MAN B&W Diesel

SL05-452/KEA
July 2005

Heavy Fuel Oil Treatment
Action Code: WHEN CONVENIENT

Dear Sirs

Lately we have received reports of incidents of excessive abrasive wear in the combustion chamber due to inefficient operation of the fuel treatment plant. By this service letter, we wish to underline the importance of proper HFO cleaning.

Abrasive wear is mainly caused by the missing ability of the centrifuges to remove catalytic fines such as aluminium and silicon oxides from the fuel oil. Rust, sand and dust are other components which are also removed by the centrifuges, however, they are normally present in much smaller quantities.

In bunkered oil, the maximum allowed content of catalytic fines, expressed as the total content of aluminium and silicon, is 80 mg/kg according to ISO 8217:1996 (Specification of Marine Fuels). It is important that all fuels are centrifuged efficiently to minimise the level of contaminants, including catalytic fines.

For bunkered fuels containing the maximum content of catalytic fines (80 mg/kg), we expect the content of catalytic fines to be reduced to below 15 mg/kg in the fuel entering the engine. However, for bunkered fuels with a lower content of catalytic fines, a proportional reduction to an even lower content is expected.

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The following actions are necessary to ensure a proper cleaning of the HFO:

- Selection and operation of the fuel oil centrifuges according to suppliers recommendation
- Correct HFO temperature at inlet to the centrifuges
- Correct throughput of fuel through the centrifuges
- Proper density of HFO in conformance with the centrifuge specification
- Proper maintenance of the centrifuges. If properly operated, a centrifuge has a removing efficiency of close to 100% for catalytic fines larger than 5 microns, but this technique cannot completely remove catalytic fines smaller than 5 microns within the time the fuel actually stays in the centrifuge.

The enclosure shows an example of excessive wear resulting from inappropriate operation of the centrifuges.

Temperature of HFO before centrifuges

It is often seen that the HFO preheaters are too small or have too low a set-point in temperature, thereby reducing the efficiency of the centrifuge.

In order to ensure that the centrifugal forces separate the heavy contaminants to the waste drain of the centrifuge, in the limited time they are present in the centrifuge, the centrifuge should always be operated with an inlet temperature of 98°C for HFO.

The importance of adjusting the throughput if the temperature is changed is illustrated in Fig. 1, which shows an example of the relationship between temperature and throughput. For example, a centrifuge operating with an inlet temperature of 90°C would require a reduction in the throughput of min. 15% to obtain the same cleaning efficiency as with a 98°C inlet temperature.

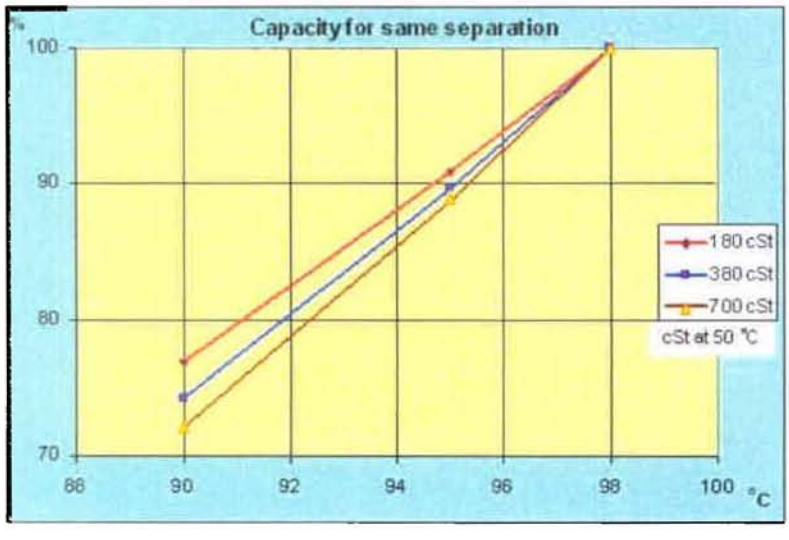

Fig. 1: Relationship between throughput and temperature

We have been in contact with different suppliers of centrifuges and, based on the information received, Fig. 1 illustrates the relationship between throughput and temperature for fuels with a viscosity of 180-700 cSt (at 50°C) for unchanged centrifuge cleaning efficiency.

As the throughput is normally controlled by a constant flow pump, it is often not possible to reduce the fuel flow to the centrifuges in case of a lower preheating temperature. **There is only one solution, i.e. to keep the 98°C inlet temperature for fuels above 180 cSt (at 50°C).**

Operation of centrifuges – in series or in parallel

In accordance with the latest rules and recommendations, ISO 8217 and CIMAC, a water content of max. 0.5% is allowed in the fuel delivered on board.

The water content often consists of salt water, and separation of water is therefore important in order to remove the salts.

Catalytic fines are hydrophilic, i.e. in case of water in the fuel, the water will attract the catalytic fines. The separation of water is thus important also for this reason.

The centrifuges should be operated in parallel, unless the centrifuge installation comprises manually operated centrifuges, with purifier followed by clarifier. To achieve the maximum separation efficiency, we recommend to always use all available HFO centrifuges whenever possible, and to operate them in parallel with an adjusted feed rate lowering the throughput in the centrifuges. This will ensure the longest possible retention time in the centrifuges and optimal efficiency for removal of catalytic fines.

Proper maintenance

With the automatically operating HFO centrifuges of today, operators no longer have to change the gravity discs. However, proper maintenance of the centrifuges is still important, and must be carried out in accordance with the recommendations from the centrifuge manufacturers.

