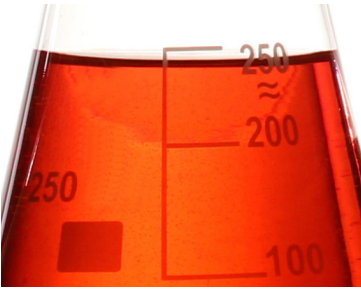


Fuel Management Solutions

Efficient handling of low sulfur fuel oil for improved vessel operation



Drew Marine[®]

Handling ECA Zone Fuel Issues



As increasing environmental regulations continue to influence the type of fuels used in the marine industry, shipping operators can look to Drew Marine for complete solutions. From the supply of MARPOL compliant fuel samplers to the reliable monitoring of an exhaust gas cleaning system if residual fuel is used, put your trust in Drew Marine. Whether your vessel uses low sulfur residual fuel, distillate fuel, or LNG to meet SOx compliance limits, the products in this guide will solve any fuel handling related issues the crew may encounter.

A complete line of onboard test kits is available to immediately analyze key parameters such as compatibility and base number. This ensures that corrective steps can be taken to minimize potential impact on a vessel's operation. Backed by more than 80 years of onboard service, our team of expert service engineers provides around-the-clock technical support at your vessels' ports of call around the world.

A Complete Suite of Select Products for Low Sulfur Fuel Oil

Drew Marine's global offering of products and services supports efficient operations and cost-effective regulatory compliance for all classes of vessels. This guide discusses a set of products and their intended application that provides a unique value proposition for vessels when they operate in ECA (Emission Control Area) Zones.

- MARPOL 73/78 Annex VI – Regulation 18 – continuous drip fuel samplers for obtaining the retained samples and a retention cabinet for secure storage of the retained samples
- Engine oil base number (BN) – base number test kit for confirming high BN and low BN of cylinder oil used when high sulfur and low sulfur fuel oils are used
- Fuel tanks /filters – fuel dispersant additives that minimize the effects of incompatibility and instability; cold flow improver additive that modifies wax deposit/crystal formation
- Fuel quality – analytical services for confirming fuel purchase specification (e.g., ISO 8217:2017)
- Low sulfur fuel oil storage stability – test kits for checking fuel instability, acid contamination, water contamination, and microbiological contamination during prolonged storage conditions to identify potential storage issues including sludging and H₂S formation
- H₂S hazard – fuel biocide that kills and controls microbial growth and H₂S formation
- Fuel oil switchover – compatibility test kit for checking incompatibility of two fuels during fuel switchover to identify potential fuel sludging in fuel oil service day tank, fuel filters, fuel line, etc.
- Fuel injection equipment – fuel lubricity additive that guarantees lubricity
- Fuel injector nozzles – next generation fuel detergent additive that cleans the effect from biofuel contamination and metal soap deposition
- Fuel combustion systems - multi-functional additive that stabilizes fuel, disperses water, cleans injection equipment, promotes combustion, and provides anti-corrosion protection to improve engine efficiency and reduce emissions.
- Exhaust gas systems – fuel combustion improver additive that promotes more complete combustion and reduces carbon deposit build-up of turbochargers, economizers, and scrubbers
- Exhaust gas cleaning system – consumables, monitoring equipment, and calibration gases for ensuring emissions reduction and efficiency check

Fuel Sampling

Available in an array of sizes, Drew Marine offers cost-effective continuous-drip line samplers that are compliant with MARPOL 73/78 Annex VI – Regulation 18. A representative sample must be collected for each grade of fuel bunkered and retained onboard for one year for every vessel of 400 gross tons and above and every fixed and floating drilling rig and other platforms.

Select the correct sampler by using the inner diameter or flange standard from the two models listed.

Continuous-Drip Line Samplers

The DREW Bunker Sampler has no bolt holes. Based solely on the inner diameter, it is fitted between the bunker manifold flange and bunkering hose flange. The DREW DRIP-TEC, on the other hand, has bolt holes for improved mounting on specific flange standards. It also comes with a quick disconnect coupling for easy Cubitainer receptacle removal. Both models are self-centering and are Type Approved by American Bureau of Shipping (ABS).



When using either model, sampling is carried out by continuous drip during the entire bunkering period. A valve on the sampler is used to adjust the drip rate into either the 5- or 10-liter Cubitainer receptacle connected to the standard thread on the line sampler. A new Cubitainer should be used for each bunkering and each different grade of fuel to avoid cross contamination.

