

**No.  
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# **Recommended procedure for the determination of contents of metals and other contaminants in a closed fresh water system lubricated stern tube**

## **1. General**

As provided by paragraph 1.2.15 of IACS UR Z21, a sample test of lubricating fresh water should be carried out at the required intervals.

The documentation on lubricating fresh water analysis is to be available on board. Each analysis, to be performed by an appropriate method, should include the minimum parameters as listed:

- Metal contents as applicable (with the material of the shaft and liners used), refer to Section 3 and 4.
- Corrosion inhibitors in fresh water (pH or equivalent alkalinity indicators) indicating the degree of passivation of the system against corrosion, refer to Section 5.
- Salinity indicators or equivalent indicators i.e. total conductivity, refer to Section 3 and 6.
- Contents of bearing particles, refer to Section 7.

Analysis result records should also include the extent of make-up water in the system.

## **2. Sampling procedure**

One lubricating fresh water sample should be taken:

- The fresh water sample should be taken under service conditions, i.e. with a rotating shaft and the system at service temperature.
- The sample is to be drawn from the same agreed position in the system which should be positively identified. The sample should be representative of the water circulating within the stern tube.
- The sample, unless supervised by a Surveyor, is to be collected under the direct supervision of the Chief Engineer.

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### 3. Contaminants determination

The presence of the following contaminants should be determined:

- In connection with presence of wear metals and corrosion products (shaft and/or liners):

Iron

Chromium

Nickel

Copper

Silicon

- In connection with the presence of sea water:

Sodium

Chlorides

### 4. Metal content values

The metal content values should be considered taking into account the chemical composition of the shaft and liner materials.

Suggested upper limits are given below for guidance only:

<b>Metal</b>	<b>Limit value</b>
Iron	25ppm
Chromium	5ppm
Nickel	5ppm
Copper	40ppm
Silicon	30ppm

These limits should be considered versus the elapsed time.

It is important to have results of a number of sequential analyses in order to observe any trends taking place.

In case of shafts provided with a corrosion protection system the possible presence of further metal contaminants should be evaluated in accordance to the indications of the shaft/system manufacturer.

### 5. Corrosion inhibitors

The fresh water used for shaft lubrication may be treated, according to the provisions of the system manufacturer, by means of corrosion inhibitors that limit the risk of oxidation of the shaft and/or liners. The characteristics and contents of such inhibitors may vary, hence no recommended value is listed.

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However a significant indicator that may be used as guidance is the pH value of the sample or an equivalent indicator of alkalinity. The lower limit of the pH value of the water that may be assumed as guidance is 11.

**6. Salinity indicators**

In order to evaluate the possible contamination of the fresh water with salt water (e.g. leakages from the outboard seals) the following indicators should be considered:

Chloride contents

Sodium

Suggested upper limits are given below for guidance only:

Chloride contents	60ppm
Sodium	70ppm

**7. Presence of bearing particles**

The bearings used in fresh water lubricated propulsion shaft are made of synthetic material and could have composite structure consisting of specifically selected polymers and additives having mineral or synthetic origin.

The possible presence of synthetic material in the fresh water sample may indicate the deterioration of the bearing or onset of bearing failure.

Mechanical filtering of the water sample, e.g. by means of a paper micro-filter, may allow a first quantitative analysis of the content of macro parts. This shall be taken before the filters if any fitted in the system.

Microscopic analysis of the particles may be recommended to identify the non-metallic bearing material in the sample.

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