

## THE FORGOTTEN PARTS OF MAIN ENGINE

We would like to bring to your kind attention an issue which may cause undesired incidents on your main engine.

You may aware service letter SL2008-492 and relevant alerts from Swedish Club but after personally, witnessing same situation, we decided to share this experience with you and remind the importance of the issue.

While we were opening main engine bearings for class inspection during vessel in drydock, everything seems good such as appearance oil, cleanliness of crankcase etc. Upon completing of job, we left vessel and come back a few days after launching. Once we open crankcase door for deflection measurement, (which vessel already started lubrication oil pump before our arrival) we have observed that lubrication oil deteriorated from excessive water in the lubrication oil system, which result replacing whole lubrication oil in the system.

After further investigation, we found out reason as extreme water presence on tank top (between main engine and sump tank) and damaged diaphragm membrane. Since vessel at drydock and crew busy for hectic jobs, ignored bilge alarm raised from M/E sunken part and could not realise water accumulation below main engine.

### **Why this part became forgotten?**

1. Because of design, even if membrane or bellow damaged, not possible to understand without dismantling. (Oil never leak to tank top)
2. In order to water leak to sump tank, water level to increase minimum 10-15 cm, but normally bilge alarm raising before that level and ship crew keeping tank top area at dry condition.  
**Only drydocking period, it is easy to disregard bilge alarm and water accumulation on the tank top area.**

### **How To Prevent Incident?**

1. Best way to follow service letter and inspect/replace the defective parts.
2. Emphasize importance to keep tank top dry and pay special attention to alarm raised from M/E sunken area, especially during drydock period. Please see below pictures belongs to above experience.

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Service letter

SL08-492/JVG  
March 2008**Rubber Diaphragm Sealings in Crankcase Oil Outlets**

Action Code: WHEN CONVENIENT

The crankcase lubricating oil outlets guide the lubricating oil from the crankcase to the bottom tank. A diaphragm at the outlet pipes prevents water and other liquids in the area from contaminating the main engine lubricating oil system, which could lead to fatal damage of the main engine bearings.

According to our Checking and Maintenance Schedule in the instruction manual of MAN B&W engines, we recommend to check the condition of the diaphragm in the crankcase oil outlet every 32,000 hours of operation and to replace the diaphragm if necessary. The procedure concerns rubber diaphragms as well as metal bellow diaphragms. However, due to the risk of material problems in rubber diaphragms, we recommend to replace the rubber diaphragms at every scheduled inspection, which is noted in our checking procedure (no. 912-5.1) for Crankcase Oil Outlet, enclosed with this letter. It should be noted that the membranes are normally supplied by the shipyard and not by the engine manufacturer.

We draw your attention to the above-mentioned schedule and our procedure and inform you as follows:

**How to avoid defect rubber diaphragm**

To avoid water entering the main engine sump tank through a defect crankcase oil outlet, it is recommended to:

- Inspect the diaphragm sealing in the crankcase oil outlet every 32,000 hours of operation and replace the diaphragm if necessary. Always replace rubber diaphragms.

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- Inspect the diaphragm sealing at the earliest opportunity after delivery of a new-building. In case of a rubber diaphragm, make sure the material is oil resistant and replace if this is not the case.
- Inspect the diaphragm sealing at the earliest opportunity when taking delivery of an existing ship and replace the diaphragm if necessary. Always replace rubber diaphragms.

Questions or comments regarding this SL should be directed to our Dept. LEE4.

