

Damages to ship gear boxes fitted with roller bearings

Medium speed diesel engines gain growing attention in shipping as the engine output has been and still is growing steadily.

To achieve optimum propeller revolutions and thus a high degree of efficiency these engines have to be fitted with a reduction gear.

The following 3 types of gear boxes are common on board ships.

1. Reduction gear in combination with PTO (Power Take-Off) and variable pitch propeller.
2. Reversing reduction gear in combination with a fixed .

An increase of damages to the roller bearings of the gear boxes with considerable consequential damage has been noticed in the recent years.

What are the causes for these damages?

- Improper alignment of engine and gear box.
Tolerances which however can be absorbed by the clutch but which will shorten the working life of the bearing of the pinion shaft, are accepted when engine and gear box is aligned.
- Vibration of propeller
Vibrations of the propeller will be transferred to the bearings of the pinion shaft of the gear, this especially endangers the thrust bearing.
- Expansion of gear box
The gear will expand during warming in operation and thus a higher load to the bearings of the PTO. The installation of the shaft generator however is rigid and thus not able to „grow“. The working life of the bearings will be reduced.
- Maintenance
Service intervals are exceeded.

- Lub oil maintenance

Lub oil often is contaminated with water (leaking oilcooler), hydraulic oil (leaking packings of variable pitch propeller system) or solid particles stemming from normal wear of the clutch lamellas. Lub oil change intervals are not adhered to.

- Classification

There are no binding rules of by the classification societies when a gear box has to be maintained / overhauled. Surveys are generally restricted to the condition of the gearing.

How damages could be prevented?

- Alignment of engine and gear box

The alignment of engine and gear box should be checked directly after the trial when the vessel enters service and minimum on a yearly basis thereafter. Tolerances during alignment should be kept to a minimum.

- Vibration of Propeller

A condition monitoring system should be fitted when a vessel is built or should be fitted subsequently. Any wear and damages caused by vibrations are detected safely and in good time by existing measuring technics.

- Casing expansion

Any possible expansion of the gear box has to be considered when aligning PTO and shaft generator.

- Maintenance

Service intervals have to be adhered to and preventive maintenance should be carried out.

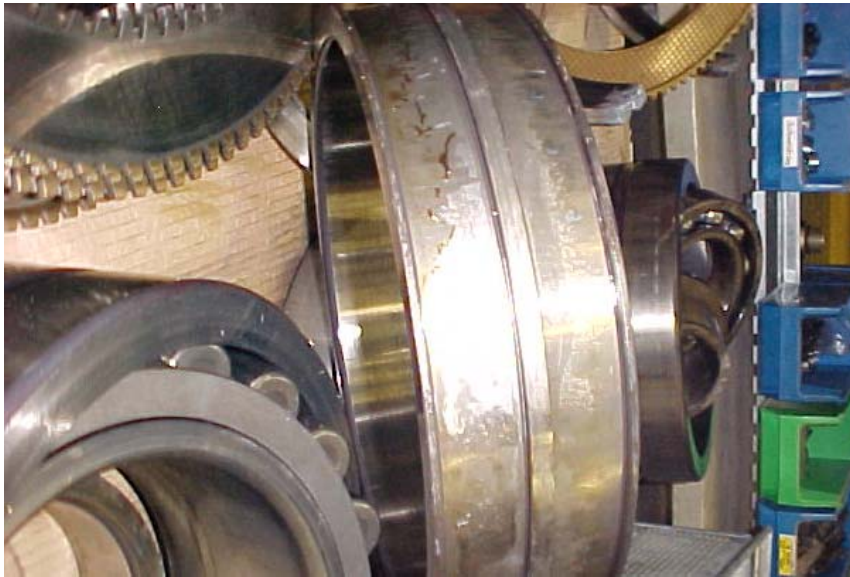
- Lub oil maintenance

Lub oil analysis should be executed continuesly. Examination of oil samples for metallic particles (wear and tear) by spectroscopy allows early recognition of damages to bearings and gearing. Due to growing age the lub oil specification will change, therefore oil change intervals have to be kept strictly.

Consequential damage

If bearing damage and consequential damage to the gearing has occurred, the pinion and the driven wheel will have to be renewed.

These spare parts are generally not available from stock, the vessel will possibly be delayed up to 4 month as new wheels will have to be manufactured.



