AM/NS INDIA

**TRANSFORMER OIL TESTING LABORATORY**
**ARCELORMITTAL NIPPON STEEL INDIA LIMITED**
**HAZIRA, SURAT**



# TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **REPORT NO. :** | **TOL-AMNSIL/NN/2406/0285** | **REPORT DATE:** | **06.06.2024** | **ULR No:** | **NA** |
| **DICIPLINE: ELECTRICAL TESTING** | | | | **GROUP: INSULATING MATERIALS & INSULATORS** | |

| | | |
|---|---|---|
| **Issued to (Customer/Plant & Dept)** | : | **MAIN RECEIVING SUB STATION-1 (MRSS-1)**<br>**ArcelorMittal Nippon Steel India Ltd., Hazira, Surat, Gujarat** |
| **Customer Ref No./Dated** | : | **Telephonic conversation dated 04.06.2024** |

| **SAMPLE DETAILS** | | |
|---|---|---|
| **Sample Description*** | : | **Transformer Oil** |
| **TOL Sample ID. No.** | : | **NA** |
| **Condition of oil** | : | **Good** |
| **Sample collected by*** | : | **Customer** |
| **Sample collection date*** | : | **04.06.2024** |
| **Sample receipt date** | : | **04.06.2024** |
| **Sample collection point*** | : | **BOTTOM - MAIN TANK** |
| **Oil temperature** | : | **---°C** |
| **Sample collection method*** | : | **---** |
| **Date(s) of Testing** | : | **04.06.2024 to 05.06.2024** |

| **TRANSFORMER DETAILS** | | |
|---|---|---|
| **Name*** | : | **100 MVA TR-3** |
| **Rating*** | : | **100 MVA** |
| **Voltage*** | : | **220/34.5kV** |
| **Sr. No.*** | : | **2015632** |
| **Make*** | : | **BHEL** |
| **Year of Manufacturing*** | : | **2004** |
| **Date of Commissioning*** | : | **2006** |

**ENVIRONMENT CONDITIONS:**
**Ambient conditions during sample collection*: Temp (ºC) : 32ºC; Relative Humidity (RH%) : 52%**
**Environment conditions during Testing: Temp (ºC) : 24.5C; Relative Humidity (RH%) : 45%; Frequency (Hz): 49.9Hz**

**Note:**
1) The test results relate only to the sample(s) tested in as received condition for applicable parameters
***2) Publication or reproduction of this test report other than in full, is not permitted without written consent of HOD - TOL-AMNSIL***
3) Any discrepancies in this Test report should be brought to our notice within 7 days from the date of issue of report.
4) The report cannot be used for any legal purposes without written consent of TOL-AMNSIL.
5) Only the tests asked by the customer have been carried out.
6) BDL : Below Detection Limit [< 1 µL/L (ppm) for Dissolved Gas Analysis]
7) '*' marked data is provided by customer/ department

**PREPARED BY:**
**Mrs. Baby Shakila**
**Testing Engineer**

**CHECKED AND APPROVED BY:**
**Mrs.Unnati Sharma**
**Technical Manager**

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## General Analysis of Transformer Oil

**Test Specifications:** **IS 1866 : 2017**

| Sr. No. | Clause No. | Test Procedure | Test Particulars | Unit | Recommonded Action Limit | | | Result | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Good | Fair | Poor | | |
| 1 | 5.2 | IS 335: 2018 | Appearance | ----- | Clear and without visible contamination | ---- | Dark and/or turbid | Clear and without visible contamination | Good |
| 2 | 5.3 | IS 6792: 2017 | Electrical Strength(BDV) | kV(rms) | >60 | 50 to 60 | <50 | 77 | Good |
| 3 | 5.4 | IS 13567: 2018 | Water Content | mg/kg (PPM) | <15 | 15 to 20 | >20 | 8 | Good |
| 4 | 5.5 | IS 1448 [P : 1/Sec 1] : 2002 | Total Acidity Number (Neutralization Value) | mg KOH / g of oil | <0.10 | 0.10 to 0.15 | >0.15 | 0.02 | Good |
| 5 | 5.6 | IS 6262: 1971 | Dielectric Dissipation Factor(Tan Delta), at | ……. | <0.1 | 0.1 to 0.2 | >0.2 | 0.0002 | Good |
| 6 | 5.6 | IS 6103: 1971 | Specific Resistance (Resistivity), at 90˚C | GΩ-m | >10 | 3 to 10 | <3 | 99 | Good |
| 7 | 5.8 | ANNEX C of IS 1866: 2017 IEC 61125(Cl.4.8.1) | Sediment & Sludge | % by mass | Non-detectable | | | Not detected | Good |
| 8 | 5.9 | IS 6104: 1971 | Interfacial Tension, at 27˚C | mN / m | >25 | 20 to 25 | <20 | 40 | Good |
| 9 | 5.11 | IS 1448 (Part 21): 2019 | Flash Point | ˚C | Max. decrease 10% | | | 170 | Good |
| 10 | 5.14 | IS 1448(P-16): 2014 | Density, at 29.5˚C | g/cm$^3$ | Max. 0.89 | | | 0.824 | Good |

**Notes**

**Test Conditions For Specific Resistance & Dielectric Dissipation Factor:**

1. Type of Cell used : IS:6262-1971(Fig.4), Average Voltage Gradient in the sample while under test : 250Vrms/mm
2. Applied test voltage for Specific resistance : 500 VDC; Applied test voltage for Dielectric Dissipation factor : 500 VAC
3. Frequency of Applied Voltage : 49.9Hz
4. Temperature and Humidity of room during test: 24.5°C and 45%RH

**Test Conditions For Electric Strength (BDV):**

1. Type of Electrodes Used : Spherical electrode ( IS:6792(FIG.1))
2. Gap between two electrodes: 2.5mm
3. Frequency of Test Voltage : 61.8Hz
4. Tempetature of Oil: 24.4˚C

**Test Conditions For Flash Point:**

1. Ambient Barometric Pressure: 756.50mmHg

| | |
|---|---|
| **Remark & Decision Rule if any** | **Sr. no. 1 to 10 are tested and the test results are within recommended limit as per IS 1866: 2017** |

**PREPARED BY:**
**Mrs. Baby Shakila**
**Testing Engineer**

**CHECKED AND APPROVED BY:**
**Mrs.Unnati Sharma**
**Technical Manager**

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## Dissolved Gas Analysis of Transformer Oil

**Test Method :** **IS 9434 : 2019**

| No. | Name of gas | Result - µL/L (ppm) |
|---|---|---|
| 1 | Hydrogen ($H_2$) | 1 |
| 2 | Methane ($CH_4$) | 2 |
| 3 | Ethane ($C_2H_6$) | 1 |
| 4 | Ethylene ($C_2H_4$) | 3 |
| 5 | Acetylene ($C_2H_2$) | BDL |
| 6 | Carbon Monoxide (CO) | 25 |
| 7 | Carbon Dioxide ($CO_2$) | 860 |
| 8 | Propane + Propylene ($C_3H_8$+$C_3H_6$) | 2 |
| 9 | Nitrogen ($N_2$) | 10368 |
| 10 | Oxygen ($O_2$) | 6679 |
| Total Dissolved Combustible gas (TDCG) | | 32 |

| | |
|---|---|
| **Remark & Decision Rule if any** | **The above results are within limits, DGA indicates normal operation of transformer.** |

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****** End of Test Report ******