Yours faithfully  
MAN Diesel A/S

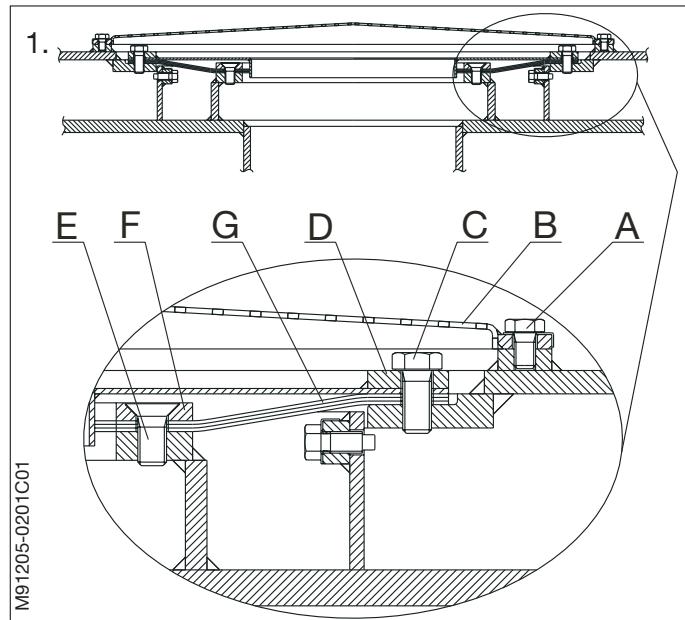
Carl-Erik Egeberg

Niels B. Clausen

The crankcase oil outlets guide the lubricating oil from the crankcase to the lubricating oil bottom tank. The sealings of the crankcase oil outlets must be checked at regular intervals, for example during dockings. The crankcase oil outlets may be equipped with either rubber diaphragm sealing or metal bellow sealing.

**Note!**

If the water content of the main engine lube oil is rising, this may indicate that the crankcase oil outlet sealings are fractured.

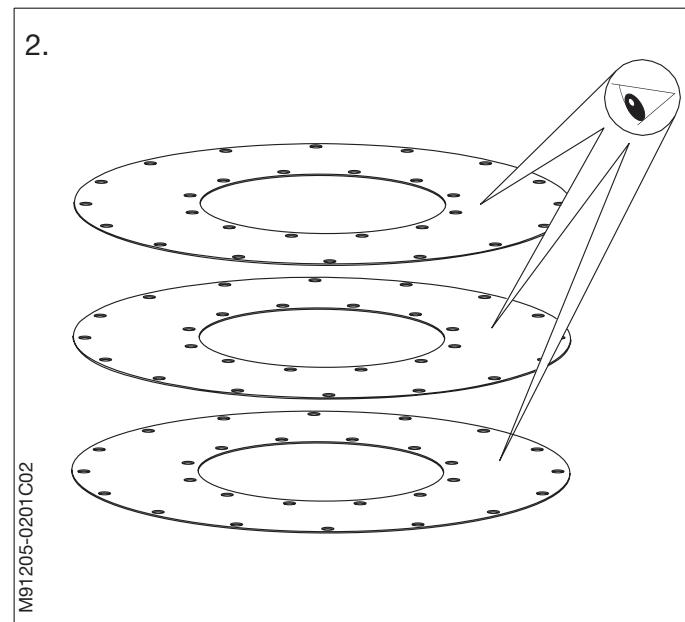


### Rubber diaphragm sealing

1. To access the rubber diaphragm sealing remove:  
Screws A  
Grating B  
Screws C  
Cover plate D  
Screws E  
Steel ring F.
2. Lift away the rubber sealing diaphragms G and examine each diaphragm closely. In case of any rips or tears in the diaphragms, they must be replaced.

**Note!**

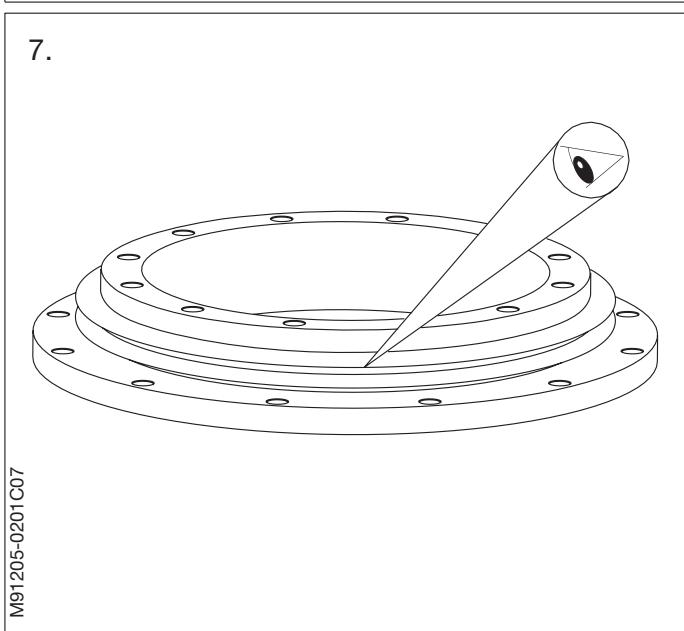
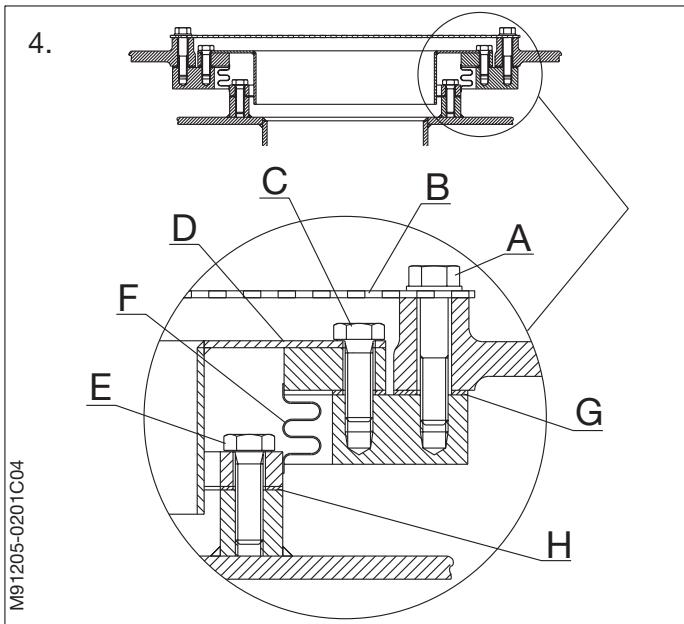
It is strongly recommended to always replace the diaphragms during inspection.  
If unavailable, new diaphragms may be made from three layers of 2 mm thick oil and temperature resistant rubber.



