

Fishing vessel fuel emissions

Outline

Responding to climate change by reducing both the amount of waste generated, and the amount of toxic substances released into the environment is a smart choice for the fishing industry. The FAO State of World Fisheries and Aquaculture Report 2008 states:

'Fisheries and aquaculture make a minor but significant contribution to greenhouse gas emissions during fishing operations and transport, processing and storage of fish,' and that good fisheries management can substantially improve fuel efficiency.

Carbon footprints relate to how much Greenhouse gases are emitted. For the fishing sector emissions are influenced by a number of factors including abundance of fish (stocks), the steaming distance to fishing grounds and the fishing technology used.

Every tonne of fuel used produces 2.25 tonnes of CO₂. There are options a skipper can adopt to improve a vessels carbon footprint by reducing fuel consumption.

This fact sheet describes the fuel used by the fishing sector, it outlines the current emissions regulations and how these may affect the fishing industry. It also provides an overview of a fishing vessels 'carbon footprint' and how it can be improved.

The fuel used

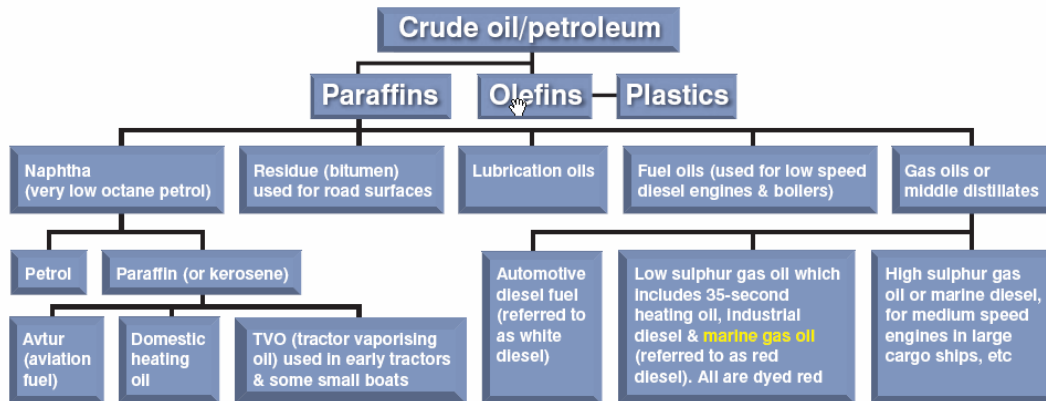
Red diesel is used by the majority of fishing vessels. It is also known as marine diesel or

gas oil. It is chemically identical to heating oil, and almost identical to the 'white diesel' bought at the roadside. Other than the colour, the differences come down to the Sulphur content and the cetane rating of the fuel. White diesel usually has an ultra low sulphur content of 50 parts per million (ppm) (0.005%), as well as additives to aid the combustion process; red diesel has up to 2000ppm (0.2%), their properties being almost identical. In order to distinguish marine and agricultural diesel from the more heavily taxed road diesel, and to prevent illegal usage, the UK Government decided in 1961 that all low-duty fuels should be marked with a chemical dye.

Sulphur in fuel

There is sulphur in fuel which acts as a lubricating agent. In order to reduce the Sulphur content of fuel, sulphur is replaced by adding lubricating agents. The fuel companies selling Low Sulphur Diesel (LSD) and Ultra Low Sulphur Diesel (ULSD) will add these additives during fuel production and say that reduced Sulphur fuel is every bit as lubricating as Sulphur diesel was. Sulphur dioxide (SO₂) and oxides of nitrogen (NO_x) affect human health through respiratory damage, and ecosystem health through acidification. SO₂ and NO_x are released into the atmosphere through the combustion of fossil fuels. Sulphur emissions are a major contributor to acid rain and Nitrogen Oxides contribute to the localised formation of smog and ozone as well as global warming.

below Red diesel for marine use is a low-sulphur gas-oil, closely related to automotive white diesel and heating oil.



