

Dear Sirs

This Service Letter gives recommendations about inspection of the main, crank pin and crosshead bearings, often referred to as “crank train bearings”, by two different methods:

- External inspection without opening the bearing
- Open-up inspection where the bearing is dismantled

Recommended inspection intervals are updated.

Furthermore, recommendations are given with regard to systems for monitoring of the bearings and their working environment.

Yours faithfully

  
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**Action code: WHEN CONVENIENT**

**Inspection and Monitoring of Crank Train Bearings**

SL12-552/HWC  
 January 2012

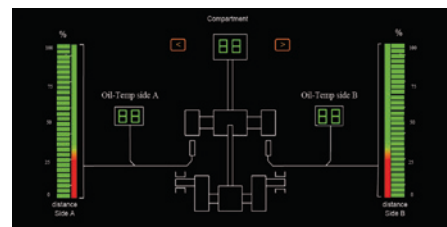
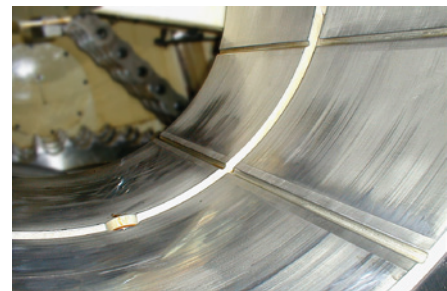
**Concerns**

Owners and operators of MAN B&W two-stroke marine diesel engines.  
 Type: MC/MC-C, ME/ME-C and ME-B.

**Summary**

This Service Letter gives recommendations about inspection of the main, crank pin and crosshead bearings.

Reference is made to SL08-498/AAB and SL05-460/NHN.



*Crosshead bearing inspection and bearing wear monitoring panel*

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## Background

Normally, main, crank pin and crosshead bearings have very low wear rates. Wear rates up to 0.01 mm/10,000 hrs. are considered acceptable, but lower values can be expected under normal running conditions. Conversely, abnormal operating conditions, e.g. pollution of the lubricating oil, scratches on journals or spark erosion may give rise to significantly higher wear rates and ultimately to bearing failure. Continuous operation with an undetected bearing failure may cause excessive heating, possibly damaging the shaft and bearing housing. In particular, in case of a main bearing failure, the repair work may become quite comprehensive. To minimise the risk of bearing damage, and possible consequential damage, inspection of the bearings is therefore recommended at regular intervals.

Dismantling of a bearing is time-consuming and costly due to the work involved. Moreover, it involves the risk of disturbing a well-functioning bearing by entering foreign matter or by mistakes made during reassembly. Therefore, it is

generally recommended only to open bearings for inspection if justified by observations from the outside.

## External inspection of bearings

The following inspections are recommended to be carried out at regular intervals.

### Inside engine:

- Bearing clearance measurements
- Bearing edge check
- Inspection of crankcase for bearing metal
- Crankshaft deflection measurement

