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BUNKERSPOT

CYBER STORM

HOW SECURE ARE YOUR BUNKER DEALS?

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ALTERNATIVE FUELS

Climate change

As the Arctic Ocean opens up to increasing maritime trade, Albert Leyson of Drew Marine urges operators to reassess fuel flow parameters for distillate fuel oil

The shipping industry is preparing to sail the Arctic Ocean. The International Maritime Organization (IMO) has developed a draft International Code of Safety for Ships Operating in Polar Waters, or Polar Code, that will be forwarded for consideration later this year by the Marine Environment Protection Committee (MEPC) and the Maritime Safety Committee (MSC). The proposed Polar Code includes mandatory requirements pertaining to navigation, ship design, construction, equipment, training, search and rescue operations, and, last but not least, the protection of the Arctic and Antarctic environments.

The IMO resolution MEPC.189(60), which entered into force on 1 August 2011, amended Annex I of MARPOL 73/78 to protect the Antarctic from pollution (by limiting the carriage and use of heavy grade fuel oils). Surprisingly, the resolution did not protect the Arctic. However, thinner ice formations in the Arctic make it viable as an alternative and more efficient trade route between certain Northern hemisphere ports during warmer summer months.

The Torremolinos protocol offered solutions to mitigate specific risks of fishing vessels operating in the polar region. For example, the protocol addressed the problem of freezing fire mains by including the use of heating systems. The Polar Code considers cold temperatures will also reduce the effectiveness of numerous components on the ship, ranging from deck machinery and emergency equipment to sea suctions. As with heated fire mains, heated ballast tanks would likely be required in future vessel designs. However, missing from Polar Code draft content are provisions for adequately heated fuel oil tanks, especially for distillate fuel oil tanks.

> 'Until ISO 8217 is amended to include new test parameters, such as cloud point and CFPP, that do address distillate fuel flow, it is unlikely the Polar Code will offer a solution to mitigate the risk of fuel gelling'

Although heating coils are included in residual fuel oil tanks to lower fuel viscosity for pumpability, heating coils are rarely, if ever, incorporated into distillate fuel oil tanks. Conversely, in recent years, distillate fuel coolers have been recommended in an effort to increase viscosity and combat fuel pump leaks and/or seizing of fuel injectors resulting from ultra-low sulphur distillate fuel's inadequate lubricity properties.

With Arctic winter sea temperatures hovering near 0°C, it is essential that distillate fuel oils used in emergency diesel generators and lifeboat engines comply with ISO 8217:2012 DMX grade specifications. These specifications include a cloud point maximum of -16°C to ensure adequate flow. Cloud point is the temperature at which wax crystals begin to form from the paraffin normally found in distillate fuel oil. Distillate fuel oil with a cloud point greater than -16°C will accumulate wax deposits that can lead to poor pumpability and filter plugging. In certain cases where the fuel is subjected to extremely cold conditions, the fuel will reach its pour point and solidify in storage leading to engine starvation. Therefore, it is recommended that the cloud point should be between 4°C to 6°C below the lowest ambient temperature the vessel will be operating at to ensure the fuel does not gel during storage or handling.

Distillate fuel oil grades typically have two maximum pour point requirements, 0°C to 6°C (summer) and -6°C to 0°C (winter), depending on the grade. Some marine gasoil (MGO) or DMA grade fuels that meet all ISO 8217:2012 specifications, including pour point, can still have a high cloud point. Although ISO 8217 defines a well-known fuel quality standard in which marine fuel oil is commercially bought and sold, ship operators often assume that distillate fuel oil samples are always of the same quality and therefore do not need to be analysed. Yet, that is not the case. Take the following fuel sample

Parameter	Unit	Limit	DMX	DMA	DMZ	DMB
Cloud point	°C	Max	-16	-	-	-
Pour point, Winter	°C	Max	-	-6	-6	0
Pour point, Summer	°C	Max	-	0	0	6

Excerpt from ISO 8217:2012 - Table 1 - Distillate Marine Fuels

While kerosene is more commonly known and used by ship operators when gelling occurs, it is expensive and it merely dilutes the problem

received in January 2014 from a vessel in Baltimore that reported trouble managing MGO onboard during the cold weather.

