POWER ELECTRONICAL
High Voltage Dielectric Diagnostics
D-24, MIDC-Ambad, Nasik-10, MH, India.
+91 253 6602387/88, 2383271
contact@powerelectronical.com
www.powerelectronical.com
TC-9953

TRANSFORMER OIL TESTING LABORATORY

TEST REPORT

TEST REPORT ISSUED TO : Reliance Industries Limited (JMD), Village - Meghpar / Padana, Taluka - Lalpur, Dist - Jamnagar - 361 280, Gujarat

REPORT # : TR23037008 DATE 30-Mar-2023

Customer Ref. No./Date : JS2/260032982 on dated 28.09.2021

Tag No. of Equipment	: ET-BBZ9G3-01	Unique Lab Report No.	: TC9953230000007008F
PE-Lab Sample ID #	: TO-23037008	Discipline	: Electrical Testing
Sampled by	: PE-lab, Nashik	Group	: Insulating Materials & Insulators
Sampling Method	: IS 6855:2017	Sample Receipt Date	: 25-Mar-2023
Breather	: With Air Cell	Sample Analysis Date	: 25-Mar-2023 TO 26-Mar-2023

Transformer Details

Type	: Generator Transformer	Ratio	: 231/14.5 kV	Sampling Point	: Bottom (Main Tank)
Make	: AREVA	Rating	: 161 MVA	Sampling Date	: 18 March 2023
Serial #	: TWBO-6674/B-30081	Oil Temp	: 50 °C	Tag No. of Substation	: GT-3
Mfg. Year	: 2007	Winding Temp	: 60 °C	Sampling Location	: SEZ-CPP
		Oil Type	: Service	Last filtration Date	: ---

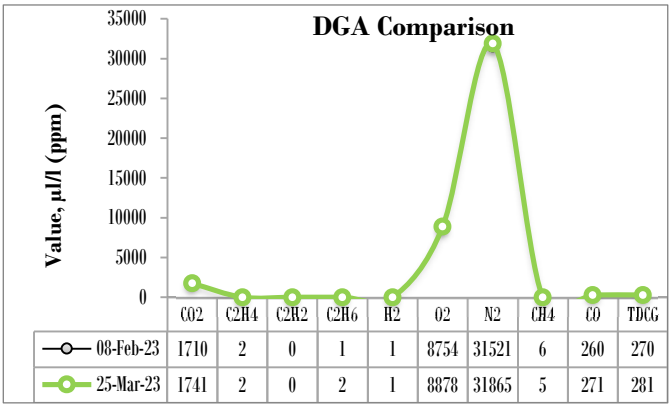
Ambient Condition(s) during sampling *Temperature : 28.1 °C* *Humidity : 40 % RH*

Remark

Transformer Insulating Oil Condition	PROBLEM SEVERITY	Transformer Internal Condition	PROBLEM SEVERITY
Oil in normal condition; continue normal sampling	Good	Low gas levels and no indication of gassing. Continue normal sampling	Normal

Key: Good / Fair / Poor

Key: Normal / Warning / Critical



	C02	C2H4	C2H2	C2H6	H2	O2	N2	CH4	CO	TDCG
08-Feb-23	1710	2	0	1	1	8754	31521	6	260	270
25-Mar-23	1741	2	0	2	1	8878	31865	5	271	281

Note

1. This report relates only to the particular sample received for testing in good condition at **PE-LAB - Permanent Lab**
2. This report can not be reproduced in part under any cirumstances.
3. Publication of this report requires prior permission in writing from **Director, PE-LAB**
4. Only the tests asked for by the customer have been carried out.
5. Decision Rule is based on customer requirement (As mentioned in Service Request Form)

PREPARED BY
(Quality Manager)
(Mr. C.V.Patil)

REVIEWED & AUTHORISED BY
(Technical Director)
(Mr. S.M.Tajne)

POWER ELECTRONICAL NASIK

POWER ELECTRONICAL
High Voltage Dielectric Diagnostics
D-24, MIDC-Ambad, Nasik-10, MH, India.
+91 253 6602387/88, 2383271
contact@powerelectronical.com
www.powerelectronical.com

TC-9953

TRANSFORMER OIL TESTING LABORATORY

Transformer Insulating Oil Condition — Reporting of Physical, Chemical & Electrical Parameters

REPORT # : TR23037008 DATE 30-Mar-2023

Unique Lab Report No. : **TC9953230000007008F**
Discipline : **Electrical Testing**
Group : **Insulating Materials & Insulators**

