

Marine Fuel Oil Viscosity Control — MDO / HFO / VLSFO / Homogeniser

cBallast · ISO 8217:2024 / IMO 2020 · System reference

ISO 8217 grades

Grade	Category	Visc 40 C cSt	Sulphur	Use
MGO	DMA	2.0-6.0	0.10% ECA	Aux engines, harbour, ECAs
MDO	DMB	2.0-11.0	0.50%	Small vessels, medium-speed aux
HFO 180	RMD 80	180 max at 50 C	3.50%	Legacy main engine
HFO 380 (IFO 380)	RMG 380	380 max at 50 C	3.50%	Main engine pre-2020
VLSFO	RMG 180/380 variant	180 or 380	0.50%	Post-2020 main engine
ULSFO	RMD/RMG variant	Varies	0.10%	SECA/NECA

Why viscosity control matters

Injector inlet needs 10-15 cSt (main engine), 2-6 cSt (MGO aux). Too viscous = poor atomisation, incomplete combustion, deposits, high smoke. Too thin = plunger leakage, loss of pump lubrication. HFO ships at 380 cSt at 50 C — heated en route to injector (~130-140 C for HFO 380).

Viscosity controller loop

Inline viscosity sensor (torque-cell or vibration-cup viscometer) at fuel supply pump discharge. PID controls 3-way pilot-op steam valve at heater. Rising visc opens steam; falling visc closes. VAF Aage Christensen,

Yokogawa, Krohne
dominant OEMs.

Homogeniser

Mechanically shears fuel to break asphaltene agglomerates + produce stable suspension. Use case 1: HFO !" VLSFO !" LSFO grade change-over — fuels miscible in bulk but stratify locally; homogeniser shears into stable blend. Use case 2: recovering old fuel sludge from centrifuge — re-suspends in main stream as small controlled dose.

Fuel change-over procedure

1) Confirm compatibility (ASTM D4740 asphaltene spot). 2) Open service tank cross-connection, "d 5% new fuel per minute. 3) Monitor viscosity — accept ~30% deviation during transition. 4) Log start/end in Oil Record Book (SECA/NECA mandatory). 5) Confirm engine load stable + exhaust gas temp within OEM window before load-up.

IMO 2020 sulphur cap

2020-01-01 global 0.50% cap forced HFO 380 !' VLSFO. VLSFO viscosity more variable (different refinery blends). Cold-flow

issues (wax precipitation) more common on VLSFO. Some vessels retained HFO via exhaust gas scrubber (IMO 2020 exemption); those operate scrubber wash-water discharge system alongside fuel oil viscosity plant.

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