



MERCANTILE MARITIME SOLUTIONS PTE LTD

Company Reg. No. 201419851N

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CLIENT – VALLES STEAMSHIP (Canada) LTD

VESSEL: SEAHERITAGE

A/E #1 ALTERNATOR SHAFT RECONDITIONING

PLACE – MELACA MALAYSIA/SINGAPORE

DATE FROM – 26/10/2017 TO - 09/11/2017



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SERVICE REPORT

680kW NISHISHIBA ELECTRIC AC ALTERNATOR



CLIENT : VALLES STEAMSHIP (CANADA) LTD
VESSEL : SEAHERITAGE
DATE : 09 NOVEMBER 2017
S/N : 619074A1A-1
JOB NO. : PJ0084-17-002



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TECHNICAL DATA / SPECIFICATIONS

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SERVICE REPORT

Job Number : PJ0084-17-002
Client : Mercantile Maritime Solutions Pte Ltd
Vessel : SEAHERITAGE
Equipment Description : 680kW NISHISHIBA Electric Alternator
Date Completed : 07 November 2017

A. Technical data / Specifications

| | | |
|-------------|-----------------|---------------------------|
| KVA : -- | KW : 680 | Manufacture : NISHISHIBA |
| Volts : 450 | Ins Cl : F | Model : - |
| Amps : 1091 | Exc. Volt : 170 | Serial No. : 619074A1A-1 |
| RPM : 900 | Exc. Amp : 66 | DE Bearing : - |
| Hz : 60 | IP : 54 | NDE Bearing : White Metal |
| Phase : 3 | Ambient : 50 | Color : Light Green |
| Pf : 0.8 | Remarks : | |

Remarks: -



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SERVICE JOB SCOPE

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B. Service Job Scope

1.0 General Scope:

- ❖ Received Alternator parts loose condition for cleaning, inspections and testing.
- ❖ Carried out steam, chemical cleaning and oven baking for all windings.
- ❖ Carried out Electrical Testing on Main Stator, Main Rotor, Exciter Stator and Rotor.
- ❖ Carried out check/testing on Heater, CT's and etc.
- ❖ Carried out Dynamic Balancing of Rotor c/w Exciter Rotor and Rotating Diode Assembly.
- ❖ Installed new NDE white metal bearing.
- ❖ Carried out final paint on alternator after re-assembly.

2.0 Additional Job Scope:

Electrical Test:

Main Stator Winding:

- Carried out winding resistance, insulation resistance, hi-pot & surge test, after steam and chemical washed; found that main stator winding testing result was satisfactory. Insulation resistance was found (87 MΩ) as received the alternator.

Main Rotor Winding:

- Carried out winding resistance, insulation resistance, and volt-drop test on the individual field winding, after steam and chemical washed, found that main rotor winding testing result was satisfactory.

Initial Insulation resistance was found (1.68 MΩ) as received.

- Found with dent mark on the lamination core of rotor field winding. (See Figs: 4 & 5)

Exciter Stator:

- Carried out winding resistance, insulation resistance test and impedance test and

Volt drop test on exciter stator winding.

Initial Insulation resistance was found (105 MΩ) as received.

- Found with some rubbing marks on the lamination core of exciter field winding.

(See Figs: 10 & 11)

Exciter Rotor:

- Carry out winding resistance, insulation resistance, and impedance test on exciter
-



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rotor. Insulation resistance was found (5.2 MΩ) as received.

Recommended to carry out rewinding on Exciter Rotor winding due to the rubbing marks found on the lamination core which burnt the slot insulations.

(See Figs: 8 & 9)

PMG Stator:

- Installed New PMG stator due to burnt as received. (Supplied by owner)

PMG Rotor:

- PMG Rotor was found with lost magnetic field due to the excessive heat caused by

the burnt PMG stator winding.

- Install New PMG rotor. (Supplied by owner)

Mechanical Check:

Rotor Shaft (Bearing Journals):

- NDE journal of rotor shaft was found worn-out with deep score marks at labyrinth journal

side (inner and outer). (See Figs: 6 & 7)

Recommended to carry out repair by pre-machining, MPI Test, pre-heat treatment, rebuilt, machine to size and final MPI Test. (Repaired done by CRC)

- NDE bearing journal of rotor shaft was found worn-out. (See Figs: 6)

Recommended to carry out polishing. (Done by CRC)

NDE bearing housing:

- Lower part of bearing housing was found badly melted with crack lines on the collar.

