The diesel doctor

Peter Weide, director of MarShip, explains why diesel can cause you problems – and how to deal with them

We nicknamed 2015 'the year of the diesel bug'. That was when marine gas oil finally came in line with red diesel ashore. It was when the sulphur content was reduced to 0.001%, or 10ppm. Sulphur acted as a relatively good natural inhibitor and, without it, diesel bug has flourished. We hear no end of stories of engines stopping because of sludge in the tanks.

But that is not the only consequence of removing the sulphur. Over the next couple of months, this column will explain what has happened to diesel – aka gas oil, red diesel, etc. It will explain why you have the problems, and more importantly, how to avoid them and what to do about them.

So what has happened? Up to the 1990s, fuel generally came from low-sulphur 'sweet' crude oil – it was the base stock to make standard gas oil we all got to use, without a second thought.

'Sweet' crude is now a lot scarcer, so refiners use high-toxic, high-sulphur 'sour' crude. That, in itself, isn't a problem, even though they now manage to squeeze double the amount of fuel from a barrel of oil as they did in the 1990s. The gas oil was still fit for purpose.

However, it then became evident that the higher sulphur was harming the atmosphere, and with reports of acid rain, governments were compelled to do something about it. A programme to incrementally reduce sulphur levels was introduced, resulting in ultra-low-sulphur gas oil (ULSGO), with 0.001% sulphur.

So we had relatively low-sulphur sweet crude producing simple diesel. Now we have high-sulphur crude producing zero sulphur.

This requires much more vigorous refining techniques that result in removing the fuel's natural lubricant and rendering it more prone to rapid oxidation and thermal degradation with poor stability, which leaves deposits on fuel components and sludge in fuel tanks.

So why do we have problems now? Removing the sulphur has also removed the 'oiliness' or lubricating properties of the fuel, which are essential to keep the fuel system components lubricated.

Because of the bio content, fuel is a lot more hygroscopic and literally absorbs water from the atmosphere. This sinks to the bottom, where it becomes the breeding ground for diesel bug.

Removing the sulphur has also removed the aromatic compounds that used to help keep asphaltenes in suspension. These asphaltenes now agglomerate as the fuel rapidly degrades due to the heat and pressure experienced in its journey to the engine and back to the tank. The result is a tarry sticky sludge formation on the bottom of the tank that looks like diesel bug (slimy and stringy), and blocks filters.

Removing the sulphur and adding the bio, which includes takeaway cooking oil, has also rendered the fuel unstable, which leaves deposits in the injectors, preventing them from functioning correctly and so increasing fuel consumption, engine smoking and component failure.

Lastly, it's not for no reason that the major oil companies sell a premium fuel on the forecourt. They know that the standard fuel they sell on the forecourt leaves deposits in engine fuel systems. They are also clever marketeers and recognise that they can make more margin by selling a premium product that has a detergent to keep the fuel system clean. It's worth buying, and your £25k+ car would thank you for it. So would your £200k common rail engine, if the fuel you used had a detergent too.

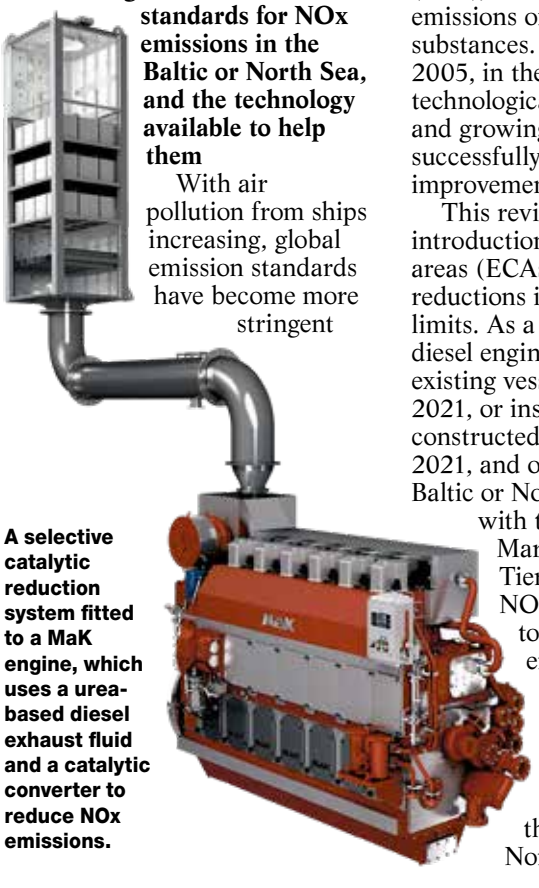
▲ **Diesel bug is a growing problem in vessel engines because of changes to fuel composition.**

