

# YANMAR SERVICE NEWS

Subject	Arrangements for Yanmar Diesel Engines to Correspond to 2020 Low Sulfur Fuel Oil Regulation	No. : 18-2-G-02-013-L-rev1 Dated: 2019. July
Engine Model	All Diesel Engines	Use Engine Nos.
		Marine Main & Aux. Engines

## Background

IMO (International Maritime Organization) presently mandates the use of fuel oil having sulfur content under 0.1% in ECA (Emission Control Area) and fuel oil having sulfur content under 3.5% in global waters (general sea areas). Concerning the latter regulation in global waters, IMO is scheduled to mandate the use of fuel oil having sulfur content under 0.5%, effective from Jan. 1, 2020 for all marine vessels including vessels already been inaugurated.

It is expected that oil companies will review their refining methods to comply with the present strengthened regulation on SOx. In the present stage, they continue to examine the refining methods to produce the IMO regulation compliant fuel oils, and no concrete fuel oil properties, etc. of new fuel oils are made public yet. However, according to the information made available domestic and abroad to now, the properties of LSHFO (Low Sulfur Heavy Fuel Oil) are assumed to be: kinematic viscosity of 5~180mm<sup>2</sup>/s(cSt)@50°C with pour point of max30°C.

Yanmar Engines are able to comply with the SOx Regulation in 3 different ways, that is, (1) use of LSHFO (Low Sulfur Heavy Fuel Oil), (2) use of LSMDO (Low Sulfur Marine Diesel Oil) or LSMGO (Low Sulfur Marine Gas Oil), and (3) to install the scrubber. This Service News explain the ways of (1) and (2) above.

## (1) When Using LSHFO




1. When the engine of the ship is already of the HFO specifications, engine parts and the onboard system need not be changed.
2. However, in order to prevent corrosion of the combustion system, review the FO recommended items for the engine inlet as follows:

[A] It is recommended to adjust the engine inlet kinematic viscosity to 11~14 mm<sup>2</sup>/s for the use of fuel oils of which kinematic viscosity is over 30mm<sup>2</sup>/s(@50°C: Adjust the viscosity by viscosity control equipment and FO heater as was done before.

[B] It is recommended to set the engine inlet fuel oil temperature at 80°C for the use of fuel oil of which kinematic viscosity is 3~30mm<sup>2</sup>/s(@50°C), (Allowable temp. range; 60~90°C) :

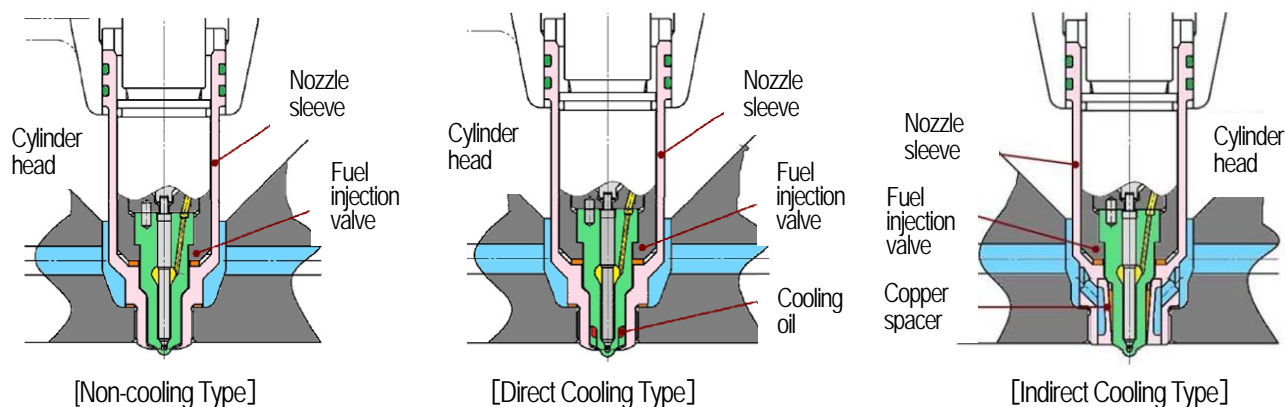
Adjust the temperature by temp. control equipment and FO heater.

When employing both of [A] and [B] above, switch the operation of the viscosity/temp. control equipment. Before actual operation, check the fuel oil used and the equipment to make sure that the equipment is able to control the viscosity or temperature appropriately.

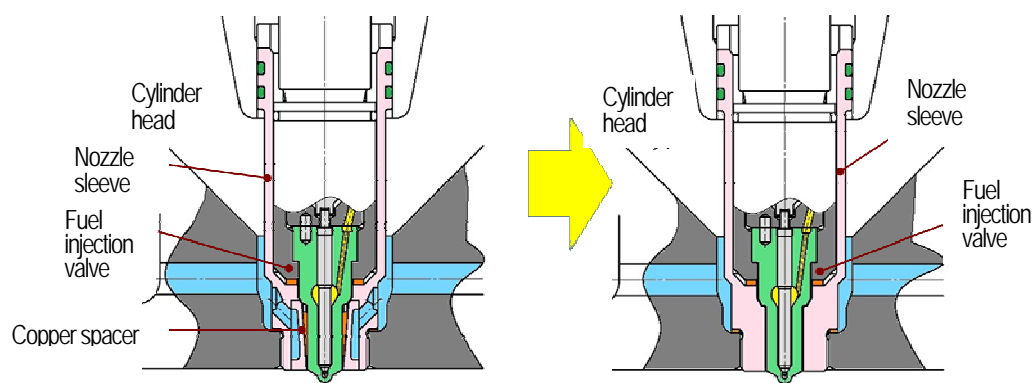
<b>YANMAR CO.,LTD.</b> POWER SOLUTION BUSINESS LARGE POWER PRODUCTS MANAGEMENT DIVISION. CUSTOMER SERVICE DIVISION.	Approved	Checked	Prepared
			

## (2) When Modifying Engine to LSMDO/LSMGO Specialized Specifications

1. The Fuel injection valve has two types, that is, the non-cooling type for use with MDO/MGO engines and the cooling type for use with HFO engines as shown below. To modify the engine to Low Sulfur MDO/MGO specialized engine, the Fuel injection valve needs to be changed to the non-cooling type.