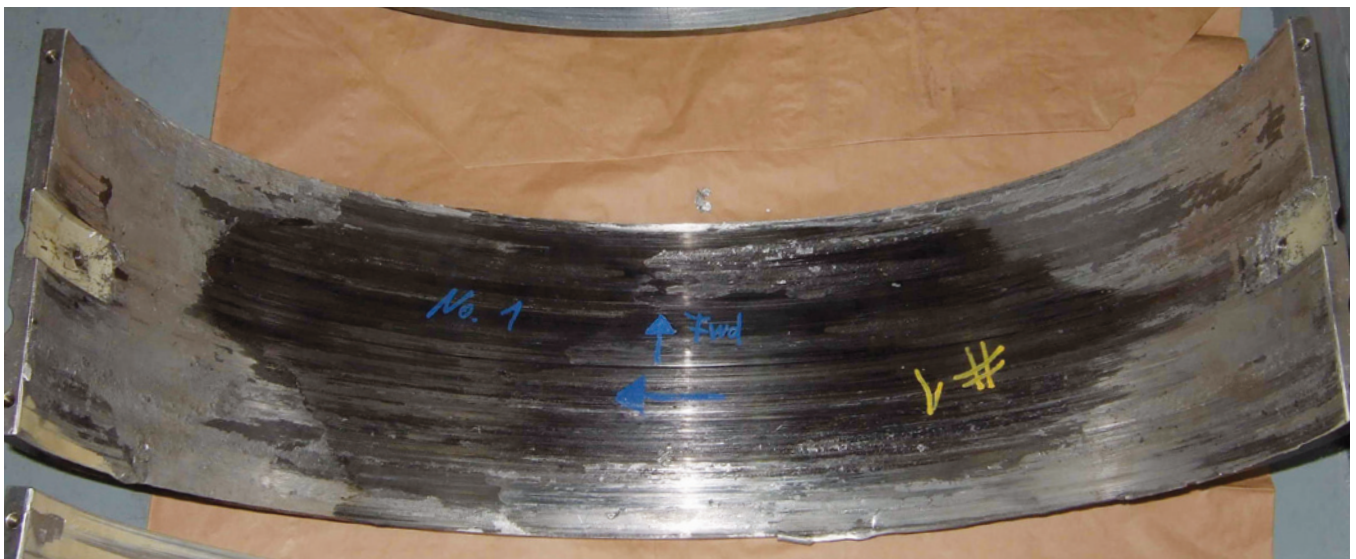
### Lubrication system:

- Inspection of oil filters
- Oil analysis as described in the "Operation" section of the instruction book.

## Open-up inspection of bearings

It is not recommended to open up bearings for inspections unless this is found justified by the above-mentioned external inspections or by other observations. The only exception is the open-up inspection of crosshead bearings and crank pin bearings for every three piston overhauls on engines not fitted with the monitoring systems recommended in the following.

For a detailed description of the inspections inside the engine and open-up inspections of bearings, we refer to the "Components and Maintenance" section of the instruction book.



Seizure of main bearing shell. Initial cause: spark erosion.



**Systems for monitoring and protection of bearings**

Several on-line monitoring systems are available and recommended by MAN Diesel & Turbo (MDT) to protect against bearing failure and consequential damage.

These can be categorised in two groups:

- *Bearing protection systems* serving to detect particular conditions of the bearing environment that may cause bearing damage. MDT recommends Shaftline Earthing Device Monitoring (SEDM) and Water In Oil Monitoring (WIOM).
- *Engine protection systems* serving to detect a bearing damage before it develops to cause damage to major parts of the engine. MDT recommends Bearing Wear Monitoring (BWM) and Bearing Temperature Monitoring (BTM).

SEDM. Shaftline Earthing Device Monitoring. A well-functioning shaft line earthing system is necessary to avoid spark erosion in main bearings. Monitoring the electrical potential between shaft and hull by a separate slip ring connected to the alarm system ensures correct function of the system. For detailed information, please see SL08-498/AAB.

WIOM. Water In Oil Monitoring. In several cases, water in the lubricating oil has resulted in poor bearing performance. The lead-based overlayer used in crosshead bearings is sensitive to water (corrosion), but also main bearings of both the White-Metal and Tin-Aluminium types have been seen to suffer from water contamination. For detailed information, please see SL05-460/NHN.

BWM. Bearing Wear Monitoring is a system that detects wear in any of the three crank train bearings, the main, crank pin or crosshead bearings, by measuring the position of the crosshead assembly in the bottom dead centre. The BWM system has threshold values for release of alarm and engine slowdown, respectively.

BTM. Bearing Temperature Monitoring systems have been available for MAN B&W engines for several years. A variety in measuring principles and executions exists, but all systems serve to release an alarm/slowdown when a bearing failure has developed to an extent where heat is developed.

For suppliers of WIOM, BWM and BTM systems, approved or recommended by MAN Diesel & Turbo, please see the enclosed list.

Furthermore, you can contact our PrimeServ department ([primeserv-cph@mandieselturbo.com](mailto:primeserv-cph@mandieselturbo.com)) for further information about retrofitting bearing monitoring systems.

**Recommendations and inspection intervals**

MDT recommends fitting WIOM and SEDM with a separate slip ring for monitoring connected to the alarm system, and BWM connected to the alarm system and safety system (slowdown). If a BWM system is not fitted, MDT recommends installing temperature monitoring of at least the main bearings, as this will protect the bedplate against heat distortion of the bearing housing. For engines fitted with WOIM, SEDM and BWM, the following intervals between external inspections of the bearings are recommended.

