INSTRUCTION MANUAL
OF
STERN TUBE SEALING
TYPE EVK2RV

SIZE : 410～630

[A] Installation
[B] Piping
[C] Inspection
[D] Handling
[E] Parts replacement intervals
[F] Service network
[G] Handling check seat
[H] Periodical inspection and maintenance
[I] Trouble shooting of the sealing
[A] Installation

1. Inspection before seal installation
   Make sure there is no serious damage on the surface of propeller shaft sleeve and bulk head in which the sealing is installed. As damage give a bad influence on the seal performance and fitting works, they should be corrected by CATALOY or equivalent.

2. Painting on shaft sleeve
   Remove grease and oil from painting area completely with solvent.
   On the surface of the shaft sleeve in which the sealing is installed, EAGLE PAINT or equivalent Epoxy paint should be painted on 2 times for against corrosion. Part of bearing sliding area is not to be painted.
   When sealing is to be disassembled, check condition of shaft sleeve surface. If paint peeled off, repainting to be done.

3. Assembling
   (1) Inflatable ring
      For new construction vessels, this seal is always delivered fitted in the seal casing by our factory, so install it in accordance with item (2).
      When assembling on shaft sleeve, perform as follows. (See Fig. -1)
      a. Insert the inflatable ring into the casing.
      b. Screw the anchor pin to the inflatable ring.
      c. Fix the infla retainer on the casing.
      d. Tighten the lock nut in the anchor pin. At this time, be careful not to twist the anchor pin by fixing the square part of the pin with a wrench.
      e. Tighten another lock nut in the anchor pin.

   (2) Casing
      a. After applying liquid packing (THREE-BOND NO.1101, etc.) to the seal mounting surface and the gasket, install the gasket to the hull.
      b. Temporarily install the casing, properly aligning the "TOP" mark.
      c. After adjusting the casing position to provide a uniform clearance between the infla retainer and the propeller shaft sleeve, securely install the casing. The clearance is 4mm in every size of sealings, and the maximum fitting error is 0.5mm. (See Fig. -1)

   (3) Seal ring and Mating ring
      a. After remove dirt from the casing and the shaft sleeve, apply a thin coat of grease to the surface of the shaft sleeve. Then wipe away surplus grease with your hand.
      b. After apply a thin coat of grease to the pocket of the seal ring, hook a garter spring up in the pocket.
      c. Place "O" ring in the groove of the casing.
      d. Remove grease from the sliding surface of mating ring and seal ring COMPLETELY with solvent (methyl ethyl ketone or equivalent).
      e. Push the seal ring into the casing using the mating ring and fasten the mating ring to the casing with bolts, aligning the TOP mark. At this time, fasten evenly each symmetrical pair of bolts so that the seal ring may be pushed in equally around the circumference.
1. Piping for water supply
   Confirm that the supply water pressure is the draft pressure plus 0.01~0.03 MPa in close vicinity to the seal.

2. Piping for air supply
   (1) The air piping from the 0.6~1.0 MPa (reduced) air source should be provided with an escape valve.
   (2) Being careful not to twist the anchor pin when connecting or disconnecting tube fitting for air pipe.

   BE CAREFUL OVER APPLYING GREASE.

   Disconnect the air supply line normally in order to prevent a inflatable ring from breaking.

[C] Inspection

1. Before launching
   Supply an air pressure of 0.3~0.6 MPa to the inflatable ring, and apply twice as great a water pressure as the draft pressure from the water supply line to verify that water is continuously no leaking from the seal ring, and that the air pressure drop is within 10% per hour.

2. After launching
   Check to see that water is continuously no leaking from the seal ring.
   Stop the propeller shaft. Close all water supply line fully. Supply an air pressure to the inflatable ring. Then open the plug③ and check to verify that water is continuously no leaking. (See Fig. -2)
[D] Handling

1. Preparation before running
   (1) Make sure to purge air in the inflatable ring on the pressure gauge (G-1) by closing valve (1) and opening valve (2).
   (2) Purge air in the casing by opening plug (3). And close plug (3).
   (3) Open valve (4).
   (4) Begin running of the cooling water pump.

2. Handling procedure of the inflatable ring
   This seal is to be used in the inspection or replacement of a seal ring at sea. In working with this seal, make sure the shaft does not rotate.
   Handling procedure is as follows.
   (1) Stop the propeller shaft.
   (2) Close valve (4) and valve (2).
   (3) Open valve (1) gradually so that the air pressure becomes 0.3～0.6 MPa in Gauge (G-1).
   (4) Open plug (3) and make sure of no water leakage from the casing.
   (5) Remove the mating ring and inspect the seal ring. If necessary, replace it.
   (6) After work, the reverse procedure should be performed. At this time, reconfirm closure of valve (1), and opening of valve (2).
   (7) Purge air in the casing by opening plug (3). And close plug (3).

