Geschäftsbereich
Montage

BABCOCK
DEUTSCHE BABCOCK
WERKE
AKTIENGESELLSCHAFT

FILE 163.641

S/S NORWAY

Dokumentation

E-0015

ID 10f 17

INSPECTION REPORT

Job: 18-8702-999

Code word: SS Norway

Customer: Norwegian Caribbean Lines AS
Oslo/Miami

Consultant: Lloyd Werft Bremerhaven GmbH
Mr. Satow, Dipl.-Ing.

Previous history

Previous damage to boilers 21 - 24 during the period from 26.7.68 to 15.2.74 can be seen from a summary report by Bureau Veritas, Paris, from 13.6.85 (see annex 1).

After that small blisters and pittings were found in the area of the weld seams of the upper drums for the first time in December 1970. In December 1973 the first cracks were found on the lower drum of boiler 24 in a length of 1 - 3.5 mm. These cracks were ground out to a depth of approx. 3 mm. The following test showed no further faults.

In February 1974 in spite of conservation corrosion blisters were again discovered on the inner longitudinal welds of the lower drums. These defective parts were again removed by grinding work. The grinding depth was again approx. 3 mm.

In May/June 1982 corrosion cracks were found in the longitudinal and circumferential welds of the boilers 21 - 24 by means of magnetoflu The defective areas mentioned were rectified by means of grinding. A subsequent magnetoflux test did not lead to any objections.

Inspection 1985

Due to the previous damage the shipping line NCL AS Miami entrusted, by telex of 28.5.1985, Deutsche Babcock Werke AG, Oberhausen, with the inspection of boilers 21 to 24 and to submit a proposal for possible repair welding to be carried out to the drums of the boilers.

For the inspection the welding specialist Mr. H.G. Koconka travelled on 31.6.85 to Miami in order to carry out an internal inspection of the drums. As boiler 23 had only been shut down for some hours inspection of the drums could only take place at sea.

This was carried out during the following days in the presence of Messrs. H. Vossen (Chief engineer NCL) and K. Satow (Lloyd Werft).

The lower drum of boiler 23 was ground on all T joints to allow testing and tested by means of dye penetration. In the longitudinal and circumferential welds lengths of 1,000 - 2,000 mm were tested in each case. Incipient cracks or corrosion cracks could not be

found. The tested T joints and longitudinal weld parts in the upper drum and the lateral wall drum were also free from defects.

The lateral wall drum and the lower drum have marked weld thickness reductions in the longitudinal and circumferential seams resulting from grinding for earlier testing.

Recommendations

As, during start-up and shut-down operation strong bending stresses and alternating stresses occur, the urgent advice is given to rework the incorrectly ground areas (ANNEX 2 ?) . In order to avoid increases in stress gentle transitions must be made.

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In the lower areas of the drums erosion is to be seen on the circumferential weld seams. These defects should likewise be rectified by grinding and subsequent testing work. It must be noted that all the drums showed strong corrosion pitting.

As only boiler 23 was available, it must be assumed that boilers 21, 22, 23 and 24 are in the same state. We also consider checking of these drums to be urgently required.

All test work required should be carried out as far as possible according to the magnetic particle method. A wall thickness measurement of all new or old grinding areas should be carried out with the ultrasonic method.

For possible repairs a welding and repair proposal according to annex 3 is enclosed. Such welding work can only be carried out by a specialist company.

On the basis of the photos talks were held with our specialist departments "boiler operation" and "water chemistry". After long discussions the conclusion was reached that heavy oxygen corrosion was present. It must be examined whether this oxygen corrosion takes place during operation or the downtimes or in the shipyard berthing times. It is recommended that during operation the adherence to the deaeration temperature which must be $>100^{\circ}C$, be ensured. The oxygen content during operation must be < 0.02 ppm. Moreover, during downtimes preservation measures must be taken without fail.

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Boiler pickling is to be recommended if the deposits in the risers and downcomers are thicker than 0.2 mm. Such cleaning can only be carried out only by a special company. Prior to that 2 - 3 pipe samples must be taken for assessment from areas to be specified.

DEUTSCHE BABCOCK WERKE AKTIENGESELLSCHAFT
Erection welding department

BUREAU VERITAS

Paris la Défense, 13th June 1985

Please, see hereunder the relevant damage reports about the main boilers of the passager ship "NORWAY" (ex "FRANCE").

1. On July 26th, 1968

repair of a water tube of the port assembly (n°1 a) on boiler 21.

2. On October, 1970

Damage report :

Crack detected on a tube of the boiler 22 (tube n°7, vapor side, starting from the end.)
Characteristics of the crack : length 25 mm, rupture in the elbow formed by the tube near the earth.
Repair by butt welding of the tube.
. hydraulic test after repair.

3. On December 15th, 1970.

Survey report :

. small flaws detected in the welded seams in the water part of the upper drums. Maximum depth : 1,5 mm. Prints were taken to watch the subsequent development of the flaws.

. lower drums found in order.

4. On December 21th, 1973.

Survey report :

. cracks (length 1 to 3,5 cm) detected between the flaws appearing on the lower drum of boiler n°24 (central part of the drum on 1,80 metre length).

. cracks were ground off up to three millimetres depth.
Dye penetrant test without observation.

. No development of the flaws previously detected on the welded seams and the securing of the tubes on drums.

5. On February 15th, 1974.

Internal report - Le Havre :
Corrosion flaws were found in way of the internal longitudinal welded seams of the lower drums.

. These defects were present in the boilers descaled by using the FRAMABORG system.
Corrosion defects ground off. Maximum depth of the defects were about 3 mm.

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6. Translation of the orders for preservation of the boilers during lay up of the ship (from August 1974 to December 1977).

. Boiler rooms

- Boilers in preservation (boilers n° 13, 14, 21, 22, 23, 24) full of distilled water up to the air valves of superheaters, heated as follows :

2 liters N_2H_4 + 1 liter NH_3 + 300 grs PO_4Na_3 : pH = 10, phosphates 4 to 8 mgr/l - Hydrazine 1,5 to 2 mgr/l.

. Check weekly if the boiler is full (complete with treatment pump if necessary). Hydrazine content is to be maintained between 1 and 2 mgr/l.

- Boiler change

After putting out the fires, made surface and bottom blow off for two levels, introduce treatment products as described here-above.

- Heating of the boilers

. After a complete washing, heat during 48 hours maximum in order to dry the boiler on the gas and combustion side. Use a heat blower. Hot air temperature is not to be less than 110°C.

- On that occasion, open air valves for gas exhaust. In the end of heating, full up and close the air valves.

- In other cases, heat the boiler with the air flow due to natural draught(i.e flood gates open). Adjust to obtain 50 to 55°C in the air sheet.

- Washing of boilers

Proceed as usual. Each evening during the washing, and especially after completion of washing, rinse copiously the wetts parts with hot fresh water mined with sodium carbonate and Gamlen Compound n°8 in order to obtain a pH in rinse water not less than 8.

- Fuel transfer

Keep a minimum number of tanks in heating.
Only transfer a tank if there is enough space in the settling tank to collect the entire intent of the considered tank.

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- Fuel treatment

Is to be undertaken with SOUTBAN BF.112 in a proportion of 1 to 2000.

- Water treatment for the boiler in service

Check during each watch : chlorides and TA .
Complete analysis every three days, mean values to obtain are as follows : chlorides 5-20 mg/l.

. TA 0,75-1 - TAC 1-2 - PO4Na3 6-15 mg/h. pH 9,8 -10,2
. N2H4 0,05 mg/l.

Hydrazine supply in the feed system is to be about 100 cm3/24 h.

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