Criteria for Replacement of Connecting Rod Big-end and Main Bearing Shells

L27/38, L23/30H, L21/31, L16/24, L16/24S, L21/31S, L23/30S, L27/38S

Safety precautions

- Engine stopped
- Shut-off starting air
- Shut off cooling water
- Shut off fuel oil
- Shut-off cooling oil
- Stop lub. oil circulation
- Press Blocking - Reset

Short Description

Inspection of bearing shells.

Starting Position

Bearing shells removed from engine:	
Big-end bearing	506-01.30
Main bearing and guide bearing	510-01.05

Related Procedure

In-situ inspection of connecting rod big-end bearing	506-01.30
Inspection of main and guide bearing shells	510-01.05

Qualified Manpower

Duration in h	:	1/4
Number	:	1

Data

Data for pressure and tolerance	(Page 500.35)
Data for tightening torque	(Page 500.40)
Declaration of weight	(Page 500.45)

Special tools

Plate No.	Item No.	Note

Hand Tools

Magnifier

Replacement and wearing parts

Plate No.	Item No.	Quantity

L27/38, L23/30H, L21/31, L16/24, L16/24S, L21/31S, L23/30S, L27/38S

The area around the engine

⚠ WARNING

The area around the engine must be clean and tidy!

General

This paper gives information about the evaluation of the connecting rod big-end and main bearing shells when wear appears on the running surface under normal operating conditions.

Bearing damages caused by incorrect running conditions, like

- Corrosion

- Overloading, overheating a.s.o.

are not described in this paper.

In these cases, the bearing shells must be exchanged, of course, and in order to avoid further bearing failures, the cause of the failure must be found and eliminated.

New Condition

The running surface has a silvery, bright color, see fig 1.

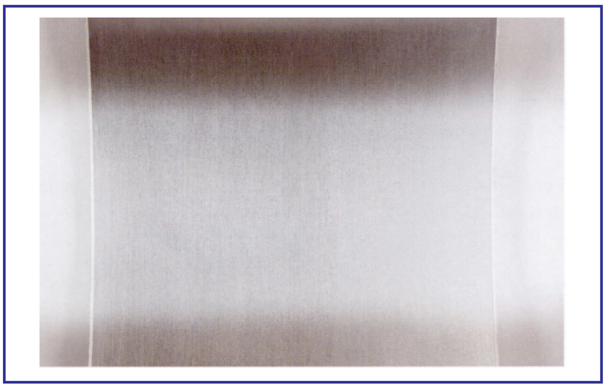

Figure 1: Without flash

Bearing Surface

Standard Miba bimetal bearings have no tin flash.

Oil is used for protective coating.

In new condition the bearing has a silvery, bright color.

The running surface might become dull silvery after only a short time of operation.

Criteria for bimetal bearing replacement

Actual wear can be determined by measuring wall thickness or via clearance measurements in comparison to the specification for a bearing in new condition.

A bearing should be replaced if the wear limit, as specified by the engine manufacturer, is reached or can be expected to be reached during the next period of operation.

Another method is to specify a certain time limit for the useful service life of the bearing.

The individual time limit (recommended maximum time in operation) specified by the engine manufacturer is based on the calculated bearing load, minimum oil film thickness and load profile.

The useful service life of a bearing is also determined by the fatigue strength of the lining material under the respective load profile.

Usual running pattern

Typical running pattern after completion of running:

Bearings to be reused

Following pictures shows the typical running pattern where bearing shells are reusable.

1) **Normal wear**
Slightly polished zones and symmetrical running pattern in the most loaded zone of the bearing. Minor scoring. See fig 2.

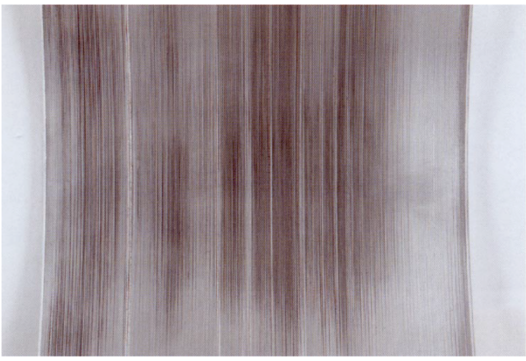

Figure 2: ***Reusable***

2) **Minor edge loading**
and usual running pattern. Slightly polished stripes along the side faces. See fig 3.

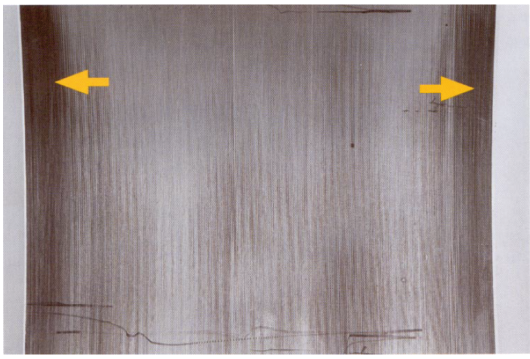

Figure 3: ***Reusable***

3) **Damage due to foreign particles**
Shallow scoring and / or imprints that are few in number. See fig 4.