Regulations affecting the marine industry

The main regulation is the MARPOL 73/78 Protocol of 1997 (Annex VI) - Regulations for the Prevention of Air Pollution from Ships. This sets limits on sulphur oxide and nitrogen oxide emissions from ship exhausts and prohibits deliberate emissions of ozone depleting substances. The annex includes a global cap of 4.5% m/m on the sulphur content of fuel oil and calls on IMO to monitor the worldwide average sulphur content of fuel.

Limits on sulphur emissions

Annex VI contains provisions for special SO_x Emission Control Areas (SECAS) to be established with more stringent controls on sulphur emissions. In these areas, the sulphur content of fuel oil used onboard ships must not exceed 1.5% m/m. Alternatively, ships must fit an exhaust gas cleaning system or use any other technological method to limit SO_x emissions. The Baltic Sea Area and the North Sea (July 2005) are designated as SO_x Emission Control areas in the Protocol.

Limits on nitrogen oxide emissions

Regulation 13 of Annex VI also sets limits on emissions of nitrogen oxides (NO_x) from diesel engines. A mandatory NO_x Technical Code establishes procedures for the testing, survey and certification of marine diesel engines to enable engine manufacturers, ship owners and administrations ensure that all applicable marine diesel engines comply with the relevant limiting emission values of NO_x. Progressive reductions in nitrogen oxide (NO_x) emissions from marine engines were also agreed as detailed below:

- **Tier I** - diesel engines installed on a ship constructed on or after 1 January 2000 and prior to 1 January 2011. It represents the 17 g/kWh Annex V1 standard.
- **Tier II** – diesel engines installed on a ship constructed on or after 1 January 2011. This would be reduced to 14.4 g/kWh.
- **Tier III** – diesel engines installed on a ship constructed on or after 1 January 2016. To be reduced to 3.4 g/kWh, when the ship is operating in a designated Emission Control Area. Outside a designated Emission Control Area, Tier II limits apply.

How these regulations affect the fishing industry

Extracts from Statutory Instrument 2007 No. 79 - The Sulphur Content of Liquid Fuels (England and Wales) Regulation 2007. In force 16 February 2008.

Maximum sulphur content of heavy fuel oil used in the marine industry

4. (1) No person shall use any heavy oil which has a sulphur content exceeding 1 percent by mass.

Maximum sulphur content of gas oil used in the marine industry

5. No person shall use gas oil -

(a) until 31st December 2007, with a sulphur content exceeding 0.2 percent by mass; or

(b) on or after 1st January 2008, with a sulphur content exceeding 0.1 percent by mass.

All local suppliers of fuel oil are required to be registered with the Maritime and Coastguard Agency (MCA). As long as the skipper purchases the fuel from a reputable supplier he will be meeting the requirement of the regulation.

Sulphur content

As fishing vessels almost exclusively use marine gas oil, which is now supplied under the **Sulphur Content of Liquid Fuels Regulation 2007** (above) and has a sulphur content of less than 0.1%, the onus is on the fuel supplier to supply fuel that complies.

Where a fishing vessel is using heavy oil it will have to meet the SECA regulations by either using fuel with sulphur content below

1.50% m/m, or alternatively fitting an exhaust scrubbing system. In terms of the SECA regulations these are also met as the sulphur content of fuel supplied to fishermen using marine diesel will be way below the limits set in the SECA areas.

Nitrogen oxide regulation

The NOx regulation for new engines is a requirement that will need to be met by the engine manufacturer. If purchasing a new engine after the January 1, 2000 where the power output is greater than 130 kW, the skipper must ensure that the engine has been issued with an Engine International Air Pollution Prevention (EIAPP) certificate. Engine manufacturers are testing their engines for compliance with the NOx emission requirements and obtaining EIAPP certificates or equivalents. They are supplying a copy of this certification with an approved Technical File and On-Board NOx Verification Procedure when requested.

These regulations may change. Contact Seafish for the latest legislation updates.

What is a carbon footprint?