(See Figs: 13 to 16)

Recommended to carry out repair. (Repaired done by CRC)

Others:

- Supplied and installed 3 nos. of Bridge Diode and install on rotor shaft as rectifier.

(See Figs: 24)

- Supply 1set of repair kit. (bolts, nuts, gaskets and etc.)

Note: Following Parts were returned to owner on 07 November 2017:

1. New white metal bearing and old one
 2. 2 nos. of new and 2 nos. of old Oil Ring
 3. Burnt PMG stator, rotor
 4. Reusable insulated sleeve ring
-



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ELECTRICAL TEST RESULTS

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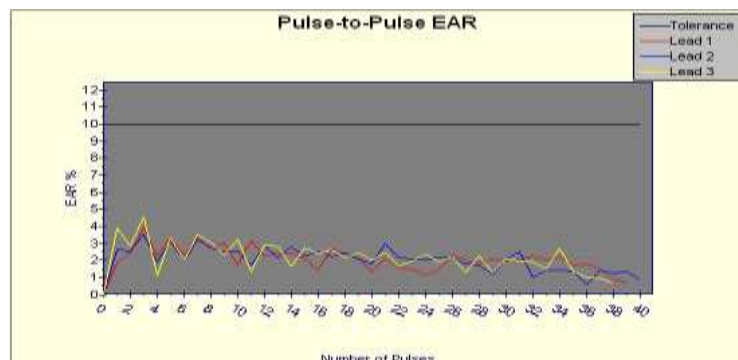
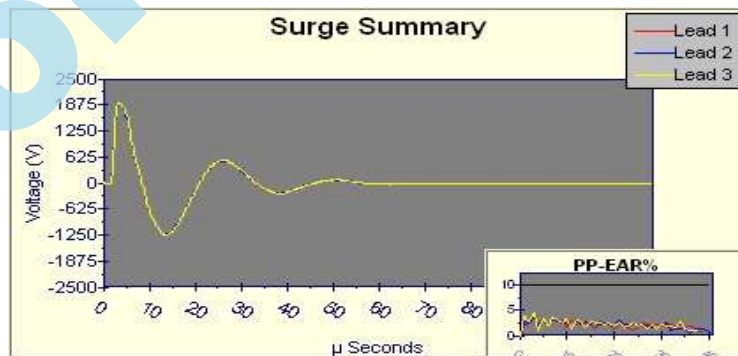
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A. Electrical Tests

1. Main Stator Winding Resistance, Megger, Polarization Index, Hi-Pot and Surge Test.

| Motor ID | Time | Temp | Resist | Megohm | DA/PI | DC | Surge |
|-----------------------------------|----------------------|--------|--------|--------|-------|------|-------|
| 680KW AC GEN (SN: 619074A1A-1) | 11/2/2017 1:35:23 PM | Tested | PASS | PASS | PASS | PASS | PASS |

| Results Summary | | Test Date/Time 11/2/2017 1:35:23 PM | |
|----------------------|-------------------------|-------------------------------------|-------------------|
| Test ID: | Default | Repair/Job # | PJ0084-17-002 |
| Tested By | EM509 | Tested For | Main Stator |
| Temp Status | Tested | PI Status | PASS |
| Temp | 50.0°C 122.0°F | Volts (V) | 1000 |
| Resist Status | PASS | DA Ratio | 1.4 |
| L1-L2 (Ohms) | 0.004459 Corr: 0.004067 | PI Ratio | 1.2 |
| L2-L3 (Ohms) | 0.004456 Corr: 0.004064 | HiPot | PASS |
| L3-L1 (Ohms) | 0.004453 Corr: 0.004062 | Volts (V) | 1960 |
| Max Delta R % | 0.140% | Current(μA) | 0.54 |
| Coil 1 (Ohms) | 0.002228 Corr: 0.002032 | Resist (Mohm) | 3665 At 40°C 7330 |
| Coil 2 (Ohms) | 0.002231 Corr: 0.002035 | Surge Status | PASS |
| Coil 3 (Ohms) | 0.002225 Corr: 0.002029 | Peak Volt(V) L1 | 1930 |
| Megohm Status | PASS | Peak Volt(V) L2 | 1930 |
| Volts (V) | 1020 | Peak Volt(V) L3 | 1930 |
| Current(μA) | 0.33 | Max P-P EAR% | 3.9%,3.5%,4.5%, |
| Resist (Mohm) | 3128 At 40°C 6256 | EAR 1-2,2-3,3-1 | 1%,1%,1% |