The Gibraltar-based supplier's bunker delivery note (BDN) indicated a pour point of -18°C. However, pictures from a sample obtained from the vessel's MGO tank revealed fuel gelling at ambient temperature. Further analysis by Oiltest Marine Services indicated a cloud point of +25°C even though the supplier pour point was confirmed as -21°C. Since the fuel analysed met the DMA grade specification, it is unlikely that a claim against the supplier could be filed unless the additional parameters were stipulated as part of the bunker contract.

Oiltest Marine Services - Marine Fuels Analysis Report – FINAL

To :	XXXXXXXXX
Attn:	XXXXXXXXX

Vessel Name	M/V XXXXXXXXXX
Attn :	Chief Engineer
Bunker Date	02/JAN/2014
Bunker Port	GIBRALTAR
Bunker Supplier	XXXXXX BUNKERING
Sample Date	22/JAN/2014
Seal Number	217495
Received By Lab	28/JAN/2014 12:36:00 PM
Sample Number	T14028019
Grade	SO 8217:2012 DMA

Tested Parameters	**Result**	**Specification**
Density, kg/m3 @ 15C	873.5	890.0 Max
Viscosity cSt @ 40C:	4.0	2.0/6.0 Min/Max
Water, % v/v	0.15	
Sulphur, %m/m	0.09	1.50 Max
MCR 10%, % m/m	0.01	0.30 Max
Total Sed, Exis., %	0.01	
Flash Point, Deg C	88.3	60.0 Min
Pour Point, Deg C	-21	-6 Max
Appearance:	PASS	Clear & Bright
Ash, % m/m	0.010	0.010 Max
Vanadium, mg/kg	0	
Sodium, mg/kg	1	
Silicon, mg/kg	1	
Aluminum, mg/kg	1	
Fe, mg/kg:	7	
Pb, mg/kg:	0	
Mg, mg/kg:	0	
Zn, mg/kg:	0	
Ca, mg/kg:	1	
Ni, mg/kg:	1	
Cetane Index:	45.5	40 Min
Additional Parameters		
Cloud Point, Deg C	25	
Cold Filter Plugging Point, Deg C	-5	

For the Arctic-bound, Drew Marine recommends the inclusion of the additional parameters for cloud point and cold filter plugging point (CFPP) in the bunker contract and in fuel analysis. CFPP is the lowest temperature at which a fuel will give trouble-free flow. Fuels analysed for cloud point, CFPP, and pour point from several North American bunker terminals revealed a varying degree of results from each sample analysed for these critical fuel flow parameters (see Figure 1). Therefore, it is essential that cloud point and CFPP be added to routine shore-based laboratory testing programmes. By knowing the results for these parameters, fuel flow through the ship's fuel storage and service systems can be managed more effectively in cold climate operation.

For ships that routinely operate in Arctic or cold waters, Drew Marine recommends the DREW XP Cloud Point Meter for onboard determination of cloud point. By immediately testing for cloud point, operators can assess whether fuel flow-related problems would arise and whether cold flow improver additives are needed to maintain fuel flow.

While kerosene is more commonly known and used by ship operators when gelling occurs, it is expensive and it merely dilutes the problem. Kerosene is more refined than typical marine distillate fuel. Furthermore, kerosene has also been heavily additivised with cold flow improvers that warrant it a freezing point maximum of -30°C. Freezing point is the lowest temperature at which the fuel remains free of solid hydrocarbon crystals that can restrict the flow of fuel through filters if present in the fuel system. To minimise the use of kerosene as a diluent on ships, Drew Marine recommends treating flow problem fuels with its latest fuel additive, AMERGY PPD.

