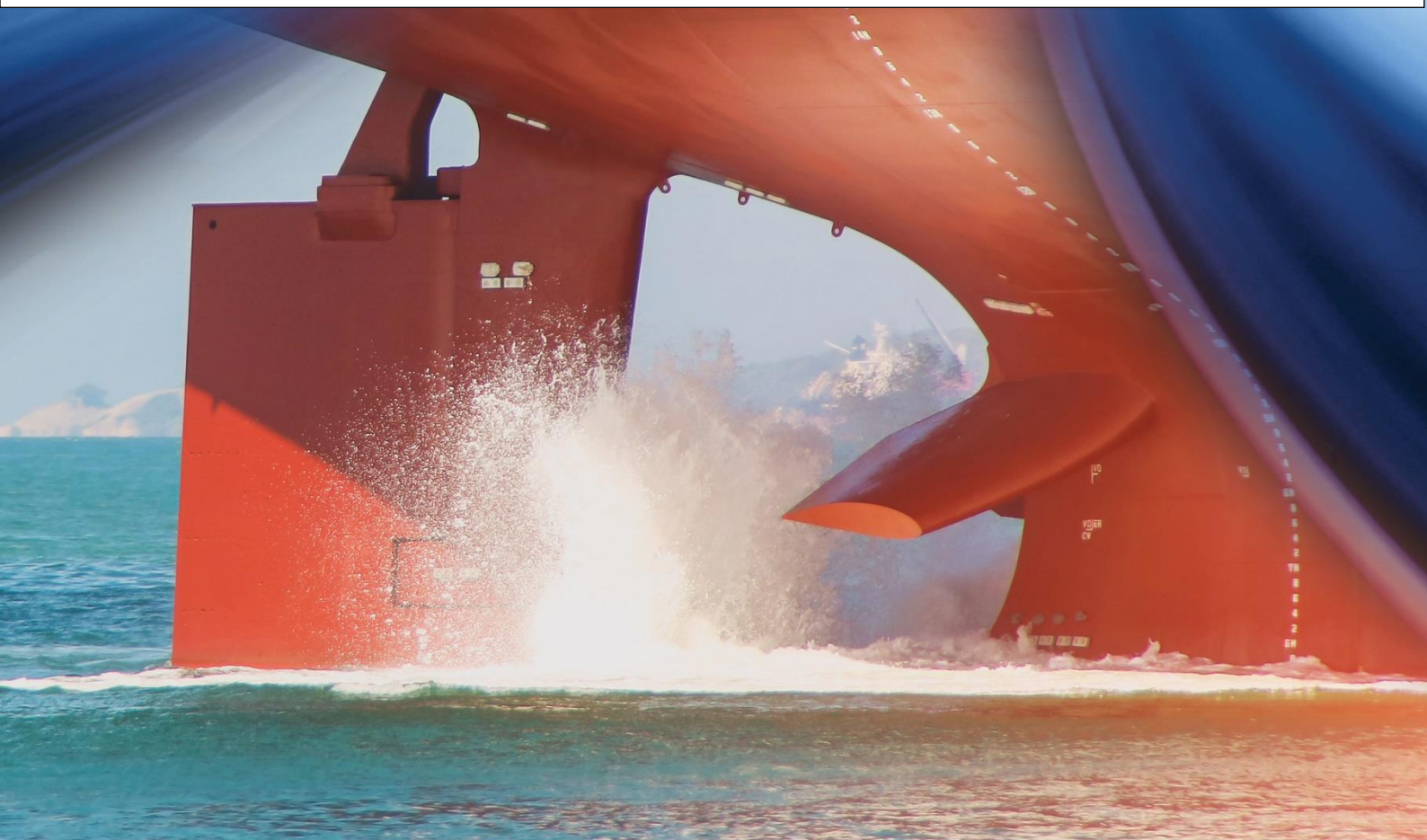


IEA-Advanced Motor Fuels ANNUAL REPORT 2021

Task 60



Task 60: The Progress of Advanced Marine Fuels

Project Duration	November 2019 – November 2022
Participants Task sharing	Austria, Canada, China, Denmark, Finland, Korea, Sweden, Switzerland, and USA
Cost sharing	Methanol Institute, USA
Total Budget	€1,795,000 (\$2,161,000 US)
Task Manager	Kim Winther Danish Technological Institute Email: kwi@dti.dk
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Purpose, Objectives and Key Question

In 2013, AMF released its first Task report on marine fuels (Task 41). This report highlighted the fact that no alternative fuel option existed without significant added cost or other serious impediments. The preferred fuel, HFO, was soon to be banned or restricted due to the high Sulphur and fossil carbon content. Recent developments, however, have highlighted several new fuel options which should be assessed.

Task 60 seeks to answer the key question: How can new forms of advanced marine fuels contribute to carbon neutral shipping in the future?

Activities

Four virtual meetings were held during 2021. Denmark, Canada, Sweden and Switzerland were the main presenters at the meetings.

	2019 Q4	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3	2021 Q4	2022 Q1	2022 Q2	2022 Q3	2022 Q4
Formal Task Documents	DK												
Work presentation			FI	-	DK	CA	SE CH		US KR	CN			
Final report contribution								SE FI	US DK	CA KR	CH CN		Final

DONE

Fig. 1. Timeline of Task 60 efforts to study the progress of Advanced Marine Fuels. Key: Denmark (DK), Finland (FI), Canada (CA), China (CN), Sweden (SE), Switzerland (CH) and Korea (KR).

Austria joined as a new participant in 2021.

Key Findings

Following are highlights of the four main presentations held in 2021:

- **Denmark** finished work on the 2 MW methanol engine in 2021 and is about to commercialize the concept. Tests on ammonia were initiated on a 20 kW engine at Technical University of Denmark (DTU). Denmark also did a special study on emission reduction on coastal ferries.
- **Canada** did a study on marine black carbon and particulate matter emission factors. Four-stroke engines were found to emit more black carbon than two-strokes per kg of fuel. Low engine load

was found to produce more black carbon per kg of fuel than high load. Scrubbers were found to be ineffective towards black carbon but effective toward Sulphur and PM.

- **Sweden** did a study to compare technologies for short sea shipping and inland waterways. Included initially were seven fuels: HVO, Biogas, Ethanol, Methanol, Hydrogen, Ammonia, and electricity (Batteries). The number of fuels was later reduced to four: Biogas, Methanol, Hydrogen, and batteries. Technology readiness is highest for HVO, biogas and battery, and it is lowest for Ammonia. All alternatives will generate higher fuel cost. HVO is almost three times the cost of reference fuel. Biogas and electricity were found to be the cheapest low-carbon options.
- **Switzerland** made an experimental setup to emulate a large two-stroke marine engine – the Flex-OeCoS – which allows optical combustion analysis and Particle Image Velocimetry (PIV).

Publications

A final report of Task 60 will be available in late 2022 and can then be downloaded on the AMF TCP website: https://www.iea-amf.org/content/projects/map_projects/60.