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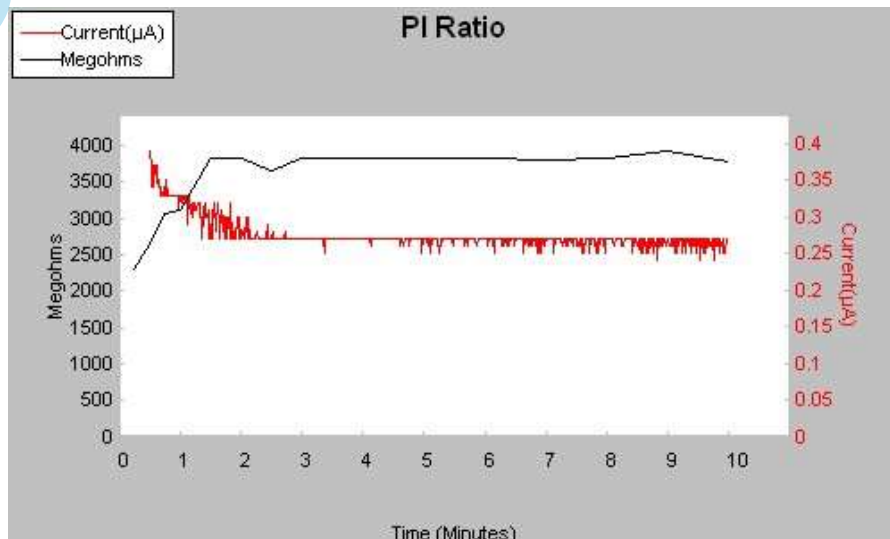
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Continuation.... Polarization Index Test of the Main Stator Winding

| DA/PI | | Motor ID 680KW AC GEN | |
|----------------|----------------------|-----------------------|------|
| Test Date/Time | 11/2/2017 1:35:23 PM | Voltage (V) | 1000 |
| DA Ratio | 1.4 | PI Ratio | 1.2 |
| PI Status | PASS | | |

| Time (Min) | Current(μA) | Megohms |
|------------|-------------|---------|
| 0:15 | 0.45 | 2302 |
| 0:30 | 0.39 | 2652 |
| 0:45 | 0.33 | 3069 |
| 1:00 | 0.33 | 3128 |
| 1:30 | 0.27 | 3843 |
| 2:00 | 0.27 | 3843 |
| 2:30 | 0.28 | 3669 |
| 3:00 | 0.27 | 3843 |
| 4:00 | 0.27 | 3820 |
| 5:00 | 0.27 | 3843 |
| 6:00 | 0.27 | 3843 |
| 7:00 | 0.27 | 3798 |
| 8:00 | 0.27 | 3843 |
| 9:00 | 0.26 | 3936 |
| 10:00 | 0.27 | 3775 |