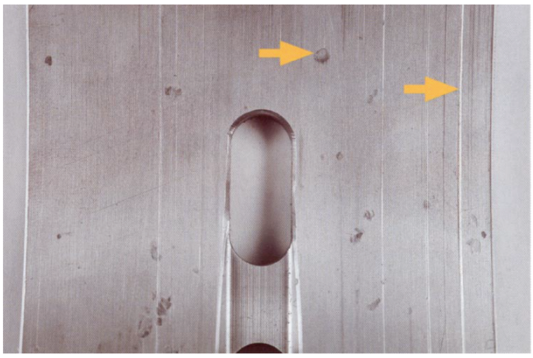

Figure 4: ***Reusable***

4) **Minor cavitation after long time in operation**
Minor and shallow material removal outside the most loaded zone. See fig 5.

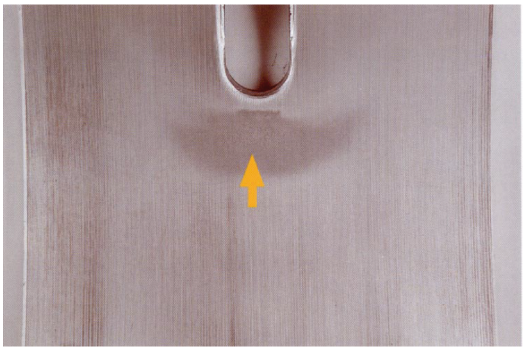

Figure 5: ***Reusable***

Bearings to be replaced

Following pictures shows abnormal wear or damages that require replacement of bearing shells i.e. investigation of reasons.

1) **Localized heavy smearing of lining material**
due to local disturbance of the oil film. See fig 6.

L27/38, L23/30H, L21/31, L16/24, L16/24S, L21/31S, L23/30S, L27/38S

Figure 6: ***Replace***

2) **More extensive area of damage with seizure locally smeared lining material** caused by a severe disturbance of the oil film. See fig 7.

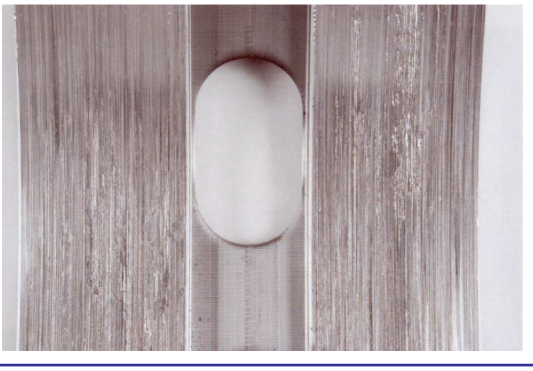

Figure 7: ***Replace***

3) **Damage due to foreign particles** Many scores or multiple deep grooves and / or imprints. See fig 8 and fig 9.

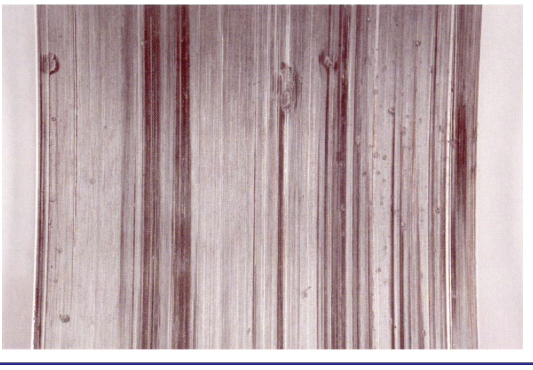

Figure 8: ***Replace*** *- deep scoring, imprints. Lining material locally smeared*

Figure 9: ***Replace*** *- many deep imprints*

4) **Deep punctual cavitation** In severe cases the cavitation extends to the steel shell, spreads along the interface between steel shell and lining material, and undermines the AlSn20 lining. See fig 10.

Figure 10: ***Replace***

5) **Deep cavitation** Cavitation at the end of the oil groove.

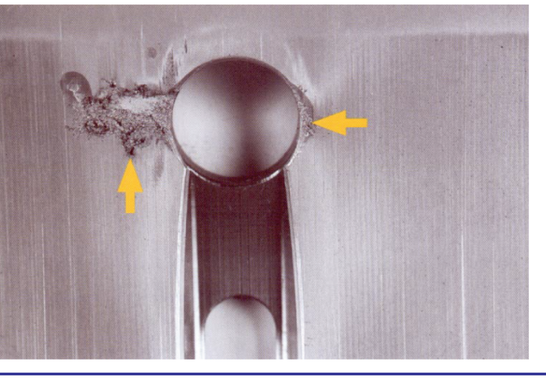

Figure 11: ***Replace*** *- deep cavitation*

6) **Fatigue rupture of the lining material**

Mechanism:

- Development of fine cracks in the lining material
- Network of cracks (crazing)
- Parts of the lining material break out

Figure 12: Fatigue rupture