CAUTION! Shaft rotation must be stopped before operating the inflatable ring.
3. Maintenance

(1) During normal operation, keep all the sea water piping valves wide open, and also keep the escape valves of the air piping wide open.

Make sure of the performance of the seal ring periodically. A little leakage of water from the seal ring is acceptable on account of lubrication and cooling.

(2) Make sure of the performance of the inflatable ring **at no shaft rotation** before dry docking.

(3) Avoid supplying over 0.8 MPa air pressure to the inflatable ring.

(4) Install a current colector near the sealing device and carry out maintenance and inspection thoroughly.

(5) Check and clean the seal water piping as occasion calls.

(6) When using fire near the sealing device, use care not to allow fire flames and sparks to come in direct contact with the sealing device.

4. Replacing procedure of the seal rings at sea

If a large amount of water (over 100～200L/day) leaks continuously, check the seal ring and replace it if necessary.

(1) Work the inflatable ring according to item 2.

(2) Remove the mating ring.

(3) Finish the sliding surface of the mating ring as flat as possible using emery paper whenever the mating ring was removed from the casing.

(4) Take the seal ring out of the casing and remove the garter spring.

(5) Cut away the seal ring.

(6) Take out the spare seal ring on the shaft sleeve and set it into the casing in accordance with item [A]-3-(3).

(7) Fix the mating ring.

(8) After work, close valve①, and open valve②. Purge air in the casing by opening plug③. And close plug③.

[E] Parts replacement intervals

1. Seal ring

The seal life might be considered approximately 2～4 years, but a little shorter in vessels with a deeper draft. In case of the replacement of a seal ring, also replace the garter spring at the same time.

2. Inflatable ring

This might be used for about 5 years, but it is recommended to replace at the shaft withdrawal. In addition, if the ring is inflated and damaged due to shaft rotation, replace the ring immediately.

3. "O" ring

If there are no serious defects or tears in the bonding part, it can be used for about 5 years. But when disassembling the sealing, replace it, judging from its condition. It can be easily replaced using instant adhesive.
4. Mating ring

The worn mating ring can be reused after reconditioning.

Reconditioning of the mating ring

If the amount of wear down on the sliding surface is over 0.5mm in depth, it should be reconditioned by lathing.

In case lathing is not necessary, finish it as flat as possible using emery paper or equivalent.
[F] Service network

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URL http://www.kemel.com
[G] Handling check seat

To Be Checked At Installation.
1. No serious defects shall exist on the shaft sleeve surface and the seal mounting surface of the hull.
2. Epoxy Paint must be applied on the surface of the shaft sleeve where the sealing is installed.
3. Liquid packing must be applied on the gaskets and the cut faces of the mating ring.
4. The casing shall be installed with its "TOP" mark at its top position.
5. The casing shall be aligned to the shaft sleeve surface within 4mm ± 0.5mm.
6. A thin coat of grease shall be applied to the surface of the shaft sleeve when the seal ring is installed.
7. Wipe away surplus of grease with your hand.
8. There must be no partial deformation of the seal ring. The seal ring shall be installed in correct direction.
10. No steps, warping or damage shall be on the sliding surface of the mating ring.
11. Remove grease from the sliding surface of mating ring and seal ring completely with solvent.
12. All pipings shall be set as required.
13. The grounding device must be installed in effective position.
14. Check if a pressure-reducing valve is necessary for the air pipe line.

To Be Checked After Installation.
1. Sealing performance must be confirmed in the following manner. Pressurize the inflatable ring to 0.3~0.6 MPa and set feed water pressure at equivalent to twice draft pressure then perform air venting. There shall be no continuous leaking from the sliding surface and air pressure downfall must be 10 %/Hr., or less.
2. Pressurizing air supplied to the inflatable ring shall be eliminated after the above mentioned performance confirmation.

To Be Checked At Launching.
1. Performance of the inflatable ring shall be confirmed when the propeller shaft is stopped.
2. The inflatable ring shall not be run without fixing the propeller shaft at launching.
3. When the propeller shaft is stopped, Fully close the valves in the feed water line and pressurize the inflatable ring to 0.3~0.6 MPa Then open the air vent plug and make sure of no water leakage from the casing.
4. After the above item 3 are confirmed, purge air in the inflatable ring shall be done.
5. No excessive leakage shall occur from the sliding surface (Max. 2 L/Hr.).
6. Air venting of the sealing device shall be performed.
7. Operation control of valves shall be done without fail.

