**SUSTAINABLE PROPULSION: NOW!**

IWA’s Sustainable Propulsion vision paper (attached) looks at the future narrowboat and the form propulsion might take over the next 30+ years in the quest for 100% carbon neutrality on the waterways. In essence the findings can be applied as much to lumpy water boating as to those of us that go ditch crawling from pub to pub!

Hybrid electric drives, and ultimately hydrogen-fuelled fuel cells, will undoubtedly form the standard specification for new boats in the years to come but right now we are looking at a parc of somewhere in the region of 60,000 plus diesel-driven boats on the inland waterways system of Britain alone.

These engines may well still have a useful life of up to 40 years, so it would be quite wrong to contemplate replacing them with a drop-in replacement hybrid drive, as well as way beyond the means of the average boater.

The solution IWA have identified, in tandem with other organisations and commercial operators, is to replace fossil fuel diesel (often referred to as dino-diesel) with a carbon neutral alternative. Initially this was biodiesel produced by a process known as transesterification using methanol, together with sodium hydroxide (or similar) as a catalyst. These two components mean that biodiesel is in fact only about 87% carbon neutral.

This product has become known as **1st generation biodiesel** and for a number of reasons is generally considered unsuitable for marine use.

Early in this century the Finns starting developing a process for converting waste vegetable oils into diesel fuel, employing hydrogen, and today this **2nd generation biofuel** (as it has become known) is gradually becoming readily available for regular commercial marine use. Greater than ninety percent carbon neutral, with none of the shortcomings displayed by its 1st generation cousin, it looks like being the drop-in replacement fuel for those keen to run their existing diesel engines in a zero carbon future.

Hydrotreated Vegetable Oil (HVO) carries a wide range of Original Equipment Manufacturers (OEM) endorsements from Volvo to Caterpillar, Scania to Kubota; is completely stable when stored (up to 10 years) remains free-flowing down to at least minus 25 deg C and is not hygroscopic (attracts water). In other words, unlike 1st generation biodiesel, it does not promote the development and growth of diesel bug.

It is 100% miscible (meaning that it happily mixes with all other diesel fuels) and bio-degradable, while strict traceability of the feedstock ensure that it is made from waste oils and not directly produced on land otherwise reserved for growing food. With lower NoX outputs and a higher cetane value, it is in fact superior in every way to dino-diesel, giving a 10% reduction in fuel consumption in a recent Land and Water trial.

I have started a conversation with Scottish Canals to explore the possibility of stocking HVO for sale to boaters as well as a fuel to run their own plant and equipment on. As with all these things, price and availability are everything and currently supply is far stronger south of the border.

Over the winter I am conducting a trial using HVO in a variety of domestic diesel heating devices used on boats (for heating, cooking and hot water) from drip feed pot burners (Dickinson, Reflecks, Kabola, etc) through to pressure jet heaters such as Mikuni, Eberspacher and Webasto – although Webasto now give full OEM approval.

Given that current engine manufacturers provide full approval for HVO use in their diesel engines, there seemed little point in broadening the trial to engines regularly found in boats on the inland waterways. However, there are still plenty of engines in regular use from manufacturers that are no longer trading so, Covid permitting, I am extending the trial to a Bolinder and a 1931 Gardner 5-cylinder tug engine. Along the way some of the fuel is also destined for a range of Lister, Petter and similar engines

***MEANWHILE*** Scottish Canals, in common with all other suppliers on the inland waterways, is no longer able to supply FAME-free diesel fuel as the Grangemouth refinery started adding 1st generation biodiesel to their dino-diesel output a little over a year ago: currently at 7% just as with road-going DERV – i.e. B7.

The government target is 12% by 2024 so, instead of boaters having the illustrious ‘Tiger in their Tanks’ (this will sort the young ‘uns from the crusties) they now have a timebomb! As already mentioned, 1st generation biodiesel is hygroscopic and at 7% is likely to exacerbate stored fuel’s tendency to attract a layer of water at the bottom of the tank, forming a water/diesel interface: the ideal environment for the development of diesel bug! Once established, it will block your entire fuel system resulting in expensive remediation.

However, all is not lost and whilst the current fuel regime persists the solution is to use one of the proprietary additives on the market. These work in one of two ways: either to ensure that the water is absorbed into the fuel and expelled as a product of combustion or to completely separate into two distinct components, with the water removed via the engine’s water-separator filter where fitted.

Here is a link <https://www.pbo.co.uk/gear/12-diesel-bug-treatments-tested-43353> to the Practical Boat Owner (PBO) fuel additive test for those who want to do some research. For those that don’t, I use Marine 16 largely on the basis that if it’s good enough for the RNLI, then it’s good enough for me! It goes down the water separating route which received wisdom suggests is the best approach.

The cheapest source of Marine 16 that I have currently found is <https://www.piratescave.co.uk/marine-16-diesel-bug-treatment.html> and to ensure accurate and economical dosing I have purchase a couple of 20 ml hypodermic syringes <https://cambodia.desertcart.com/products/130254933-kinbom-20-ml-syringes-plastic-syringe-sterile-with-no-needle-for-scientific-labs-experiment-dispensing-measuring-watering-4-pack> as the volumes concerned are very small. I’m sure it goes without saying that for proper mixing, inject the additive before filling your tank.

Problems thought to relate to the addition of 1st Generation biodiesel to standard mineral diesel are not limited to diesel bug as River Canal Rescue (RCR) are now finding out. RCR, who are to the waterways what the AA or RAC are to the road network, are coming across an ever-increasing number of calls outs to boats immobilised by so-called ‘sticky fuel’:

<https://www.iims.org.uk/river-canal-rescue-calls-for-sticky-fuel-samples/>

<https://www.narrowboatworld.com/12767-curious-cases-of-sticky-fuel>

Oh, and as boaters we are not alone. Farmers, who generally have an even more lax regime for storing their diesel fuel than we do, are already experiencing a range of problems that are regarded as 1st generation biodiesel-related:

<https://www.nfus.org.uk/news/news/union-drives-forward-on-fuel-issues>

<https://www.thescottishfarmer.co.uk/news/18640971.farmers-updated-problems-biodiesel-fuel-filters/>