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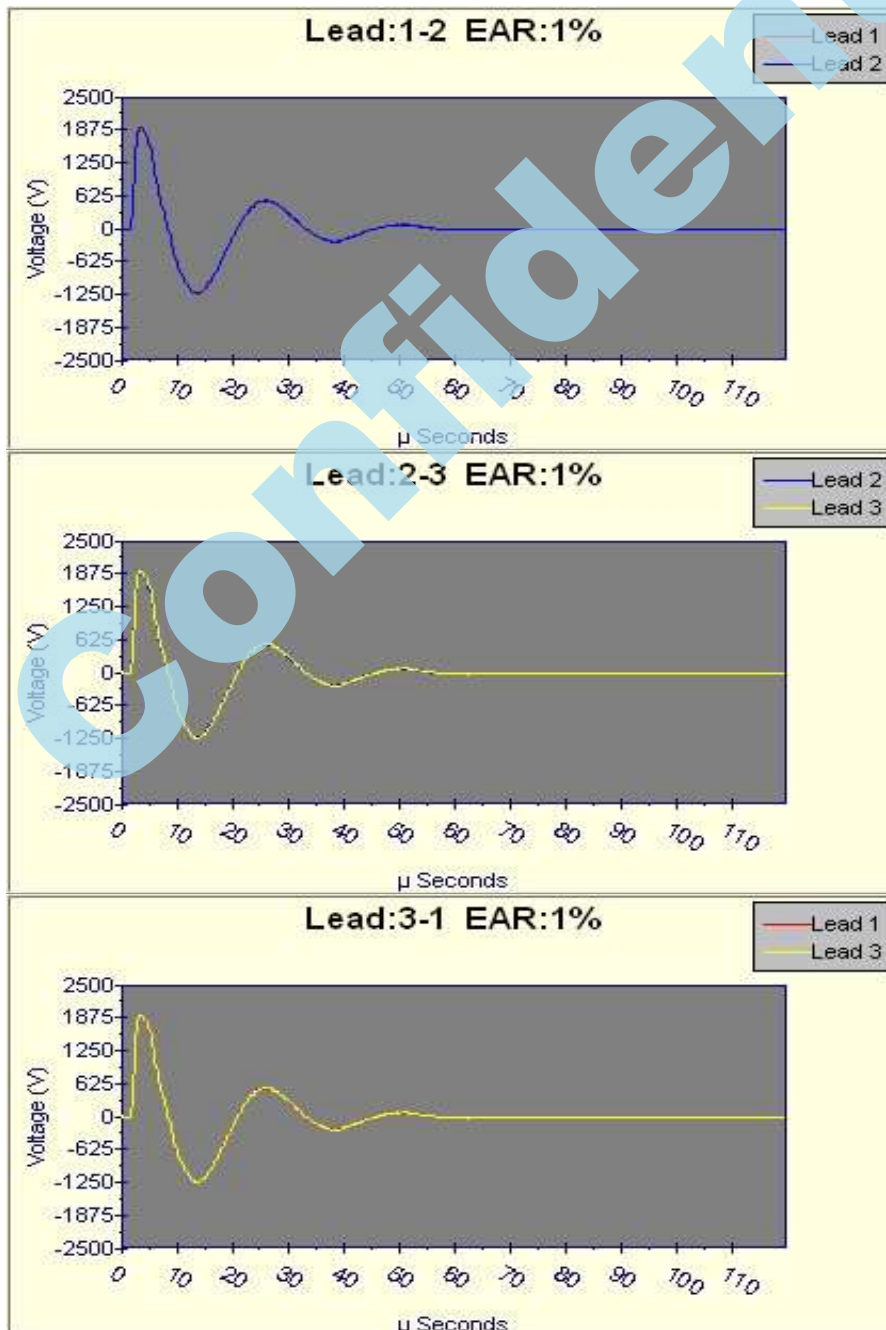
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Continuation.... Surge Test of the Main Stator Winding

| Surge: Waveforms | | Motor ID 680KW AC GEN | |
|------------------|----------------------|-----------------------|------|
| Test Date/Time | 11/2/2017 1:35:23 PM | Surge Status | PASS |

| Lead | Peak Voltage (V) | PP EAR Status | Max P-R EAR% |
|------|------------------|---------------|--------------|
| 1 | 1930 | PASS | 3.9% |
| 2 | 1930 | PASS | 3.5% |
| 3 | 1930 | PASS | 4.5% |





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2. Main Rotor, Exciter Stator and Rotor Winding Test Results After cleaned

| Coil # | Winding Resistance | Megger (60 sec) @ 500 VDC | Impedance Test | | Volt Drop Test (387VAC @ 2.80 A) |
|--------|--------------------|---------------------------|----------------|----------|----------------------------------|
| | | | Volt (AC) | Amp (AC) | |
| 1 | 1.49 Ω | >550 MΩ | 306 | 2.2 | 96.6 Vac |
| 2 | | | | | 96.1 Vac |
| 3 | | | | | 96.7 Vac |
| 4 | | | | | 96.2 Vac |
| 5 | | | | | 98.1 Vac |
| 6 | | | | | 98.0 Vac |
| 7 | | | | | 98.7 Vac |
| 8 | | | | | 97.2 Vac |

| Exc. Stator Winding Resistance (Ohms) | | | |
|--|---------|------------------|----------------|
| Exc. Stator Winding Resistance (Ohms) | | F1-F2 = 8.68 Ω | |
| Megger (60sec.) @ 500VDC | | >550MΩ | |
| Impedance Test (Parallel connection) | | | |
| Supply Voltage | 110 Vac | Measured Current | 0.99 Amps (AC) |
| | 220 Vac | | 1.99 Amps (AC) |

