YANMAR DIESEL	SERVICE NEWS	No. 95-1-G-04-021-K

TITLE : Con. Rod Troubles, Causes and Prevention of Trouble

Troubles involving con. rod, their causes and prevention of trouble have been enumerated below for facilitating your engine servicing:

1. Con. Rod Troubles

The Con. Rod troubles reported to us in the past were ①breakage of rod bolt, ②breakage of con. rod large end, ③breakage of con. rod middle area and ④longitudinal crack of the small end.

2. Troubles and Causes

2-1) Breakage of Rod Bolt

This trouble, comprising the major part of the con. rod troublrs, is generally attributable to faulty tightening of rod bolts. The factors relating to this trouble are as follows:

(1) Problems involving the torque control for rod bolt tightening we have been recommended so far are:

- Insufficient rod bolt's tightening force (clamping force) as a result of excessive tightening resistance when there is scoring or other damage in the threads and tightening seat face.
- Use of improper lube oil (molybdenum disulfide, etc.) to the bolt threads and tightening seat face and resultant overtightening of bolts at the specified tightening torque, abnormal elongating of bolts and drop of tightening force.

ンマーディーゼル株式会社
尼崎工場 品質管理部
エンジン技術課
Tel. No. 06-489-8017
Fax. No. 06-488-4003

YANMAR DIESEL CO. LTD.
AMAGASAKI WORKS
QUALITY CONTROL DEPT.
Tel. No. 06-489-8017
Fax. No. 06-488-4003

Approved	Checked	Drowing

[Countermeasure]

To prevent the trouble deriving from the above factors, bolt tightening method was changed to angle tightening for our production units from Oct. 1994.
We also instructed that the tightening method should be changed to angle tightening on servicing the con. rod for the units already shipped.

(2) Trouble deriving from the drop of partial strength of bolts due to drop or bolt strength or damage of bolts relating to the use of bolts exceeding their limits (20,000 hrs.) and frequent bolt removal and re-tightening necessitated extraction servicing.

[Countermeasure]

It is recommended that the bolts be replaced every 20,000 hrs. (according to the instructions in the operation manual). If extended use of the bolts is desired, contuct precision inspection for the bolts, (through manetic testing, etc.).

2-2) Breakage of Con. Rod Large End

Most troubles of this type were started from the bolt threads bottom of con. rods. The involving factor was the flaw or other damage in the bolt threads bottom or bolt end tips. These led to fatigue fracture.

[Countermeasure]

Clean the threads fully when servicing the con. rod.
Prior to the assembly, ensure that the bolts can be lightly screwed into the bolt holes by your hand.

2-3) Breakage of Con. Rod Middle Area

This type of trouble derives from the distortion of con. rod.
Distortion of the con. rod is caused by water hammer, piston seizure, overspeed, etc. These slight distortion, normally not visible, causes partial stress to develop when tensile force is applied on the con. rod by inertia force through

piston reciprocation and the resultant cracks will lead to fracture.

[Countermeasure]

When any of the above troubles arose, it is necessary to check the distortion of the con. rod. The simple way of inspection is to insert a round rod (having the same diameter as the con. rod oil hole) into the oil hole.

2-4) Longitudinal Fracture (along Oil Hole) of Small End

Due to abnormal wear of piston pin bush, clearance between both parts enlarges and causes hammerring. According to the increase of hammering, cracks will develop and a longitudinal fracture will rsult.

[Countermeasure]

It is recommended to measure the inner dia. of bush and outside dia. of piston pin when servicing the con. rod. Keep the dimension of both parts within the wear limits as specified in the operation manual.

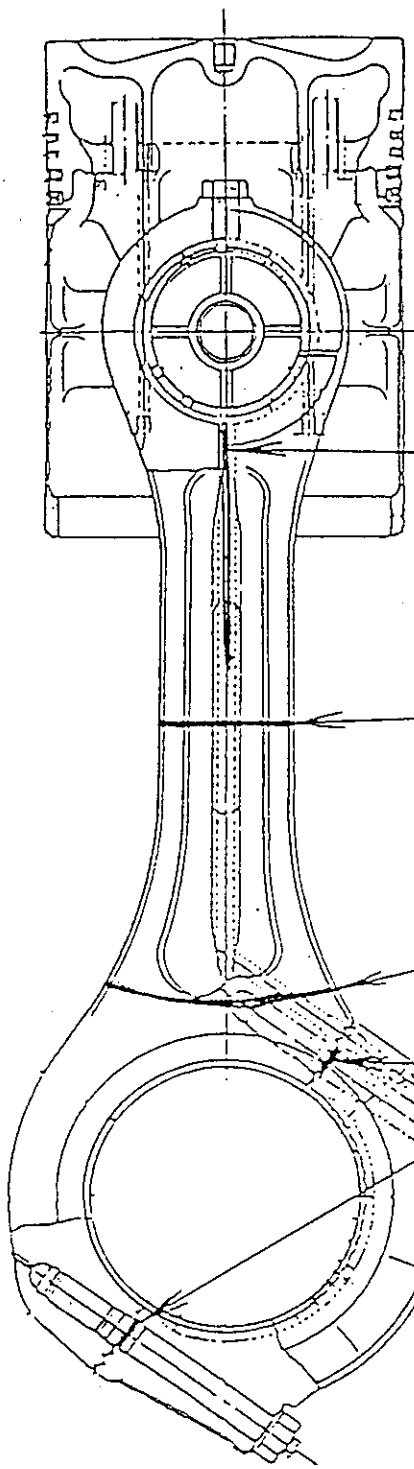
3. Summary

In general, following conditions apply to the breakage of con. rods:

- Con. rod breakage develops after long years' use of the engine.
- In most cases, con. rods present a heavy fracture.

In view of these, please interprete our review above as an approximate standard but not as a precise analysis. In order to analyse the cause of con. rod breakage accurately, it is necessary to grasp the history of troubles and maintenance in the past and the results of detailed inspection of the fractured parts.

A part of Brekage of Con Rod for Fxample



④ A part of longitudinal carck of the small end

③ A part of breakage of con rod middle area

② A part of breakage of con rod large area

① A part of breakage of rod bolt