

Environmental concerns propel research into marine biofuels

May 18 2021



Credit: CC0 Public Domain

A global effort to reduce sulfur and greenhouse gas (GHG) emissions from ships has researchers from the National Renewable Energy Laboratory (NREL) and other Department of Energy facilities investigating the potential use of marine biofuels.

"Biofuels turned out to be very good options because they have zero or very, very low [sulfur](#) compared to [fossil fuels](#)," said Eric Tan, a senior research engineer at NREL and lead author of a new article published in the journal *Environmental Science and Technology*.

His co-authors of "Biofuel Options for Marine Applications: Techno-Economic and Life-Cycle Analyses" are Ling Tao, also from NREL, along with scientists with Argonne National Laboratory, Pacific Northwest National Laboratory, and the U.S. Department of Transportation's Maritime Administration.

The International Marine Organization (IMO) has been ratcheting down the allowed amount of sulfur oxides emissions from ships since 2005. The newest upper limit, which took effect at the start of 2020, reduced the sulfur content of ships' [fuel](#) oil to 0.5% from 3.5%. IMO said the reduction should have major benefits for the environment and the health of people, particularly those living near ports and along coasts. Additionally, IMO has set aggressive targets to decarbonize [marine shipping](#), targeting at least a 50% reduction in GHG emissions from international shipping by 2050, relative to 2008 levels.

The new regulation, which is enforced by individual countries, requires changes to bring ships into compliance. Ship owners can either install sulfur scrubbers to reduce emissions, or they can adopt a different, low-sulfur fuel. Both options carry an additional cost.

The NREL-directed research provides a starting point for establishing the feasibility of ships using biofuels. Fueling costs already account for a significant part of running a shipping line, so the researchers examined both prices and emissions.

The economics are weighed against the cost of burning heavy fuel oil (HFO), which accounts for about three-quarters of the fuel used by

ships. A low-sulfur HFO costs slightly more a gallon than traditional HFO. The low-sulfur HFO prices would be the maximum ship owners are willing to pay for biofuels for a one-to-one replacement. The biofuels are considered to be potential drop-in fuels compatible for use in marine engines, but further work is needed to confirm that compatibility.

Upon examining different types of fuels for their ability to reduce emissions of greenhouse gases and air pollutants, the researchers found biofuels produced entirely from biomass offer much higher reductions in life-cycle [greenhouse gas](#) emissions—from 67% to 93% less than HFO. Biomass-derived fuels also are mostly free of sulfur and exhibit reductions in criteria air pollutant emissions such as particulate matter.

Tan's research concluded that, if shipping had no competition, the United States has a large supply of bio-feedstocks for producing substantial amounts of marine biofuels to displace fossil fuels. With ships using 400 million metric tons of fuel annually, a blend of 5% biofuels translates to about 5 billion gallons.

More information: Eric C. D. Tan et al. Biofuel Options for Marine Applications: Technoeconomic and Life-Cycle Analyses, *Environmental Science & Technology* (2021). [DOI: 10.1021/acs.est.0c06141](https://doi.org/10.1021/acs.est.0c06141)

Provided by National Renewable Energy Laboratory

Citation: Environmental concerns propel research into marine biofuels (2021, May 18) retrieved 7 May 2024 from <https://phys.org/news/2021-05-environmental-propel-marine-biofuels.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is

provided for information purposes only.