| Exc. Rotor Winding Resistance (Ohms) | | |
|---|-------------------|---|
| T1 – T2 = 100.1 mΩ | T2 – T3 = 99.9 mΩ | T3 – T1 = 99.8 mΩ |
| Megger (60sec.) @ 500VDC | | >550MΩ |
| Impedance Test (2 sec) | | |
| Supply Voltage = 23.7 Vac, 3Phase, 50Hz | | Measured Current L1 = 80.2 Amps L2 = 82.2 Amps L3 = 81.7 Amps |
| PMG Stator Winding Resistance (Ohms) | | |
| L1 – L2 = 0.335 Ω | L2 – L3 = 0.336 Ω | L3 – L1 = 0.337 Ω |
| Megger (60sec.) @ 500VDC | | >550MΩ |



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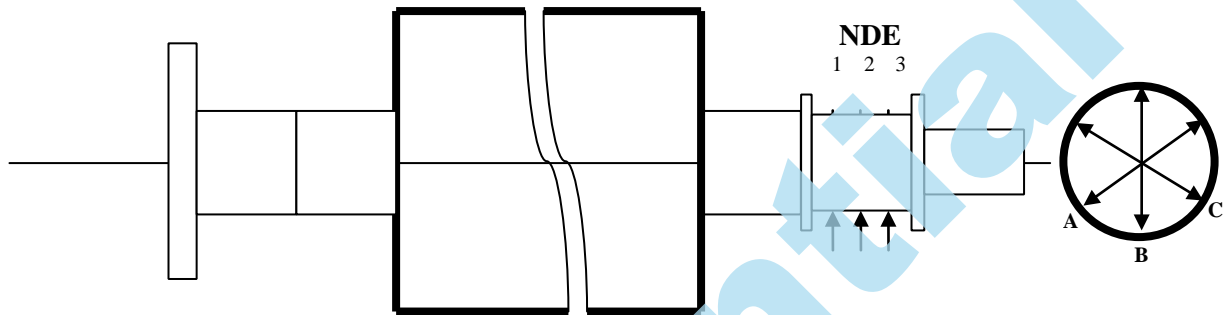
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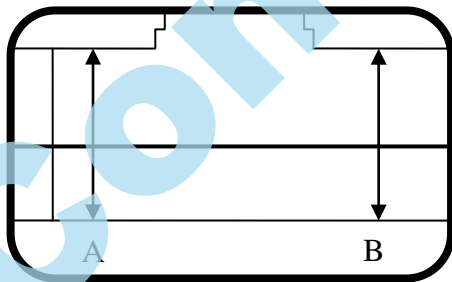
MECHANICAL MEASUREMENT RESULTS

**D. MECHANICAL
 MEASUREMENT
 RESULTS**

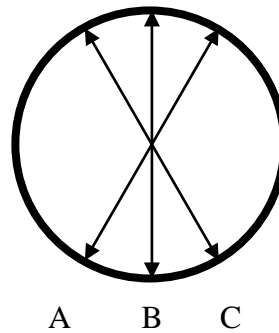


| Bearing Journal | | | | | |
|-------------------------------|------------|----------|----------|----------|------------------|
| | | A | B | C | Remarks |
| Non-Drive End Bearing Journal | Top/Bottom | 130.01mm | 130.02mm | 130.01mm | Within Tolerance |
| | | 130.02mm | 130.02mm | 130.01mm | |

Bearing Bore Diameter



Diameter Point of Measurement



| Bearing Bore Diameter | | | | | |
|---|------------|----------|----------|----------|---------|
| | | A | B | C | Remarks |
| Bore Dia. @ 1 (Outer side) Facing shaft end | Top/Bottom | 130.25mm | 130.23mm | 130.26mm | |
| Bore Dia @2 (Inner side) Facing Rotor winding | Top/Bottom | 130.26mm | 130.25mm | 130.25mm | |



