



Info. No.: <b>372408</b>		Item Name: Fuel Oil Change-over Procedure			Item Id.: <b>5212208-3</b>	
Scale:	Size: <b>A4</b>	Product Type: All Engine		Page No.: 1 (2)	Projection: 	<b>MAN Diesel &amp; Turbo</b>
Date	Des.	Chk.	A.C.	Revision Change		Chg. Not. Rev.
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### Change-over between HFO and MDO/MGO

Prior to the intended change-over from HFO to MDO/MGO and vice versa, we recommend that the compatibility of the two fuels is checked – preferably at the bunkering stage. The compatibility can be checked either by an independent laboratory or by using test kits onboard.

As incompatible fuels may lead to filter blocking, there should be extra focus on filter operation in case of incompatibility.

Change-over of fuel can be somewhat dangerous for the fuel equipment, as hot heavy fuel is mixed into relatively cold gas/diesel oil. The mixture is not expected to be immediately homogeneous, and some temperature/viscosity fluctuations are to be expected. The process therefore needs careful monitoring of temperature and viscosity.

In general, only the viscosity controller should control the steam valve for the fuel oil heater. However, observations of the temperature/viscosity must be the factor for manually taking over the control of the steam valve to protect the fuel components.

During change-over two things are to be kept under observation:

- The viscosity must not drop below 2 cSt and not exceed 20 cSt
- The rate of temperature change of the fuel inlet to the fuel pumps must not exceed 2°C/min, to protect the fuel equipment from thermal shock (expansion problems) resulting in sticking.

It should be noticed that operation on low viscosity fuel, internal leakages in the fuel equipment will increase. With worn pump elements, this can result in starting difficulties and an increased start index might be necessary. The wear in the fuel pumps should be monitored by comparing the fuel index for the new engine and during service. At a 10% increase of the fuel index for the same load, the plunger/barrels are considered as worn out and should be replaced.

A change-over of the main engine’s fuel will happen as a dilution of the fuel already in the booster circuit. The fuel feed to the system will mix with fuel in the system, and the main engine’s consumption from the system will be a mixture of the fuels. A complete change of fuel (only MDO/MGO in the system) can therefore take several hours, depending on the engine load, system layout and volume of fuel in the booster circuit.

Prior to manoeuvring in port, it should be tested that the engine is able to start on MDO/MGO.

It is not recommended to reduce the temperature difference between the HFO and the MDO/MGO, by preheating the MDO/MGO in the service tank, as this will reduce the cooling capacity of the oil and might result in a too low viscosity during change-over.



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## Manual change-over

### Heavy Fuel Oil → Distillate Fuel

- Ensure that the temperature of the MDO/MGO in the service tank is at an acceptable level , considering the following:
  - Viscosity at engine inlet must not drop below 2 cSt
  - Heat transmission from the metal parts in the system to the fuel will occur
  - Cooling capacity in the system, if any
- Reduce the pre-heating of the fuel, by increasing set point of the viscosity controller to 18 cSt
  - Manual control of the heater might be necessary, if it is observed that the viscosity control exceeds the maximum temperature change gradient 2°C/min at engine inlet
- Reduce the engine load, when the fuel has dropped to a temperature corresponding to 18 cSt
  - During this change-over the load should be 25-40% MCR to ensure a slow reduction of the temperature at engine inlet, maximum change gradient 2°C/min
- Stop steam tracing
- Carry out change-over by turning the three-way valve
  - The load can, based on experience with the individual system, be changed to a higher level – up to 75% MCR, as long as change gradient is kept below 2°C/min
- Stop steam to pre-heater, when regulating valve has closed completely. Depending on the system layout and condition, it might be necessary to open heater bypass
- Slowly start the cooler (if installed), when viscosity is below 10 cSt
  - A slow start of the cooler can be done by controlling the oil flow through the cooler, the cooling medium flow or a combination of both
  - Temperature change gradient at engine inlet is still to be kept below 2°C/min

### Distillate Fuel → Heavy Fuel Oil

- Ensure that heavy oil in the service tank is at normal service temperature (80-100°C)
- Reduce the engine load
  - During this process the load should be 25-40% MCR to ensure a slow heat-up to normal heavy fuel service temperature at engine inlet (up to 150°C), maximum change gradient 2°C/min
- Carry out change-over by turning the three-way valve
  - The load can, based on experience with the individual system, be changed to a higher level – up to 75% MCR, as long as change gradient is kept below 2°C/min
- Slowly stop the cooler (if installed), when viscosity is above 5 cSt
  - A slow stop of the cooler can be done by controlling the oil flow through the cooler, the cooling medium flow or a combination of both
  - Temperature change gradient at engine inlet is still to be kept below 2°C/min
- Start steam to pre-heater and check that set point is at normal level (10-15 cSt)
  - Manual control of the heater might be necessary, if it is observed that the viscosity control exceeds the maximum temperature change gradient 2°C/min at engine inlet
- Start steam tracing, when the pre-heater is operating normally