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Service Letter

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Ref. No.: HHI-HSM-SL-17-003

- **Subject : Recommendation to Avoid Sticking of Fuel Injection Pump**
- **Type : H17/28(E)(U), H21/32, H25/33(V), H32/40(V)**

Dear Sirs,

HiMSEN had improved the quality of fuel injection pump to avoid sticking and seizing for various operation circumstances, whereas it was reported the sticking occurred repeatedly especially for heavy fuel oil (HFO) operation. Sticking and seizing occurred on account of not only quality of fuel injection pump, but also ship operation conditions.

We therefore, would like to inform you of the technical operation guidance in order to prevent sticking at least. Please refer to the enclosed technical Circular (TEC2016/K2D0-011) for your perusal.

We hope the above will be of service to you.

Faithfully yours,

G. Y. Oh, General Manager
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Enclosure : Technical Circular TEC2016/K2D0-011

HYUNDAI HIMSEN

TECHNICAL CIRCULAR

RECOMMENDATION TO AVOID STICKING OF FUEL INJECTION PUMP

TYPE: H17/28(E,U), H21/32, H25/33(V), H32/40(V)

Ref. No.: TEC2016/K2D0-011
Date: 22nd June 2016

[DEFINITION OF STICKING]

Failure of fuel injection pump on diesel engines can occur by various reasons. Among the pump failure, “not moving plunger of fuel injection pump” is classified into two kinds – STICKING and SEIZING.

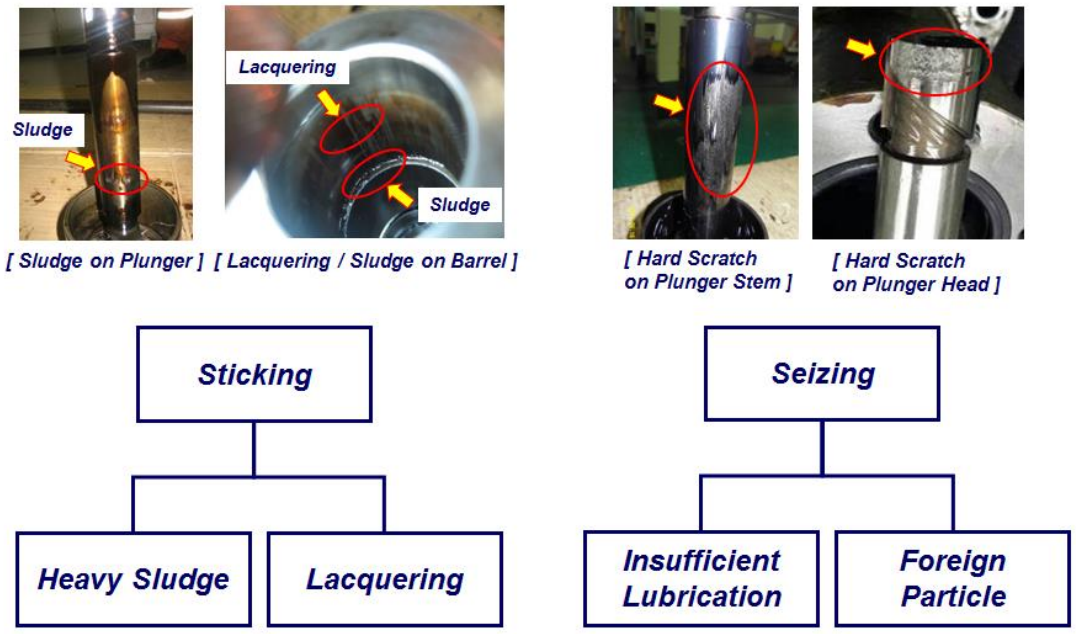


Fig.1 Possible cause of STICKING and SEIZING

STICKING generally occurs due to heavy sludge or lacquering phenomenon between plunger and barrel. And almost of stuck plungers and barrels can be re-useable after cleaning with kerosene and soft cloth. (Do not use steel wire brush.)

Fig.2 Before and after condition of STUCK barrel of fuel injection pump

On the other hand, SEIZING is caused by mechanical damage on outer surface of plunger and inner surface of barrel. Insufficient lubricant or foreign particle can make this failure. Normally seized plungers cannot be used again.

Recently, quality of heavy fuel oil (HFO) used on vessels has become worse, STICKING of plunger and barrel in the fuel injection pump has been reported occasionally. Most of them could be re-used after overhauling and cleaning, but it might bother operators even make failure of engine starting. To avoid sticking of fuel injection pump, several recommendations are issued on this document.

[RECOMMENDATIONS TO AVOID STICKING OF FUEL INJECTION PUMP]

1. Crankshaft turning before engine starting
   - When engine stops using high viscosity HFO, fuel rack of fuel injection pump might be hard to move or stuck. Several pumps can be free after starting, but if not, it can be solved by turning crankshaft using turning gear or air running according to instruction manual O02300 “Preparations for Engine Starting” with opened indicator cock.

2. MDO/MGO flushing operation
   - When engine stops using high viscosity HFO before long term standstill, it is necessary to change-over from HFO to MDO/MGO to prevent sticking of fuel injection pump (Refer to instruction manual O02700). If stuck plunger was found when standstill with HFO, circulating MDO/MGO and starting engine with MDO/MGO after fuel oil change-over from HFO to MDO/MGO can be effective to make plunger released.

3. Drain line of fuel injection pump
   - If the drain hole or groove inside of barrel is clogged by fuel oil sludge, sticking condition may get worse. Therefore drain line connected on the fuel pump body should be checked periodically whether fuel oil drain flow comes out well during engine running. If not, the drain hole and groove need to be overhauled and cleaned.