Damaged inner ring of a roller bearing



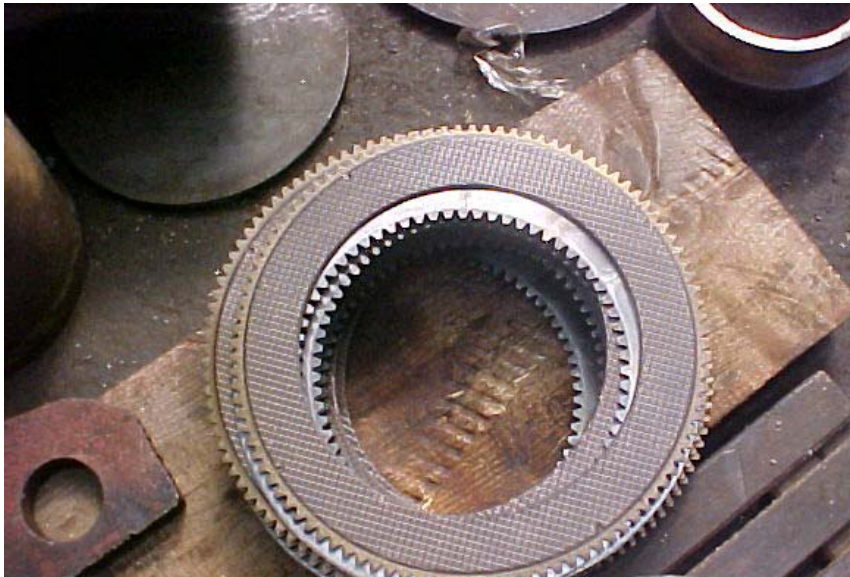
Damaged roller body



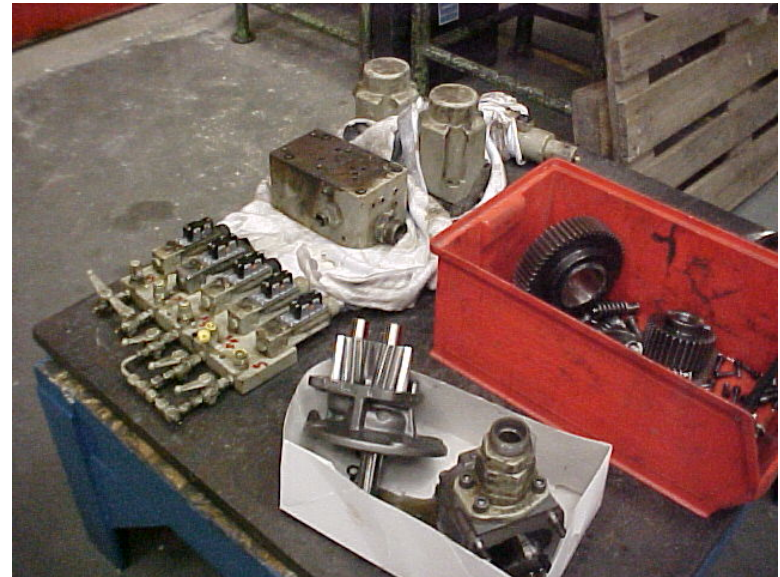
Ball race of a thrust bearing



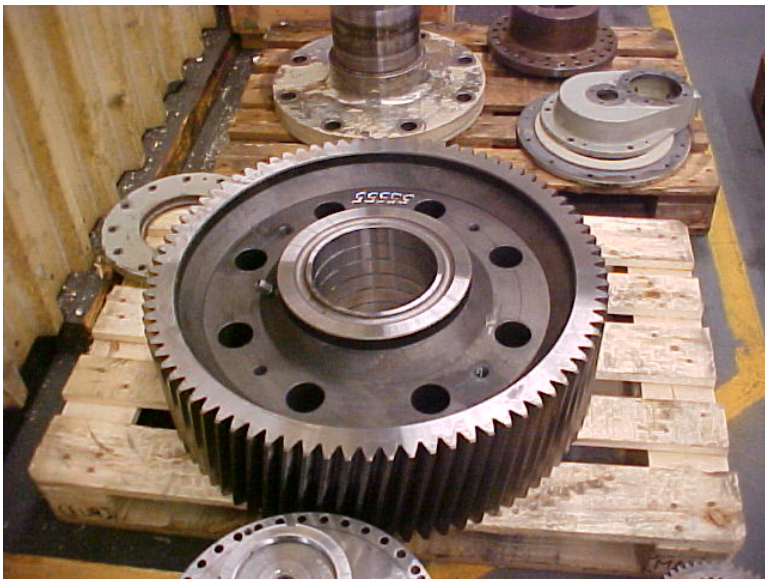
Broken ball race and roller bodies of a thrust bearings