*Peter Weide, director of MarShip, was formerly a chief engineer, and subsequently became marine lubricants manager, ship repair director and head of sales for Wärtsilä UK. MarShip (**www.marship.eu**) specialises in maintaining the vital elements of your engine – air, fuel and oil. The company can be contacted on: 01666 818 791 or at: sales@marship.eu*

Preparing for the upcoming North Sea NOx emission limits

Eric Hyder, new equipment sales manager – marine for MaK, part of Finning, discusses the issues that those in the fishing industry need to consider to ensure their vessel's diesel engine meets the International Maritime Organisation's Tier III standards for NOx emissions in the Baltic or North Sea, and the technology available to help them

With air pollution from ships increasing, global emission standards have become more stringent over time to help manage this challenge. MARPOL Annex VI, first adopted in 1997, limits the main air pollutants contained in a ship's exhaust gas, including sulphur oxides (SO_x) and nitrous oxides (NO_x), and prohibits deliberate emissions of ozone-depleting substances. It was revised in 2005, in the light of significant technological advancement and growing confidence in successfully implementing these improvements.



A selective catalytic reduction system fitted to a MaK engine, which uses a urea-based diesel exhaust fluid and a catalytic converter to reduce NOx emissions.

This revision saw the introduction of emission control areas (ECAs), plus progressive reductions in NO_x emission limits. As a result, a new marine diesel engine installed in an existing vessel after 1 January, 2021, or installed on a vessel constructed on or after 1 January, 2021, and operating in either the Baltic or North Sea, must comply with the International Maritime Organisation's Tier III standards for NO_x. These limits apply to each marine diesel engine with a power output of more than 130 kW installed on a vessel.

This will clearly impact fishing vessels that use the Baltic and North Sea. The two new ECAs mean that fishing vessel owners and operators will need to use NO_x emission reduction technologies to meet these requirements. So what solutions are available to help meet this demand?

Selective catalytic reduction technology

Selective catalytic reduction (SCR) technology uses a urea-based diesel exhaust fluid and a catalytic converter to reduce NO_x emissions. Diesel exhaust fluid is injected into the exhaust air stream – which contains NO_x – and then the energy contained in hot exhaust gas causes the NOx to evaporate into ammonia. Once the ammonia and exhaust gas reaches the catalyst, it decomposes, breaking down into nitrogen gas and water vapour.

Importantly, unlike other NO_x reduction technologies, engines fitted with an SCR system will operate without interruption even in the event of an SCR failure, or if the system runs out of diesel exhaust fluid.

Naturally, fishing owners and operators will want to know how much diesel exhaust fluid will be consumed, and what impact this will have on their bottom line. This will depend on many factors, including engine type, annual running hours, duty cycle, and the concentration of diesel exhaust fluid being used. It is advised that those in the fishing industry should work with an SCR technology specialist to determine this. In addition, be sure to ask the supplier whether it can provide evidence that the urea-based diesel exhaust fluid has passed ISO 22241-1 standards, and therefore meets the requirements for quality, handling, testing, transportation and storage.

For owners and operators seeking low operating costs too, however, SCR can offer benefits above and beyond meeting NOx emission limits. Most operators expect fuel consumption to increase if emissions standards become more stringent. Interestingly, engine-out NOx and fuel consumption are inversely proportional, meaning the greater the engine-out NOx, the lower the volume of fuel consumed. In most cases, the cost of diesel exhaust fluid is more than offset by the engine's reduction in fuel consumption, which is likely to be a key attraction to those considering an SCR system.

To ensure that engine performance remains as efficient as possible, it is recommended that those in the fishing industry take advantage of support options from a trusted and experienced engine supplier. Options such as customer service agreements, access to genuine spare parts and routine condition monitoring can all help to make sure that an engine continues to run at peak performance.

▲ **Eric Hyder.**

In the fishing industry, where assured reliability and engine efficiency are important, SCR provides a tried and trusted solution, and has proven itself in a variety of vessels in the marine sector. From ferries and tankers, to container ships, cruise ships and – of course – fishing boats, SCR technology can help to meet NOx emission limits. And with the ECAs for the Baltic and North Sea fast approaching, it makes smart commercial sense to plan ahead and get prepared now.

For more information on MaK from Finning, visit: **finning.com**