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DYNAMIC BALANCING

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D. Dynamic Balancing Report

| DYNAMIC BALANCING REPORT | | | | | | |
|---|---------------------------------------|--------|---|---------|-----------------|---------|
| Client / Vessel | Mercantile Maritime Solutions Pte Ltd | | | | | |
| Job No. | PJ0084-17-002 | | | Date | 06 NOV 2017 | |
| Description | Main Rotor with complete assembly | | | | | |
|  | | | | | | |
| Rotor Weight | 1500 kg | | | | Operating Speed | 900 rpm |
| Rotor parameters | A | 200 mm | B | 1150 mm | C | 160 mm |
| R1: Left plane correction radius | 210 mm | | | | | |
| R2: Right plane correction radius | 500 mm | | | | | |
| Compensation method | Added | | | | | |
| Balancing Standard: ISO 1940-1986 (E) | | | | | | |

| BALANCING SPEED R.P.M. | LEFT PLANE INITIAL UNBALANCE | ANGLE | RIGHT PLANE INITIAL UNBALANCE | ANGLE |
|------------------------|------------------------------|-------|-------------------------------|-------|
| 600 | 128.0 g | 220° | 263 g | 224° |
| BALANCING SPEED R.P.M. | LEFT PLANE FINAL UNBALANCE | ANGLE | RIGHT PLANE FINAL UNBALANCE | ANGLE |
| 600 | 61.8 g | 219° | 38.7 g | 210° |

Remarks: Balancing OK



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MEASURING INSTRUMENTS USED



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F. Measuring Instruments Used

| Instrument | Make/ Model | Serial No. | Cal. Date/ Due Date | Measure |
|---------------------------|-----------------------|------------|--------------------------|--|
| Volt meter | Fluke 179 True RMS | 26150381 | 01Aug17/ 01Aug19 | Voltage |
| Insulation Tester | Fluke 1507 | 13290414 | 05Jan16/ 05Jan18 | Insulation Resistance |
| Clamp Meter | FLUCK 337 Multi AC/DC | 13350457 | 01Aug17/ 01Aug19 | Current |
| Baker Instrument | Baker D65R | 10172 | 01 Nov16/ 31 Oct17 | Resistance, Insulation Resistance, Hi-Pot and Surge Test |
| Infrared Thermometer | Line Seiki TC-6000 | 07000983 | 22 Apr 16/ 22 Apr18 | Temperature |
| Micrometer Caliper | Mitutoyo (75-100mm) | 57128148 | 06 Jan16/ 06 Jan18 | Bearing Journal clearance |
| Micrometer Caliper | Mitutoyo (175-200mm) | 96084886 | 25 Apr16 / 25 Apr18 | Bearing Housing clearance |
| Micrometer Caliper | Mitutoyo (225-250mm) | 96048509 | 25 Apr16 / 25 Apr18 | Bearing Housing clearance |
| Tubular Inside Micrometer | Mitutoyo/ (50-1000mm) | 0000363 | 10 Mar 17 / 10 Mar 19 | Bearing housing Inside Diameter |



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PHOTOGRAPHS

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Fig 4 & 5: Condition of main rotor after dismantling, was found dent mark as shown in photo.

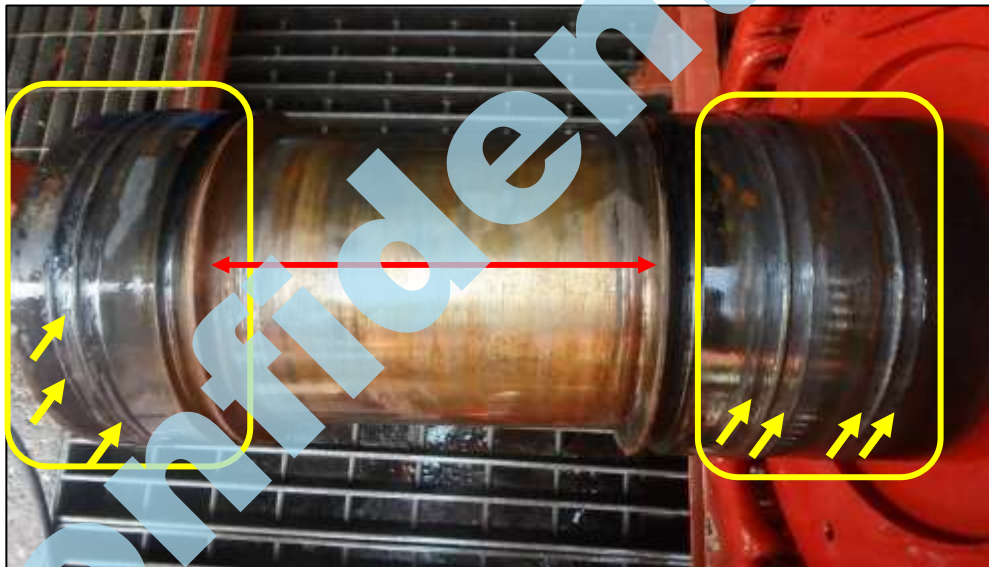


Fig 6 & 7: Condition of rotor shaft journal after dismantling, was found deep score marks.
(Shaft journal was repaired by CRC)



Fig. 8 & 9: Condition of exciter rotor was found with rubbing marks as received.