SPECIFICATION	DREW BUNKER SAMPLER	DREW DRIP-TEC
Material	SS 304 SS 316	copper alloy C51180*
Construction	machined	mold casting
Asbestos	none	none
Length	192 mm (2") to 1225 (14")	375 mm (3") to 720 mm (14")**
Width	95 mm (2") to 420 mm (14")	126 mm (3") to 410 mm (14")
Nominal thickness	25 mm – 26 mm	27 mm – 32 mm
Valve lock	optional	included
Mounting	vertical $\pm 15^\circ$	vertical $\pm 0^\circ$
Quick-disconnect	none	yes
Thread	38-400 G.P.I.	38-400 G.P.I.

* Handle & valve fittings: carbon steel

** Excludes 88 mm lifting handle



Drew Marine.

I. D.	DREW BUNKER SAMPLER	FLANGE STANDARD	DREW DRIP-TEC
80mm (3")	1AB3201	—	1AA7988
100mm (4")	1AB3202	DN 100 PN10 PN16 ANSI 4" 150 LB JIS 100 5K JIS 100 10K	1AA7904 1AA7905 1AA7906 1AA7907
125mm (5")	1AB3203	DN 125 PN10 PN16 ANSI 5" 150LB 9 JIS 125 5K JIS 125 10K	1AA7908 1AA7909 1AA7910 1AA7911
150mm (6")	1AB3204	DN 150 PN10 PN16 ANSI 6" 150 LB JIS 150 5K JIS 150 10K	1AA7912 1AA7913 1AA7914 1AA7915
200mm (8")	1AB3206	DN 200 PN10 DN 200 PN16 ANSI 8" 150 LB JIS 200 5K JIS 200 10K	1AA7916 1AA7917 1AA7918 1AA7919 1AA7920
250mm (10")	1AB3208	DN 250 PN10 DN 250 PN16 ANSI 10" 150 LB JIS 250 5K JIS 250 10K	1AA7921 1AA7922 1AA7923 1AA7924 1AA7925
300mm (12")	N/A	DN 300 PN10 DN 300 PN16 ANSI 12" 150 LB JIS 300 5K JIS 300 10K	1AA7926 1AA7927 1AA7928 1AA7929 1AA7930
350mm (14")	N/A	DN 350 PN16 ANSI 14" 150 LB JIS 350 10K	1AB4753 1AB4754 1AB4755

Additional sizes and flange standards (e.g., PN6) are available on request.



Fuel Sampling Containers and Retention Cabinet

Sample Preparation

In order to minimize disputes between the bunker buyer and supplier, international standards, such as ISO13739, provide the procedures for the proper transfer of bunkers to vessels.

Drew Marine recommends preparing a minimum of four individual fuel samples from the primary sample, with additional samples prepared as needed (e.g., surveyor):

1. MARPOL retained sample
2. Vessel retained sample
3. Supplier sample
4. Laboratory sample





DREW Bunker Sample Cabinet

Individual sample bottles are available from the Fuel Oil Sample Bottle Kit, which contains 40 empty sample bottles complete with caps, labels and seals.

The retained samples can be stored in a Fuel Sample Retention Cabinet. Specifically designed for compliance, the MARPOL retained sample must be retained onboard for one year, while the Bunker Delivery Note must be stored for three years.

Should there be a dispute on the sulfur content of the bunker fuel, the MARPOL sample may be requested by authorities for independent testing to determine the official and binding sulfur value.

The supplier sample should be offered to the supplier representative. The laboratory sample should be dispatched to the shore-based testing laboratory to determine the overall fuel quality for the bunker delivery. The vessel retained sample can also be used for onboard fuel quality testing or as a backup sample should the one destined for the laboratory get lost in transit.

Drew Marine offers a complete line of onboard test kits and shorebased analytical services for fuel oil as well as lube oil.

ORDERING INFORMATION

DESCRIPTION	PCN
5L Cubitainer Kit, 12 pieces	1AA9830
10L Cubitainer Kit, 12 pieces	1AA9831
Fuel Oil Sample Bottle Kit, 40 Bottles	1AA9829
Fuel Sample Retention Cabinet (Empty)	1AA7636

Fuel and Lube Oil Testing Solutions

Fuel oil and lubricating oils touch assets and therefore creates a substantial operating cost to ship operators. Fuel samples drawn at the start of the bunkering operation can be quickly analyzed using onboard test kits providing peace of mind. Results obtained from shore-based laboratories can be compared against the fuel purchase specification.