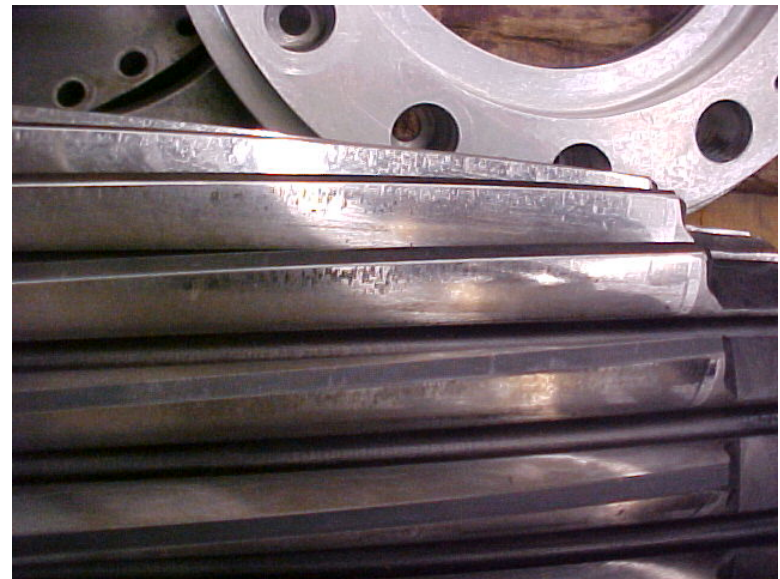
Clutchdiscs – rendered useless by metallic particles



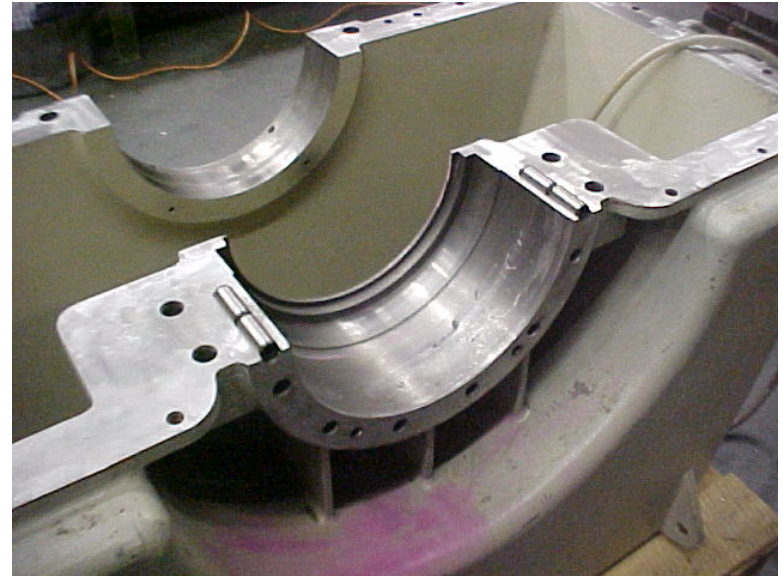
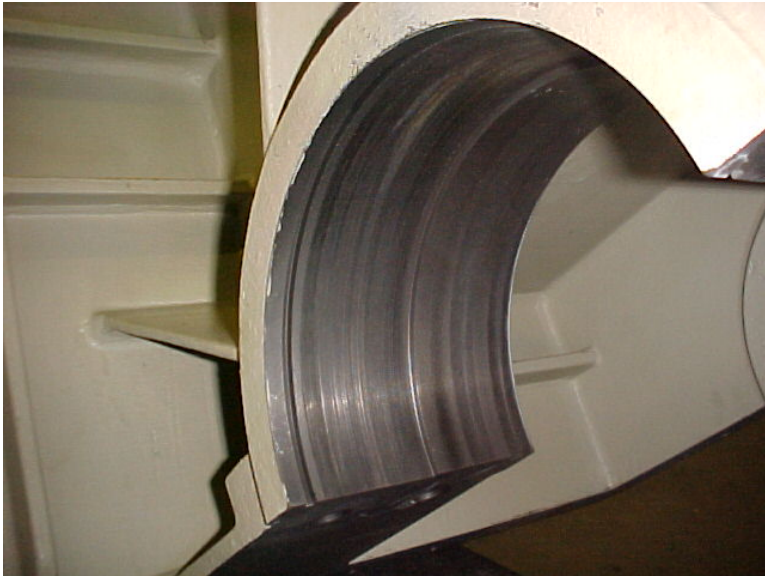
Metallic chips in oil pump and hydraulic system



Damaged large wheel



Damage to gearing of a pinion



Damaged
bearing seats