Sub Cl. No. (IS 1866:2017)	Property	Method of Analysis	Standard In Service (IS 1866:2017)	Obtained Value	Remarks
5.2	Appearance	IS 335:2018/IS 1866:2017	Clear and without visible contamination	Clear and without visible contamination	Good
5.3	Breakdown Voltage, kV a. Individual Breakdown Voltage, kV 70.1,72.1,68.5,69.3,72.1,71.6	IS 6792:2017 (IEC 60156:1995)	50 (Min)	71	Good
5.4	Water Content, mg/kg (ppm)	IS 13567:2018 (IEC 60814:1997)	20 (Max)	11	Good
5.5	Acidity (Neutralization Value), mgKOH/g	ASTM D 974:2021	0.15 (Max)	0.0196	Good
5.6	Dielectric Dissipation Factor at 90°C, Actual	IS 6262:1971	0.20 (Max)	0.000725	Good
	Resistivity at 90°C, GΩm	IS 6103:1971	3 (Min)	1656.500	Good
5.8	Sediment & Sludge, % by mass	Annex 'C' of IS 1866:2017/IEC 61125:2018 (Cl. 4.8.1)	Non Detectable	Not Detected	Good
5.9	Interfacial Tension at 27°C, mN/m	IS 6104:1971	20 (Min)	33	Good
5.11	Flash Point (PMCC), °C	IS 1448[P-21]:2019	125 (Min)	153	Good
5.13	• • Pour Point, °C	IS 1448[P-10/Sec 2]:2013	-10 (Max)	< -21	Good
5.14	• • Density at 20°C, g/ml	IS 1448[P-16]:2014	0.895 (Max)	0.819	Good
5.15	• • Kinematic Viscosity at 40°C, mm2/sec	IS 1448[P-25/Sec 1]:2018	15 (Max)	8.254	Good
5.17	** Corrosive Sulphur at 150°C for 72 Hrs*	IEC 62535:2008-10 (Ed. 1)	Non Corrosive	*NR*	

- IS 1866:2017 (IEC 60422:2013) - Mineral Insulating Oils in Electrical Equipment Supervision and Maintenance Guidance (Fourth Revision)
- The value of Water Content is given at transformer operating temperature
- The specified Limits mentioned for Pour point, Density at 20°C & Kinematic Viscosity at 40°C are as per IS 335:2018 (New Insulating Oil - Specification) - Table 2

* NR - The test(s) are not required by customer

Note

Test Conditions for Breakdown Voltage
- Type of electrodes used : Spherical
- Gap between two Electrodes : 2.5 mm
- Frequency of applied voltage : 49.9 Hz
- Oil Temperature during testing : 25.2 °C

Test Condition for Flash Point
- The ambient barometric pressure in the vicinity of the apparatus : 938 hPa

Test Conditions for Resistivity & Dielectric Dissipation Factor
- Type of cell used : SS Three Terminal Oil Cell (IS 6103:1971, IS 6262:1971-Fig. 2)
- Average voltage gradient in the sample while under test (rms) : 250 V/mm
- Frequency of applied voltage : 49.9 Hz
- Temperature of room during test : 25 °C
- Humidity of room during test : 44 % RH
- Method of Measurement - Section II of IS 6103:1971 & IS 6262:1971

PREPARED BY
(Quality Manager)
(Mr. C.V.Patil)

REVIEWED & AUTHORISED BY
(Technical Director)
(Mr. S.M.Tajne)

POWER ELECTRONICAL NASIK

POWER ELECTRONICAL
High Voltage Dielectric Diagnostics
D-24, MIDC-Ambad, Nasik-10, MH, India.
+91 253 6602387/88, 2383271
contact@powerelectronical.com
www.powerelectronical.com

TC-9953

TRANSFORMER OIL TESTING LABORATORY

Tansformer Internal Condition

Reporting of Dissolved Gas Analysis (DGA)

REPORT # : TR23037008

DATE 30-Mar-2023

Unique Lab Report No. : **TC9953230000007008F**
Discipline : **Electrical Testing**
Group : **Insulating Materials & Insulators**

Clause No. 27	**Method of Analysis : ASTM D 3612 (Method C - Headspace Sampling)**									
Dissolved Gases	Carbon Dioxide	Ethylene	Acetylene	Ethane	Hydrogen	Oxygen	Nitrogen	Methane	Carbon Monoxide	**Total Dissolved Combustible Gas (TDCG)**
	CO_2	C_2H_4	C_2H_2	C_2H_6	H_2	O_2	N_2	CH_4	CO	
Obtained Value, µl of gas/l of oil (ppm)	1741	2	NIL	2	1	8878	31865	5	271	**281**
										The total volume of gases in a given volume of oil (%) : 4.3 %
Limit IEEE Std. C57.104-2019, 10-30 Y, O2/N2 Ratio ≤ 0.2	10000	50	1	90	75	---	---	90	900	---

DIAGNOSIS OF DGA RESULTS

● IEEE C57.104 Rogers Ratio Method

Ratio	Value	Suggested Fault Diagnosis	Typical Examples
C_2H_2/C_2H_4	FALSE	Analyzed Gases do not exceeds Concentrations of dissolved gas. Rogers Ratio Method is not applicable	---
CH_4/H_2	FALSE		
C_2H_4/C_2H_6	FALSE		

● IEEE C57.104 DIAGNOSIS OF CELLULOSE PAPER INSULATION

Ratio	Value	
CO_2/CO	FALSE	Neither gas exceeds thier limit. CO2/CO ratio is not applicable

● IS 10593 DUVAL TRIANGLE METHOD

Gas	Value (%)	Fault	Typical Examples
CH_4	FALSE	Internal problem does not exists, Duval Triangle is not applicable	----
C_2H_4	FALSE		
C_2H_2	FALSE		

Note - The word FALSE is indicate in above mentioned diagnosis methods is consider as "Not Applicable"

PREPARED BY
(Quality Manager)
(Mr. C.V.Patil)

REVIEWED & AUTHORISED BY
(Technical Director)
(Mr. S.M.Tajne)

POWER ELECTRONICAL NASIK