Fuel Oil Compatibility Tester

Fuel Oil Compatibility Tester

For immediate testing of stability and compatibility onboard, order the essential Fuel Oil Compatibility Tester. With six sample bays, any single or combination of fuels can be tested at one time to identify potential fuel sludging in fuel oil storage tanks, fuel filters, fuel line, etc., during fuel switchover and during prolonged storage.

Microbiological Dual Assay Slides

To detect the presence of microbial activity during prolonged storage conditions of low sulfur fuels, order the Microbiological Dual Assay Slides to identify potential storage issues including sludging.

Sulfate Reducers Test Set

To specifically identify microbial activity that results in the formation of hazardous H_2S , order the Sulfate Reducers Test Set so that appropriate steps can be taken to reduce the hazard.

ORDERING INFORMATION

DESCRIPTION	PCN
DREW XP Fuel & Lube Oil Test Cabinet	1AB6170
Fuel Oil Compatibility Tester	1AB2185
Microbiological Dual Assay Slides	6923016
Sulfate Reducers Test Set	1707019

DREW XP Fuel and Lube Oil Test Cabinet

The DREW XP Fuel & Lube Oil Test Cabinet is ideally suited for outfitting newbuildings with essential testing capabilities in a rugged, self-contained, wall-mountable unit. When standardized across all vessels in service, this cost-effective test cabinet offers timely, centralized testing that covers some of the most essential tests required for fuel and lube oil.



DREW XP Fuel & Lube Oil Test Cabinet

Fuel Analysis Program

To participate in our Fuel Analysis Program, contact your Drew Marine representative and order the Fuel Oil Sample Bottle Kit, which contains 12 mailers and prepaid courier waybills. Our convenient mailers get the sample to the lab as quickly as possible for routine ISO 8217 analysis.

Our laboratory can identify potential stability issues with individual fuels, such as low sulfur fuels that are used only when required, and compatibility issues with mixing fuels during fuel switchover. The laboratory can also test for lubricity and identify the presence of acid waste and used lubricating oil (ULO) in fuel, which may sometimes be used as cutter stock to lower the sulfur content of low sulfur residual fuel oils. Insufficient lubricity, acid waste and ULO may cause injector seizing, fouling and/or corrosion.



Fuel and Lube Oil Testing Solutions

Quality lube oils used in modern high performance engines consist of refined base oils with complex additive packages formulated for the harsh marine environment. Periodically testing of lube oil onboard coupled with shore-based laboratory analysis can identify degraded oil and wear contaminants enabling protection of engine and equipment performance.

Dual Test Kit (Water & BN determination)

Suitable for monitoring water contamination and the alkalinity reserve of engine oils, the Dual Test Kit helps onboard engineers combat the degrading effects of water in oil and the corrosiveness of combustion byproducts.

Lube Oil Five Test Kit

Our Lube Oil Five Test Kit, which can test water and base number in a single test cell also includes the capability to check for seawater contamination and qualitative viscosity and insolubles.



Drew XP Dual Test Kit (PCN 1AB6240)

ORDERING INFORMATION

DESCRIPTION	PCN
Drew XP Dual Test Kit	1AB6240
Drew XP Lube Oil Five Test Kit	1AB6168
Lube Analysis Program – Prepaid, 10PK	1AB2918

Fuel Oil Treatment Additives

Drew Marine has a complete line of fuel additives available to mitigate the risk of injector seizing, fouling and corrosion, fuel sludging, and H₂S formation from any of the fuel properties and contaminants that may be encountered, as described previously, when using low sulfur fuel oil.

Global Availability to Serve Your Needs

Drew Marine is able to serve your needs with fuel oil treatment technology and global availability. From the fuel storage tank to the exhaust stack economizer when it comes to handling fuel-related problems, we provide solutions.

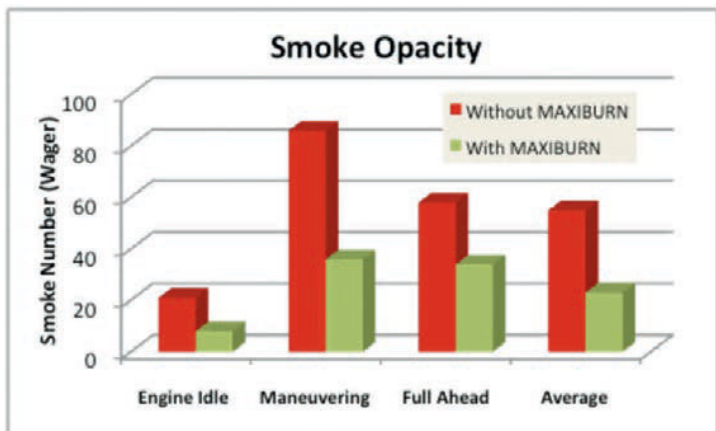
It is important to analyze fuel test results, diagnose problems and identify the proper corrective treatment if needed. Specific fuel oil additives are targeted to solve specific problems, no single product can cure all fuel related problems.

