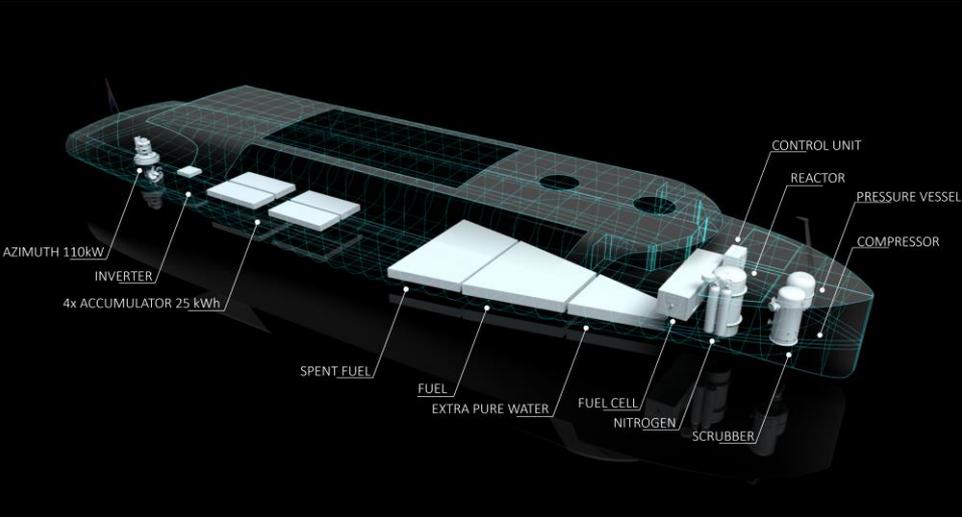
- The ship will be certified as inland waterway vessel (zone 3 and 4 Amsterdam)
- For the hydrogen installation the Lloyd's Register Rules and Regulations for the Classification of Ships using Gases or other Low-flashpoint Fuels, July 2019, Part A will be used:

The HAZID resulted in 32 recommendations. 14 teams worked on these recommendations, resulting in various Technotes. They were approved by Lloyds.

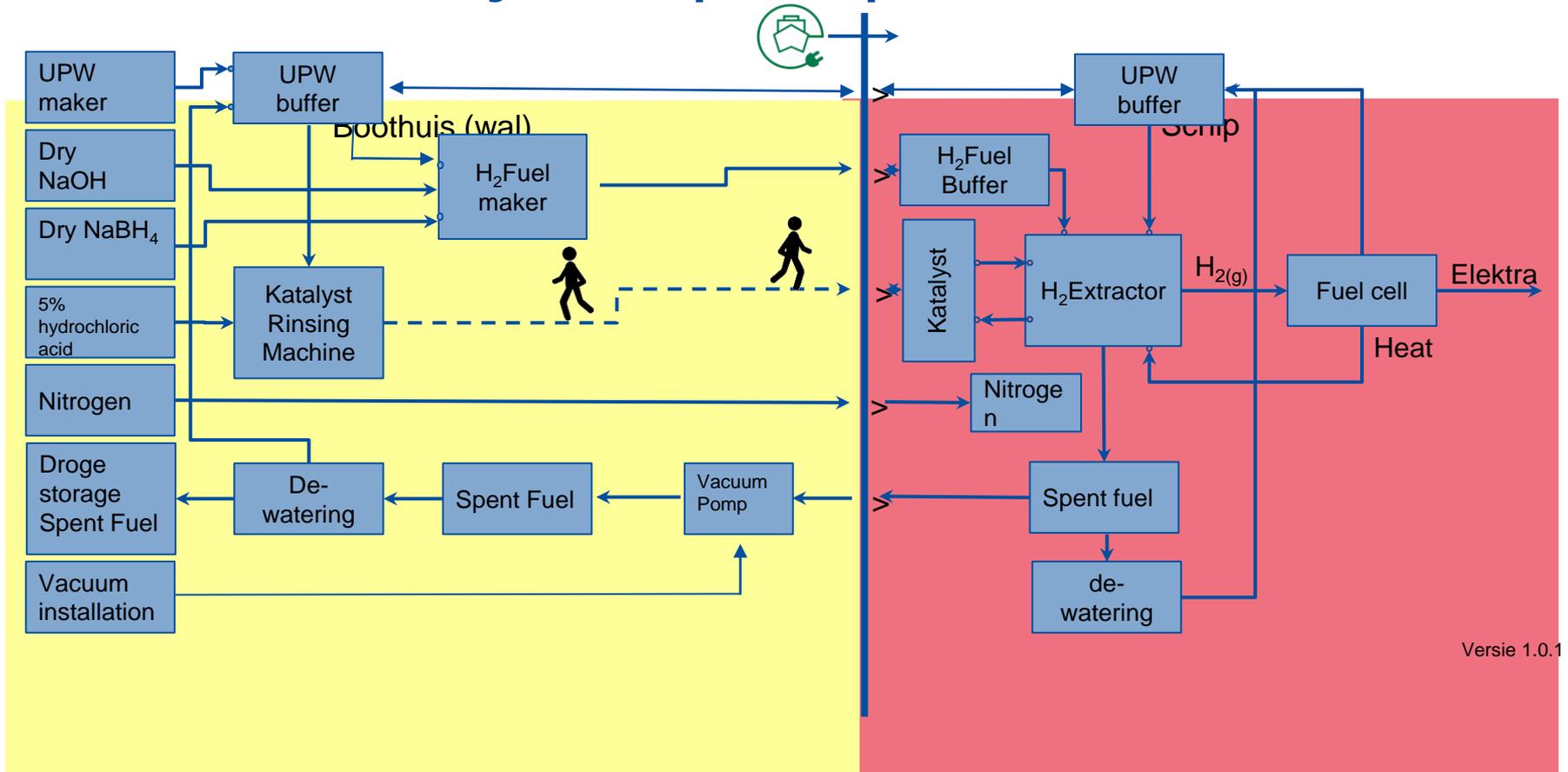
De pre-engineering resulted in 3 HAZOP'S. Detail engineering will demand 1 HAZOP.

After the building phase, Lloyds will test profoundly on safety.

System design



System principle



Versie 1.0.1

Design of the boathouse



The interior as circular as possible



Lessons learned



- Poa stepped in the H2 Ships project after scope, planning and finances were decided on for a totally different ship. This means not only the design had to be altered, but also a boathouse has to be built.
- This project is not the build of a vessel, but the innovation of a new propulsion.
- This innovation demands a lot of more time, energy and funds than originally foreseen: the finished design is 1,5 years later. Costs are 300% higher. Planning is a huge challenge.
- Lloyds RBC results in re-designing.
- Innovation by a start-up is a challenge.

Neo Orbis June 2023



Questions?