3. Mount:  
Rubber sealing diaphragms G  
Steel ring F  
Screws E  
Cover plate D  
Screws C  
Grating B  
Screws A.

**Note!**

Remember to fit new locking plates at screws A.



### Metal bellow sealing

4. Remove all screws A and grating B.
5. Remount four of the screws A at diametrically opposite positions.
6. Remove:
  - Screws C
  - Cover plate D
  - Screws E.
7. Lift away metal bellow sealing F and examine it closely. If any cracks or punctures are found in the metal bellow sealing, it must be replaced.

#### Note!

**It is recommended to always replace the metal bellow sealing during inspection.**

8. Replace gaskets G and H.
9. Mount metal bellow sealing F.
10. Mount:
  - Screws E
  - Cover plate D
  - Screws C.
11. Remove the four screws A.
12. Mount grating B.
13. Mount all screws A.

# MEMBER ALERT

October 20<sup>th</sup> 2007

## The "forgotten" rubber membrane

### Background

Following a number of recent incidents the Club launched an investigation regarding "forgotten" parts of the machinery. The parts in question are the rubber membranes connecting the main engine crankcase and sump tank.

### Definitions: Wärtsilä/Sulzer & MAN Diesel A/S

The engine configurations concerned are all 2-stroke main engines from Wärtsilä/Sulzer, and MAN Diesel A/S.

It should clearly be mentioned that during commissioning of the ship the parts in question are supplied by the yard, and not by the engine manufacturers.

### Sequence of Events

It has come to the Club's attention during the launched investigation in one of the cases, that the rubber membranes were not oil resistant, which eventually caused complete failure of the membranes. In other cases the rubber membranes failed due to natural aging process.



Defective rubber membranes may cause severe engine damage.

### Consequence

In both cases described above excessive quantities of water on the tank top entered the main engine sump tank, and subsequently contaminated the main engine lubricating oil system, resulting in severe damage to the main engine bearings.

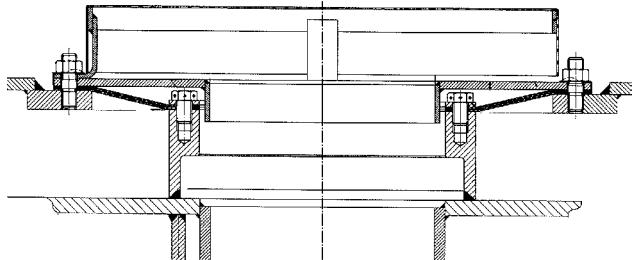
Weather it being the aging or the non-resistant to oil feature that triggers the failure of the membranes, is of less importance. The mere fact that these "forgotten" parts of the machinery can result in serious losses to owners and underwriters is a fact and therefore serious enough to promote steps being taken to prevent occurrence.

In a recent case the repair cost alone exceeded USD 3,000,000. This obviously does not take into account owners' deductible, loss of time and other commercial embarrassments connected with the casualty.

### How to avoid a casualty

It is rather clear that the design of Wärtsilä/Sulzer and MAN Diesel A/S in this respect are similar, and as a consequence they are both potentially exposed.

We would like to emphasize that the actual parts in question, during commissioning of the ship, are supplied by the yard, and not by the engine manufacturers.