Fig.3 Drain line of fuel injection pump and contaminated condition by sludge

4. Viscosity control of fuel oil

- Recommended viscosity range before fuel injection pump for HiMSEN engine is 12~18 cSt for HFO according to instruction manual G05100. (Viscosity should be considered based on fuel oil temperature measured not at viscosity meter but at engine inlet to reduce the influence of cool down effect through external pipes.)

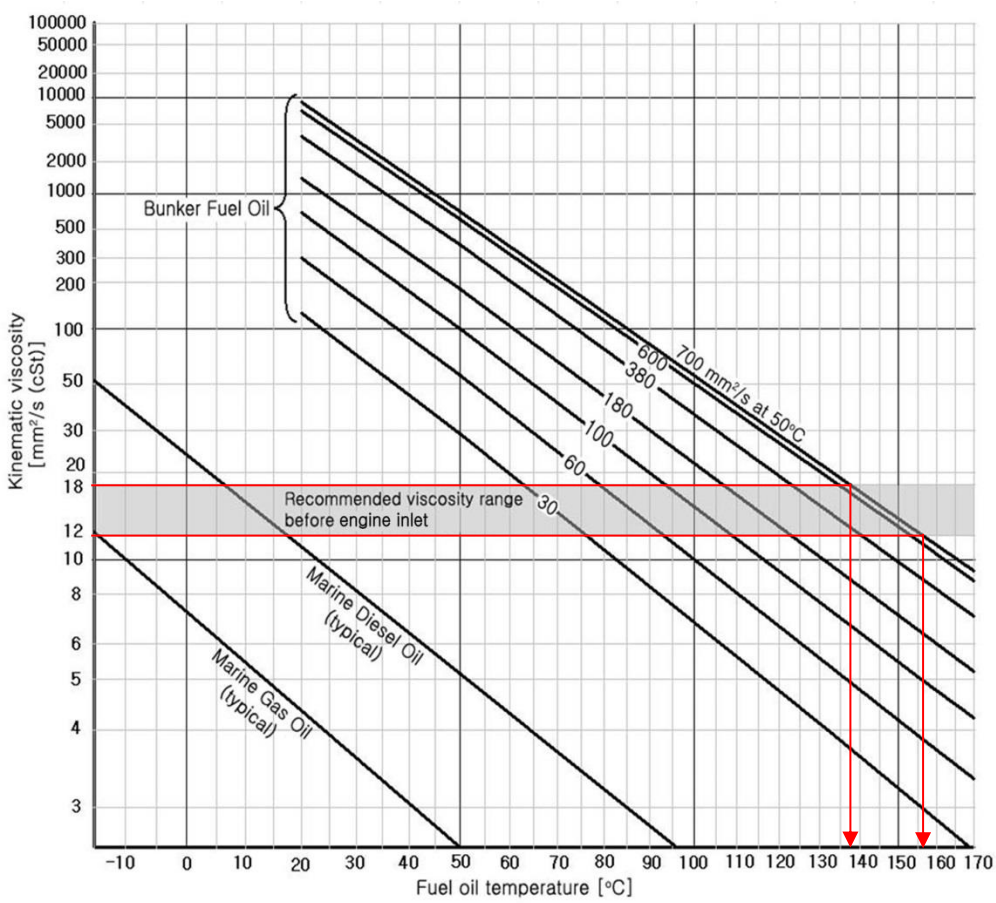


Fig.4 Fuel oil viscosity diagram (Manual G05100)

Recently, in accordance with using very high viscosity fuel oil (500 - 700 cSt), fuel oil temperature needs to be increased higher than 140℃ to keep the recommended viscosity range. For example, fuel oil temperature should be reached over 155℃ to make 12 cSt in case of RMK700 grade. (Refer to Fig.4). Due to this increased fuel oil temperature, it was reported that lacquering or fuel oil sludge seemed to be formed much more than before. Hence, to avoid formation of lacquering or heavy sludge when using very high viscosity fuel oil, fuel oil temperature needs to be reduced under 140℃ via increased viscosity up to 18 cSt according to HFO grade and vessel's condition. To find out suitable setting value, viscosity should be increased step by step.
This recommendation was tested on several vessels and showed positive result. Especially for H32/40(V) type, viscosity setting is allowed up to 24 cSt when following conditions are fulfilled.

- For auxiliary generator engines
- Vessel's fuel oil system must be capable to handle 24 cSt of HFO
- Viscosity should be increased step by step to find out suitable value
- Maximum engine load is not recommended to reach over 80% load of the rated output at continuous running condition
- Target viscosity should be considered based on fuel oil temperature measured not at viscosity meter but at engine inlet to reduce the influence of cool down effect through external pipes

[SUMMARY]

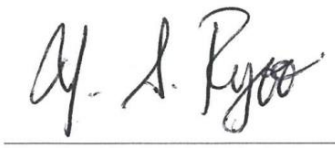
To avoid sticking of fuel injection pump, following methods are recommended.

- Turn crankshaft using turning gear or air running according to instruction manual O02300
- Change-over from HFO to MDO/MGO when engine stops using high viscosity HFO before long term standstill according to instruction manual O02700
- Circulating MDO/MGO and starting engine with MDO/MGO can make plunger released which was stuck
- Keep clean condition of the drain hole or groove inside of barrel from fuel oil sludge
- Increase viscosity up to 18 cSt using very high viscosity HFO (500 - 700 cSt)
  to avoid formation of lacquering or heavy sludge at high temperature
  (for H32/40(V), viscosity is allowed up to 24 cSt when suitable condition is fulfilled)

We hope this information will be helpful to you.

[The end]

Yours sincerely,



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