AMERGY PPD modifies the crystallisation of the wax or paraffin normally found in distillate fuel and prevents the wax's formation on it in large layers or sheets of crystals that can eventually clog filters and pipes. The total amount of wax in distillate fuel can vary, from as little as 5% to 25%, typically, based on the quantitative determination of the carbon number distribution, and it is dependent on crude source, refinery capability, and the distillate blend components used (see Figure 2). AMERGY PPD has been formulated to depress the pour point and improve the cold flow properties of typical marine distillate fuels. The advanced chemistry in AMERGY PPD minimises the need for

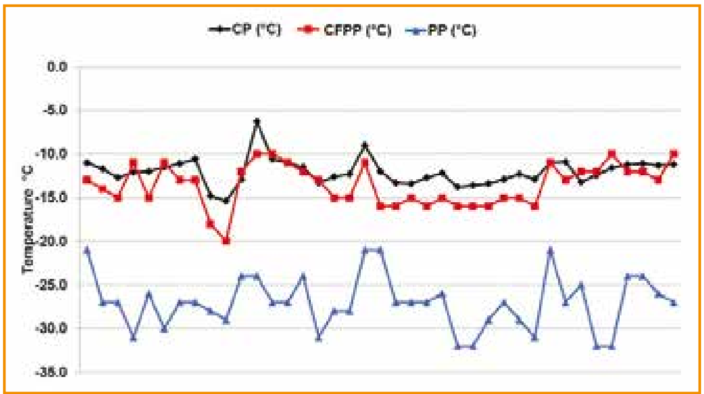

Figure 1: Variability in Fuel Flow Properties – Cloud Point (CP), Cold Filter Plugging Point (CFPP), and Pour Point (PP)

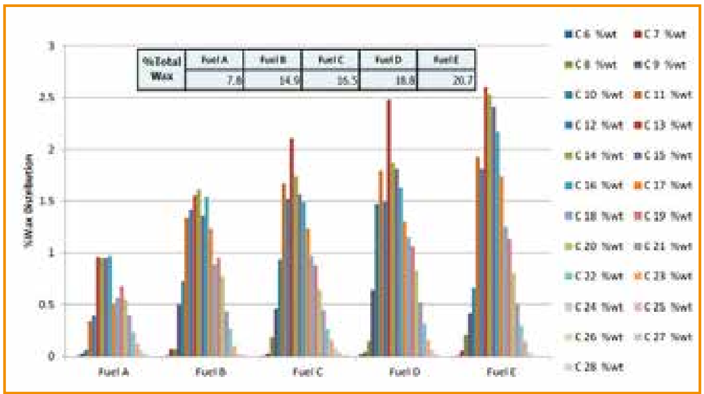

Figure 2: Variability in Fuel Wax Content by Carbon Number

expensive kerosene addition and dilution.

Since the amount and type of wax can vary in marine distillate fuel, AMERGY PPD treatment ranges from 50 parts per million (ppm) to 2,000 ppm (1 litre per 20 metric tonnes (mt) to 1 litre per 0.5 mt), based on the cloud point result. Vessels intending to voyage into colder climates but taking bunkers from warmer climates, as in the example provided, should treat their fuel prior to bunkering to ensure proper mixing and trouble-free flow when operating in cold conditions. AMERGY PPD should be dosed directly into the nominated bunker tanks and non-nominated tanks that will be used while operating in colder geographies.

Until ISO 8217 is amended to include new test parameters, such as cloud point and CFPP, that do address distillate fuel flow, it is unlikely the Polar Code will offer a solution to mitigate the risk of fuel gelling. To avoid being stranded in the remote Polar regions, Drew Marine recommends cold flow improver treatment with AMERGY PPD to ensure that wax deposits are modified sufficiently to prevent fuel filters from choking.

Drew Marine provides technical solutions and services to the marine industry with a comprehensive range of advanced marine chemicals, and equipment.

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