Carbon footprints relate to how much Greenhouse gas is emitted by the combustion of fossil fuels used on a daily basis. Carbon Dioxide, or CO₂, is a major component of the Greenhouse Gases warming our planet. Others include Methane, Nitrous Oxide and Hydro-fluorocarbons. Compared to Carbon Dioxide, each Greenhouse gas has a greater or lesser warming effect, but all are standardized into equivalent units of CO₂. Carbon footprints are therefore measured in terms of kilos or tonnes of Carbon Dioxide (CO₂).

Overall concentrations of CO₂ are increasing but by being aware of the carbon footprint steps can be taken to reduce it and thereby reduce impact on the planet. This issue concerns individuals, retailers, seafood processors and fishermen. Fishing and harvesting (in the case of aquaculture) often makes the largest contribution to total Greenhouse gas emissions within the seafood supply chain.

The carbon footprint from fishing vessels

A vessels carbon footprint is the emission of Greenhouse gases (measured in kilos or tonnes of CO₂) from fossil fuels during the building, use and disposal of a vessel.

For fishermen emissions are influenced by the fishing gears and technology used, the abundance of fish (stocks) and the steaming distance to fishing grounds. This link between stocks and fishing effort is important. Recent research suggests that through the latter half of the 20th Century, energy consumed (and therefore greenhouse gas emissions) increased markedly as fleets expanded and many stocks declined (Tyedmers 2004).

Burning fuel in the engine(s) plays a large part in overall emissions. Steaming distance is important but additional CO₂ emissions may be generated during fishing operations (i.e. whilst towing the gear through the water) or by using a generator or hydraulics on the vessel. An important guide to the carbon footprint of a vessel is the amount of fuel burnt in the engine or by the generator.

Minimising the carbon footprint from fishing vessels

Skippers can directly reduce a vessels carbon footprint by reducing fuel consumption. There are a number of ways that this might be achieved:

- Increase the efficiency of the power plant through the use of more efficient engines.
- Revise the design of hull and propellers to reduce resistance and increase efficiency.
- Reduce vessel speed to improve fuel efficiency without costly additional equipment.
- Install an electronic fuel meter to help monitor fuel consumption and establish an optimum steaming speed.
- Remove excess weight to lighten up the boat and significantly reduce fuel consumption.
- Regularly maintain the vessels hull and engine to reduce drag and enhance engine performance.
- Shift to low fuel (passive) fishing techniques such as static gear or seine netting.
- Use alternative fuels such as liquefied natural gas, wind power, biofuels and solar energy. The oxides of sulphur emissions from BioDiesel are at least 80% lower than low sulphur fossil diesel.

The impact of climate change on fisheries

There is no doubt that climate change is having a significant effect on fisheries and fisheries management. Notably:

- A shift in distribution and changes in the abundance of fisheries
- Changes in productivity
- The invasion of alien species
- A decline in ocean primary production
- The effects of increased ocean acidity

Increasing concentrations of CO₂ in the atmosphere are likely to be mirrored by increasing acidification of the marine environment. The ocean absorbs about one-third of the CO₂ entering the atmosphere and our oceans are absorbing more CO₂ and at faster rates than ever before, causing a shift toward greater acidity.

Too much carbonic acid lowers the natural pH balance of the oceans, causing acidification, which wreaks havoc on marine habitats and species. Marine ecosystems, especially coral reefs, are likely to be badly affected, with fishing and tourist industries losing billions of pounds each year. Ocean acidification cannot be changed by fisheries but negative effects can be reduced.

Reducing carbon emissions is the right thing to do

There are many good reasons and incentives to reduce the amount of waste generated:

- Economic incentive: it pays to reduce waste
- Regulatory incentive: it is the law
- Liability incentive: it is a responsibility of the fishing sector
- Human health and environment incentive: it is the future
- Public incentive: it is the right thing to do

For further information

Further information on carbon emissions is available through Seafish:

- Carbon footprint profiling tool
www.seafish.org/co2emissions/tool
- CO₂ emissions briefing paper
www.seafish.org/co2emissions
- Seafood Strategic Outlook Edition 4
Carbon emissions

References:

Tyedmers, P. (2004) 'Fisheries and Energy Use', Cleveland, C (editor in chief), Encyclopedia of Energy, Elsevier, Amsterdam. Col 2: 683-693.

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