**Inspection intervals for engines with recommended monitoring systems (WIOM, SEDM and BWM)**

Running hours	2,000 h	4,000 h	8,000 h
Inspection of crankcase	x		
Inspection of oil filter	x		
Oil analysis	x		
Clearance measurements			x
Edge inspection			x
Crankshaft deflection			x
Open-up inspections of bearings	None	None	None

For all other engines, the below intervals are recommended.

**Inspection intervals for engines without recommended monitoring systems**

Running hours	2,000 h	4,000 h	8,000 h
Inspection of crankcase	x		
Inspection of oil filter	x		
Oil analysis	x		
Clearance measurements		x	
Edge inspection		x	
Crankshaft deflection		x	
Open-up inspections of bearings	Only crosshead and crank pin bearings as mentioned below *)		

*\* For engines without recommended monitoring systems, it is recommended to open the crosshead and crank pin bearings for inspection for every three piston overhauls of the cylinder in question because of the risk of dirt particles entering the bearings during piston overhaul.*

MAN Diesel & Turbo recommends that all data from the above inspections are entered in a log system, computerised or manually, giving the possibility of viewing trends in the data. Such trends can disclose slow wear in bearings well before it becomes critical. Preferably, the log should be able to refer to the data taken during sea trial when the vessel was new.



Besides the earlier-mentioned scheduled inspections, some observations of the lubricating oil system can conveniently be made on a more frequent basis, preferably on a daily basis:

- A visual check of an oil sample for appearance and smell can give early information about deterioration or contamination by particles or water. A detailed description of these checks can be seen in the instruction book.
- Most lube oil systems have a filter unit where back flushing will be triggered by high differential pressure over the filter. In case of abnormal wear in one of the engine bearings, the back flushing frequency is likely to increase. Therefore, frequent observations of the back flushing frequency are advisable.

### **WIOM (Water In Oil Monitoring) suppliers, approved by MAN Diesel & Turbo**

#### **Kongsberg Maritime AS Kongsberg**

[www.km.kongsberg.com](http://www.km.kongsberg.com)

WIO monitoring system: MMT330

#### **Dr. E. Horn GmbH**

[www.dr-e-horn.de](http://www.dr-e-horn.de)

WIO monitoring system: FRG00032-2\_AW

#### **Doosan Engine Co. Ltd. Head Office & Changwon Plant**

[www.doosanengine.com](http://www.doosanengine.com)

WIO monitoring system: O-WACS

#### **Vaisala Oyj Asiakaspalvelu**

[www.vaisala.com](http://www.vaisala.com)

WIO monitoring system: MMT330

#### **E+E Elektronik Ges.m.b.H.**

[www.epluse.com](http://www.epluse.com)

[www.ee-elektronik.de](http://www.ee-elektronik.de)

WIO monitoring system: EE36

#### **PAJ Systemtechnik**

[www.paj.dk](http://www.paj.dk)

WIO monitoring system: WIO 200

### **BWM (Bearing Wear Monitoring) suppliers, approved by MAN Diesel & Turbo**

#### **Amot**

[www.bearingwear.com](http://www.bearingwear.com)

BWM system: XTS-W+

#### **Dr. E. Horn GmbH**

[www.dr-e-horn.de](http://www.dr-e-horn.de)

BWM system: BDMS

#### **Kongsberg Marine**

[www.km.kongsberg.com](http://www.km.kongsberg.com)

BWM system: BWCM

#### **Rovsing Dynamics**

[www.rovsing-dynamics.com](http://www.rovsing-dynamics.com)

BWM system: OPENpredictor

### **BTM (Bearing Temperature Monitoring) suppliers, recommended by MAN Diesel & Turbo**

#### **Kongsberg Marine**

[www.km.kongsberg.com](http://www.km.kongsberg.com)

#### **Dr. E. Horn GmbH**

[www.dr-e-horn.de](http://www.dr-e-horn.de)

BTM system: BTMS