If the bowl is not cleaned in time, there will be deposits on the bowl discs. The free channel height will be reduced, and the flow velocity increases, which in turn tends to drag particles with the liquid flow towards the centre. This leads to a reduced separation performance.

Check of centrifuges

In order to check the efficiency of the centrifuges, we recommend that operators take samples before and after the centrifuges when operating on a bunker fuel oil with more than 25 ppm catalytic fines, or at least every four months, and send the samples to an established fuel analysing institute.

Settling and service tanks

At calm weather, the heavy components in the HFO, e.g. catalytic fines, will settle on the tank bottom, but at high seas they can be hurled up and led to the centrifuges, in a concentration exceeding the maximum of 80 ppm. This will most probably influence the efficiency of the treatment system, leading to large quantities of catalytic fines at engine inlet, and it is therefore important to drain the settling and service tanks regularly. Furthermore, it is also recommended to use the standby fuel centrifuges in heavy weather.

Standard for separation efficiency

A procedure for defining a standard for separation efficiency is under development within the European Committee for Standardization (CEN) and is expected to be finished by summer 2005. This procedure will make it possible to compare the efficiency of different types of centrifuges, when operated at a controlled flow rate, before their introduction to the market.

Questions or comments regarding this SL should be directed to our Dept. 2160.

Yours faithfully

MAN B&W Diesel A/S

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Encl.

Excessive wear incidents caused by inefficient operation of centrifuges

Enclosure for
SL05-452/KEA

Fig. A: Fuel valve cut-off shaft with scuffing marks

Fig. B: Magnification of scuffing marks (2.6x)

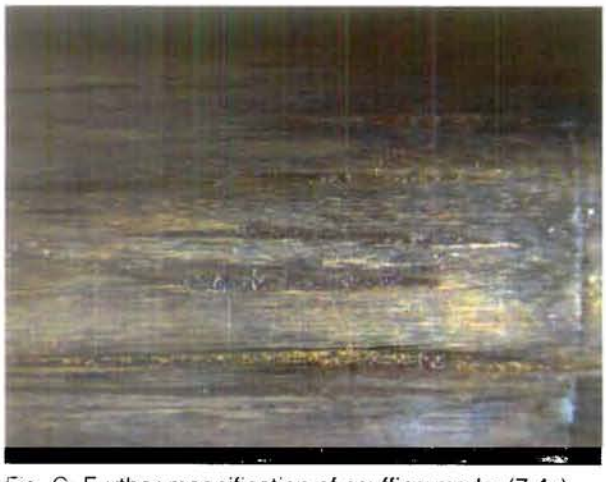

Fig. C: Further magnification of scuffing marks (7.4x)

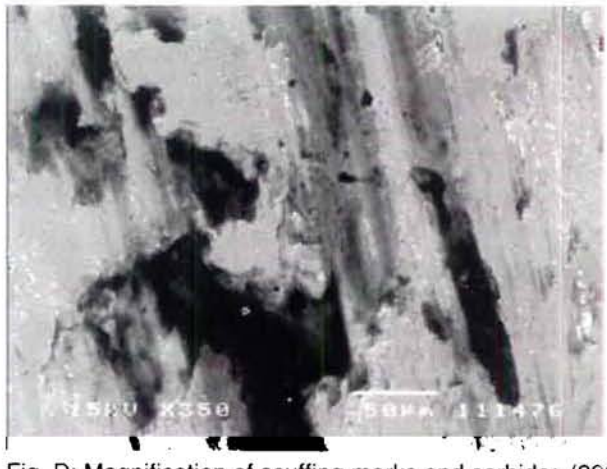

Fig. D: Magnification of scuffing marks and carbides (290x)

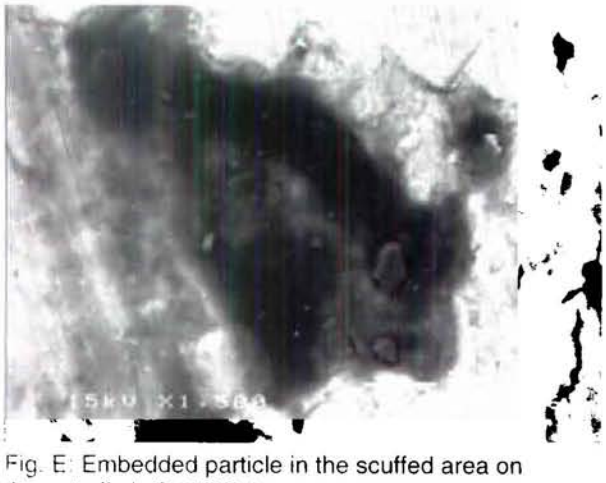

Fig. E: Embedded particle in the scuffed area on the cut-off shaft (1800x)

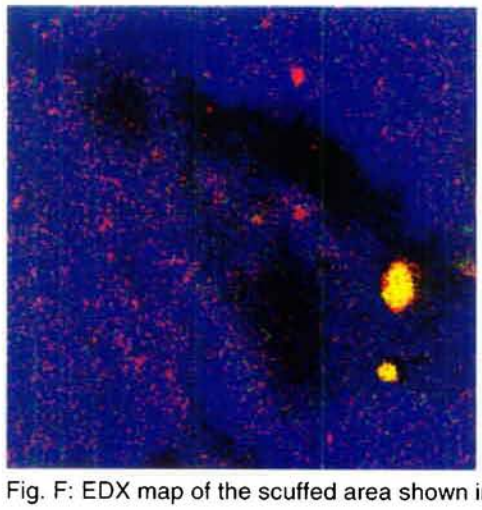

Fig. F: EDX map of the scuffed area shown in Fig. E