In addition, to change the indirect cooling type Fuel valve to the non-cooling type, change the nozzle sleeve as shown below:



Specifications to be modified for MDO/MGO specialized engine varies depending on model, year of manufacture and rated output. For convenience, these differences are shown in the list below:

## Items to be Changed When Changing HFO Spec. Fuel Injection Valve to MDO/MGO Spec. Type

Model	Injection Valve Spec. of HFO	If or not change to MDO/MGO spec. valve is required.	Change of injection valve relative parts
EY33	Direct Cooling Valve (common with MDO/MGO)	Not required	Cooling pipe needs be removed
EY26	Non-cooling (sleeve cooling) (common with MDO/MGO)	Not required	Not required
EY22	Indirect Cooling (common with MDO/MGO)	Not required	Nozzle sleeve needs be changed
EY18	Indirect Cooling (common with MDO/MGO)	Not required	Not required
N165	Indirect Cooling (IMO Tier 1&2)	Not required	Nozzle sleeve needs be changed
N330	Non-cooling, IMO-compliant	Not required	Not required
	Direct Cooling, not IMO compliant	Nozzle may be changed, or existing spec. be left	Cooling pipe needs be removed
N280	Direct Cooling Valve	Nozzle may be changed, or existing spec. be left	Cooling pipe needs be removed
	Indirect Cooling	Not required	Nozzle sleeve needs be changed
N260	Direct Cooling Valve	Nozzle may be changed, or existing spec. be left	Cooling pipe needs be removed
	Indirect Cooling	Not required	Nozzle sleeve needs be changed
N21 -W N21 -N (NOx non-compliant)	Indirect Cooling	Not required	Nozzle sleeve needs be changed
N21 -V N21 -N (NOx compliant)	Indirect Cooling	Not required *)	Nozzle sleeve needs be changed
N18 -V (NOx compliant) N18 -N (NOx compliant)	Indirect Cooling	Not required *)	Nozzle sleeve needs be changed
N18 -N (NOx non-compliant)	Non-cooling (sleeve cooling)	Not required *)	Not required
M220	Non-cooling	Not required	Not required
	Indirect Cooling	Not required	Change nozzle sleeve to non-cooling type and plug the bypass
M200	Oil cooling separate gallery valve	Not required *)	Plug the bypass
	Indirect Cooling Nozzle Spec.	Not required	Nozzle sleeve needs be changed

\*) MDO specialized Fuel valve can also be used.

## 2. Fuel Injection Pump Plunger/Barrel

The existing equipment can be used as it is, but most engine models have both the MDO- and HFO-use equipment. Since plunger/barrel clearance differs, leak oil quantity may be increased. Changing the equipment to MDO specialized use will curtail the leak oil quantity. (Max. 0.1% FO consumption for HFO-use equipment can be halved when the equipment was changed to the MDO specialized use equipment.)

## 3. Concerning Fuel injection pump, remove the pinion LO pipe of HFO-use equipment and plug the pipe. This curtails LO consumption by about 5~10L/24 hrs.

## 4. Exhaust Valve:

Nimonic exhaust valve can be used as it is. It is also possible to change it to the MDO specialized exhaust valve.

## 5. Turbocharger:

The nozzle ring, specially coated for use with HFO, can be used as it is. It is also possible to change it to the MDO specialized use non-coating nozzle ring.

## 6. Starting is possible without using the jacket CW heater. (Use engine mutual warm-up.)

## 7. Part Nos. of modification parts are listed in YE Service News, YEN-CP22930-3. Refer to the list when ordering modification parts from us.

### (3) Common Items

1. When using fuel oils with the viscosity range of 3~15mm<sup>2</sup>/s(@50°C), the plunger needs not be changed immediately. We recommend it be changed to the specially coated plunger at the next maintenance opportunity. (Applicable Models: EY18, N18, N21, M200, M220 and previous models)

2. LO makers are now developing new lube oils with enhanced distributed cleanliness to comply with the regulation to use sub-0.5% LSHFO. We, assessing this trend, have decided to change the recommended base number for engines which use sub-0.5% LSHFO to be 15~20mgKOH/mg(BN). However, the base number for LSMDO/LSMGO engines remains the same at 9 ~ 15mgKOH/mg(BN).

3. HFRR Wear Diameter shows the index of fuel oil lubrication performance. Use fuel oils of which HFRR wear diameter is under 460µm.

4. When using low viscosity fuel oils of which kinematic viscosity at the engine inlet is under 1.8mm<sup>2</sup>/s, install the FO cooler or chill cooler, etc. to lower the FO temperature. For cooler installation, refer to our Service News, attached, (06-2-G-07-009-S-Rev.4), "Use of Low Sulfur Fuel Oils".

5. Since the properties of LSHFO being of the residual oil, implement FO pretreatment at engine inlet by the purifier as has been done before.

6. Change of the technical file because of the present modification is not required. However, keep the records of servicing and parts replacements for review by the surveyor upon his request.

### (Notes)

- For further information or questions about engine modification, please ask your contact at Yanmar Engineering Company or Marine Products Sales and Marketing Division.
- This Service News is subject to be reviewed as needed depending on the FO distribution trend in the market and status of LO development made available hereafter