To familiarize yourself with the line, identify the correct product based on the application, and contact your nearest Drew Marine representative to obtain more information.

DESCRIPTION	PCN	SYSTEM
AMERGY 222 PLUS	1105403	Storage tanks, fuel lines, centrifuges, and filters
AMERGY XLS PLUS	1402403	Storage tanks, fuel lines, centrifuges, and filters; and fuel injection equipment
AMERGY PPD NF	5751400	Storage tanks, fuel lines, and filters
AMERSTAT 25DM	6981402	Storage, settling, and service tanks
AMERGY ULS-D	1410406	Fuel injection equipment (fuel pumps, fuel injector nozzles and fuel valves)
AMERGIZE	0098401	Engine exhaust systems (turbochargers, economizers, and scrubbers)
MAXIBURN	0092403	Storage, fuel injection, combustion chamber and engine exhaust systems
LT-SOOT RELEASE	0045626	Engine exhaust systems (economizers)
DREWCLEAN EST	1706409	Engine exhaust systems (economizers)



Emissions Comparison



FUEL TYPE	APPLICATION
HSHFO VLSFO	Minimize the sludging effects of incompatibility and instability such as system choking and overloading
VLSFO ULSFO	Minimize the sludging effects of incompatibility and instability such as system choking and overloading; fuel injector tip fouling; and restore and guarantee sufficient fuel injection equipment lubricity
VLSFO ULSFO	Modifies wax deposit/crystal formation during cold climate operation to ensure flow
ALL	Kill and control microbial growth and H ₂ S formation; minimize the sludging effects from microbiological contamination
VLSFO ULSFO	Clean the effect of metal soap deposition from biofuel and used lube oil contamination; restore proper fuel metering, timing, and atomization for more complete combustion and restore system operation
HSHFO VLSFO	Promote more complete combustion and reduce system high temperature and carbon deposit build-up to restore system operation and efficiency
VLSFO ULSFO	Improve overall combustion, reduce smoke opacity, and reduce fuel consumption
ALL	Reduce system carbon deposit build-up; restore system efficiency
ALL	Reduce system carbon deposit build-up; restore system efficiency

Exhaust Gas Cleaning System Products

For operators that have opted to install exhaust gas cleaning systems, such as scrubbers, Drew Marine is your global partner in procuring high volume absorptive materials (e.g., NaOH or better known as sodium hydroxide). Available in up to 1000L non-returnable totes, you can rely on us to deliver the consumable your exhaust scrubber needs to operate. Custom specialty absorptive materials and other commodity reactants are available on request.

PRODUCT	PACKAGE SIZE	AVAILABILITY	ORDER PCN
Urea	1000 liter IBC	EU & Asia	3014958
	1040 liter IBC	USA	3017010
	1250 liter IBC	USA	3018018
	Tanker Truck	Global	3016012
Caustic Soda	1000 liter IBC	EU & Asia	2053353
	1040 liter IBC	USA	2054013
	1250 liter IBC	USA	2054021
	Tanker Truck	Global	2053007



Scrubber Wash Water Testing

To ensure that your scrubber washwater discharge is compliant with currently published guideline criteria, we offer a pre-paid kit that enables operators to have three samples of inlet water, after scrubber (but before any treatment system), and discharge water to be analyzed by a shore-based laboratory. IMO Resolution MEPC.184(59) recommends testing during approval or shortly after scrubber commissioning and about twelve-month intervals for a period of two years operation at a minimum.



DESCRIPTION	PCN
Scrubber Sampling Kit 'A'	1AB5910
Scrubber Sampling Kit 'B'	1AB5911
PRESERVATION REAGENTS	
Sulfuric Acid, 4ml bottle	1AB5912
Nitric Acid, 4ml bottle	1AB5913

OUR VISION

Drew Marine is the most trusted brand and preferred global resource for marine solutions that enhance the longevity and operating efficiency of ocean vessels.

OUR MISSION

To sustain the superiority of the Drew Marine brand by bringing environmentally and technologically superior products and services for the benefit of vessel owners and operators while increasing shareholder value.



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