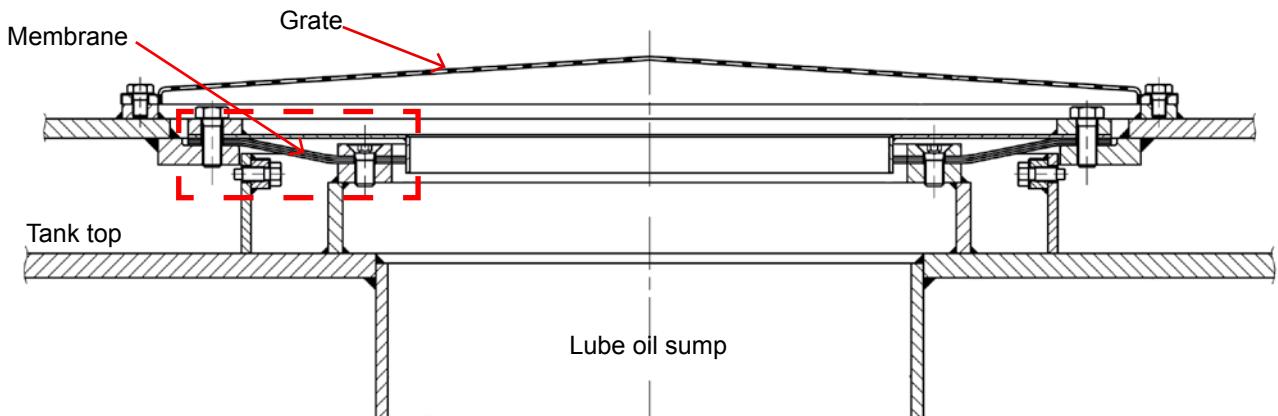


Design of the Wärtsilä/Sulzer sump tank connection.

**Wärtsilä/Sulzer's recommendation is as follows:**  
 inspection of this part at 40,000 running hours, during a dry dock and replace it if it's damaged.



## The forgotten Rubber membrane



*The Swedish Club and MAN recommend you to replace the membrane at each dry-docking and also keep extra membranes on board.*

MAN Diesel A/S, Copenhagen, has recently issued a more comprehensive recommendation to replace all membranes in connection with each dry-docking of the vessel.

**MAN Diesel A/S, Copenhagen, recommends:** in order to avoid water entering the main engine sump tank through a defect in the crankcase oil outlet:

- Inspect the diaphragm sealing in crankcase oil outlet every 32,000 hours of operation and replace the diaphragm if it is indicated by the observation. Always replace in case of a rubber diaphragm.
- Inspect the diaphragm sealing at the earliest opportunity after delivery of a new-building. In case of a rubber diaphragm make sure the material is oil resistant and replace if this is not the case.
- Inspect the diaphragm sealing at the earliest opportunity when taking delivery of an existing ship and replace the diaphragm if it is indicated by the observation. Always replace in case of a rubber diaphragm.

In line with the recommendation issued by MAN Diesel A/S, Copenhagen, we recommend that all membranes are replaced in connection with every relevant scheduled inspection of the ship.

In addition, it is recommended to owners that they check the status of the membranes at earliest opportunity, unless they are certain that the membranes meet the required specifications.

Finally, it is recommended to owners currently in the process of commissioning a ship, or taking delivery of one, to check whether or not the relevant material composition of the rubber membranes is oil resistant and otherwise suitable for its intended purpose.

Given what was mentioned above, there is no guarantee that a fairly new ship does not have defective membranes. A new ship could very well have defective membranes if it turns out that the composition of the rubber in the membranes is not oil resistant.

### Critical Situations

Obviously all situations encompassing free flowing water on the tank top in connection with defective membranes are critical. One of the situations identified by The Swedish Club which typically is more conspicuous in this respect is the dry-docking. During a dry-docking it is more common to have water on the tank top.

### Cost of Replacement

The cost is approximately USD 1,000 – 3,000 depending on the number of outlets. Adding some extra in respect of labour cost, it is easily ascertained that this minor investment in planned maintenance is well spent money when comparing with what could otherwise happen.

**For further information and details please contact:**  
The Swedish Club head office in Göteborg, Wärtsilä/Sulzer or MAN Diesel A/S Copenhagen, Denmark, Marine Installation.

We would recommend to owners  
that spare membranes are kept  
onboard at all times.

## Main Engine Lubricating Oil Outlet diaphragm

In 2007, the Swedish Club published a Member alert, The "Forgotten" Rubber membrane, where we reported about a number of main engine claims caused by water contaminated lubricants. The incidents caused by failure of the lubricating oil outlet diaphragm connecting the main engine crankcase and sump tank.

We have recently seen an increasing number of incidents regarding these "forgotten" parts of the machinery, hence the need to address this topic again.