To Be Checked During Operation.
1. The supply water pressure is draft pressure+0.01~0.03 MPa in close vicinity to the seal.
2. Sealing condition shall be without problem at any time such as at stoppage, during forward and back sailing, in rough weather condition, at empty or full load condition, etc.
3. The coupling for the air pipe line shall be released.
### [H] Periodical inspection and maintenance

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Frequency</th>
<th>Inspection / Maintenance</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sealing Condition</td>
<td>1 time/day</td>
<td>Check visually or measure if there is any leakage, and increase or decrease in leakage rate.</td>
<td>Amount of water leakage. (L/day)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>A little leakage of water from the seal ring is acceptable on account of lubrication and cooling.</td>
<td>Size Less than</td>
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<tr>
<td></td>
<td></td>
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<td>190  40</td>
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<td></td>
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<td></td>
<td>210  50</td>
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<td></td>
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<td></td>
<td></td>
<td>330  80</td>
</tr>
<tr>
<td>2</td>
<td>Supply water pressure</td>
<td>1 time/day</td>
<td>Check it is equivalent that supply water pressure is shaft center level pressure + 0.01~0.03 MPa.</td>
<td>Pressure gauge to be positioned in close vicinity to the seal.</td>
</tr>
<tr>
<td>3</td>
<td>Sea water filter</td>
<td>1 time/wk.</td>
<td>Check and prevent clog condition of element.</td>
<td>Adjust frequency of inspection. And sweeping clog for good condition.</td>
</tr>
<tr>
<td>4</td>
<td>Grounding device</td>
<td>1 time/wk.</td>
<td>Check carbon brush works well. Check and remove dust and oil on sliding surface.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Inflatable ring</td>
<td>1 time/yr.</td>
<td>No leakage of water at 0.3~0.6 MPa of air pressure. Air pressure drop in piping to be within 10 %/Hr.</td>
<td>Inspection to be done before docking. Releasing air in the inflatable ring to be done after inspection.</td>
</tr>
<tr>
<td>6</td>
<td>Disassembly condition</td>
<td>1 time/yr.</td>
<td>Check seal ring works well and its installation position.</td>
<td>No excessive wear or deformation on seal ring.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Confirm that something clogged in the grooves of outside sliding surface of seal ring.</td>
<td>Something clogged in the grooves cause the sliding surface to hot.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Check wears down condition of mating ring.</td>
<td>If the amount of wear down on the sliding surface is over 0.5mm in depth, it should be reconditioned by lathing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check condition of shaft sleeve surface.</td>
<td>If EPOXY PAINT peeled off, repainting to be done.</td>
</tr>
</tbody>
</table>
**1] Trouble shooting of the sealing**

<table>
<thead>
<tr>
<th>Term</th>
<th>Method of inspection</th>
<th>Normal condition</th>
<th>Detected abnormality</th>
<th>Cause of the trouble</th>
<th>Course of action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Temp. of the mating ring</td>
<td>hand inspection</td>
<td>warm to the touch. less than 50°C</td>
<td>too hot to touch.</td>
<td>high water pressure due to excessive water supply.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>initial operating temp. for a new ring may be higher.</td>
<td>smell of burning rubber noted.</td>
<td>inflation of inflatable ring.</td>
</tr>
<tr>
<td>2</td>
<td>Amount of water leakage</td>
<td>visual inspection and measurement of water leakage</td>
<td>shaft rotating, seal size ≤190 : leakage ≤40L/day 310 ≥ seal size ≥ 210 : leakage ≤50L/day seal size ≥ 330 : leakage ≤80L/day shaft stationary, leakage ≤50L/day</td>
<td>leakage above 100~200L/day.</td>
<td>something caught between seal ring and mating ring.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>with new seal ring and reconditioned mating ring, leakage should be minimal[approx. 10cc/min].</td>
<td></td>
<td>warped seal ring.</td>
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<td></td>
<td>worn seal ring.</td>
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<td></td>
<td>worn mating ring. (more than 0.5mm depth)</td>
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<td></td>
<td>seal ring hardens due to low water temperature.</td>
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<td></td>
<td>something caught between seal ring and shaft sleeve.</td>
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<td>rubber adhesive fails</td>
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<tr>
<td>3</td>
<td>Supply water pressure</td>
<td>check pressure gauge G-2</td>
<td>draft pressure + 0.01~0.03 MPa</td>
<td>mating ring too hot to touch.</td>
<td>see term 1.</td>
</tr>
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<td></td>
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<td></td>
<td>a large amount of water leakage.</td>
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<td>damaged stern tube rubber bearing</td>
</tr>
<tr>
<td>4</td>
<td>Inflatable ring</td>
<td>with shaft stationary, inflate ring to 0.3~0.6MPa ; inspect for water leakage.</td>
<td>air pressure drop is within 10 %/Hr.</td>
<td></td>
<td>insufficient air pressure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>no sea water leakage.</td>
<td>inflatable ring cannot be inflated and water leakage from air supply line.</td>
<td>ring inflated while shaft running.</td>
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<td></td>
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<td></td>
<td>inflatable ring inflates but leaks sea water.</td>
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<td></td>
<td>supply water line valve left open.</td>
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</tbody>
</table>