

D3.4 Demonstration hydrogen dual fuel engine

Synergetics | Synergies for Green Transformation of Inland and Coastal Shipping

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DELIVERABLE LEADER	CMB.TECH
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Deliverable D3.4 is a deliverable of type "demonstrator, pilot, prototype" (DEM). This document provides additional information on the background, status and plans. A detailed report will be submitted in June 2025 with the deliverable D3.5 Evaluation report hydrogen dual fuel on CTV.

Project Overview

Within the SYNERGETICS project, CMB.TECH is converting and calibrating the Volvo Penta D8 marine engine to a dual-fuel hydrogen/diesel configuration. The Volvo Penta D8 engines are widely used in inland navigation and short-sea vessels, serving as main propulsion engines, variable speed gensets, or fixed speed gensets. This demonstration has the potential for significant environmental and operational impact across a broad fleet of marine vessels.

Technology Highlights

- **Dual Fuel Combustion:** Utilises a pilot diesel injection to ignite a hydrogen/air mixture, enabling reduction of diesel consumption. This directly reduces CO₂ emissions, diesel particulates, and AdBlue consumption.
- **Cost-Effective Retrofitting:** Allows existing fleets to adopt dual-fuel technology with minimal modifications.
- **IMO Tier III and Stage V Compliance:** Achieves ultra-low NO_x and particulate emissions, easing regulatory burdens while improving environmental outcomes.
- **Operational Benefits:** Enables ship operators to gain hands-on experience with hydrogen safety, refuelling, and availability without full dependence on hydrogen infrastructure.

Progress to Date

- The **Volvo Penta D8** engine has been installed on a state-of-the-art dynamometer.
- Calibration for hydrogen and diesel dual fuel operation is ongoing, with emissions certification and class approval expected by summer 2025.
- In parallel, the CAD team is finalising the design of a hydrogen injection system optimised for marine applications, addressing safety and operational challenges.



Future Work

- Completion of engine calibration for optimal performance and emissions.
- Emissions testing and certification in compliance with marine standards.

Impact

This project demonstrates a scalable pathway for reducing greenhouse gas emissions in the maritime sector, leveraging existing assets and infrastructure to accelerate the adoption of hydrogen as a clean fuel.