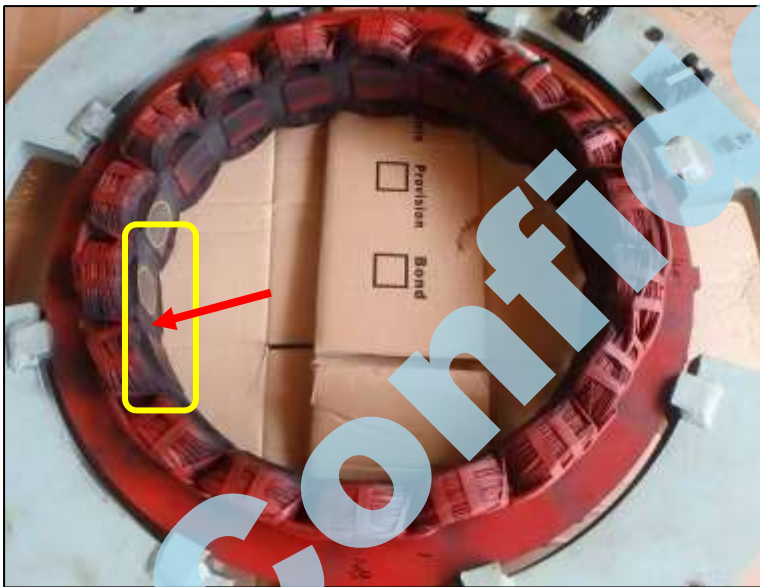


Fig 10 & 11: Exciter stator was found with some rubbing marks as received.

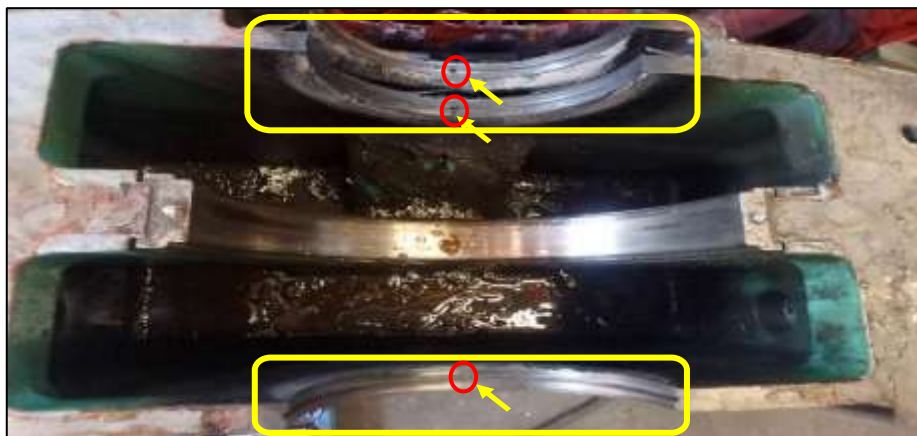


Fig. 12: Condition of lower part bearing housing as received.



Fig 13, 14 & 15 & 16: Lower part bearing housing was found badly melted collar with internal deep long crack lines.



Fig. 17 & 18: Condition of Main Stator after servicing.



Fig. 19: Condition of Main Rotor after servicing.



Fig. 20: Condition of Main Stator insulation test, hi-pot and surge testing in progress before reassemble.



Fig. 21 & 22: Condition of Lower part bearing housing after re-installed.



Fig. 23: Condition of impeller before installed and after servicing.



Fig. 24: Condition of Rectifier bridge diodes after renewed and installed as per original.



Fig. 25: Condition of rotor shaft journal after repaired by CRC.



Fig. 26 & 27: Condition of LH space heater and RH space heater after re-installed as per original.



Fig. 28 & 29: Outgoing power supply terminals, some control terminals, CT & resistor after re-installed as per original.



Fig. 30 & 31: NISHISHIBA Electric Alternator after servicing and ready to dispatch.