The engine configurations concerned are all 2-stroke main engines from Wärtsilä and MAN Diesel A/S.

### Consequences

In all cases excessive quantities of water on the tank top have entered the main engine sump tank via the defective diaphragm and subsequently contaminated the main engine lubricating oil system, resulting in severe damage to the main engine bearings and journals.

The repair cost for the engine damage can easily reach millions of dollars. This obviously does not take into account loss of time, towage, transshipment of cargo and other commercial embarrassment caused by the casualty.

### Manufacturers' recommendations

The design of both Wärtsilä and MAN Diesel A/S lubricating oil outlet diaphragms are quite similar. Wärtsilä has recommended maintenance as follows:

- ▶ Inspection/replace at 40,000 running hours or at dry dock.

MAN Diesel A/S, Denmark, has released a Service letter SL08-492/JVG, March 2008. In order to avoid water entering the main engine sump tank through a defect in the crankcase oil outlet, it is recommended to:

- ▶ Inspect the diaphragm sealing in the crankcase oil outlet every 32,000 hours of operation, and replace the diaphragm if indicated by the inspection.



Failed diaphragm



Deteriorated diaphragm

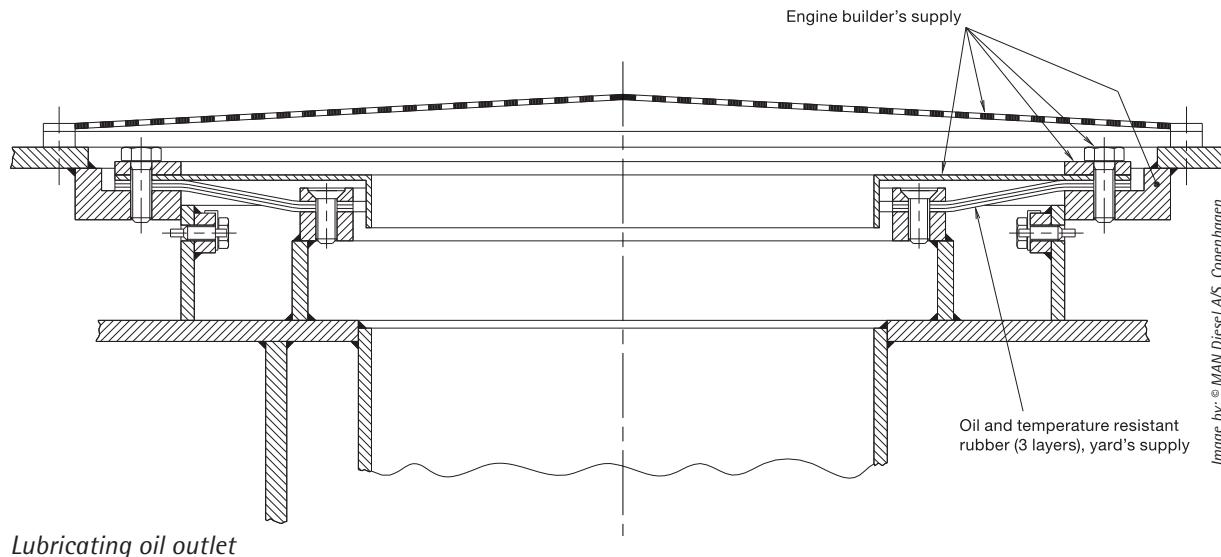


Image by: © MAN Diesel A/S, Copenhagen

**It should be stated that during construction of the ship, the parts in question are supplied by the yard, and not by the engine manufacturers.**

#### Loss Prevention

All situations with excessive water on the tank top in connection with defective diaphragms are critical. During a dry-docking it is, for various reasons, more common to have water on the tank top than during normal operations.

In line with the recommendation issued by MAN Diesel A/S, Copenhagen, we recommend that all diaphragms are replaced in connection with every relevant scheduled inspection of the ship.

If heavy contamination of water is present in the system: (1) the lube oil in the sump tank must be transferred to a settling tank, (2) the sump tank and crank case should be cleaned, and (3) fresh oil filled to the level recommended by the engine maker.

#### Observations

Obviously all situations with excessive water on the tank top in connection with defective diaphragms are critical. During a dry-docking it is, for various reasons, more common to have water on the tank top than during normal operations.

In the recent incidents we have noted that none of the vessels had enough lubrication oil onboard to completely replenish the system.

The cost of inspection/replacement is minimal compared to the consequences if it's left unattended.

We would recommend to owners that spare diaphragms are kept onboard at all times.

For further information and details please contact The Swedish Club's head office in Gothenburg.  
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