

TECHNICAL SPECIFICATION FOR FRESH TRANSFORMER OIL

- 1.0 SCOPE:** This specification covers the manufacturing and testing of fresh transformer oil at manufacturer's works, supply of fresh insulating oil in MS drums and delivery at destination store center by road anywhere in PVVNL for use in transformers and switchgears.
- 2.0 QUALITY:** Fresh insulating oil is required for use in transformer and switchgears conforming to the requirement of IS: 335/2018 and any amendment thereof. The oil shall not contain any oxidation inhibitor or other additives. It should not contain polychlorinated biphenyls. It should be resistant to oxidation and deposit formation. The oil supplied should have high dielectric strength and flash point. The oil ready for dispatch at supplier premises should strictly conform to guaranteed technical characteristics of insulating oil mentioned in above IS and TS and the values of each characteristics should be given clearly in proforma of technical particulars enclosed herewith. Some of the values are reproduced as follows:

| | <u>Property</u> | <u>Test Method</u> | <u>Limiting value as per TS</u> |
|----------|--|--|---|
| A | <u>Function</u> | | |
| | 1 | Viscosity at 40 ⁰ C | IS 1448 (Part 25) 15mm ² /s, (Max) |
| | 2 | Viscosity at 0 ⁰ C | IS 1448 (Part 25) 1800mm ² /s, (Max) |
| | 3 | Pour Point | IS 1448 (Part 10/Sec 2) — 10 ⁰ C, (Max) |
| | 4 | Water Content (for drum supply) | IEC 60814 25 mg/kg, (Max) |
| | 5 | Breakdown Voltage(rms) | IS 6792 30 kV/ 70 kV ⁵⁾ , (Min) 5) After laboratory treatment (see 6.4 of IS) |
| | 6 | Density at 20 ⁰ C | IS 1448 (Part 16) 0.895 g/ml, (Max) |
| | 7 | DDF at 90 ⁰ C | IS 16086 0.005, (Max) |
| B | <u>Refining/stability</u> | | |
| | 8 | Appearance | - Clear, free from sediment and suspended matter |
| | 9 | Acidity | IEC 62021-1 0.01 mg KOH/g, (Max) |
| | 10 | Interfacial Tension at 27 ⁰ C | ASTMD971 0.04 N/m (Min) |
| | 11 | Corrosive Sulphur | DIN 51353 Not corrosive |
| | 12 | Potentially corrosive sulphur | IS 16310 Not corrosive |
| | 13 | DBDS | IS 16497 (Part 1) Not detectable (<5mg/kg) |
| | 14 | Inhibitors according to IS 13631/IEC 60666 | IS 13631 (U) Un uninhibited oil Not Detectable (<0.01%) |
| | 15 | Metal Passivator additives according to IS 13631/IEC 60666 | IS 13631 Not detectable (<5mg/kg) |
| | 16 | 2-Furfural and related compounds content | IS 15668 Not detectable (<0.05 mg/kg) for each individual compound |
| C | <u>Performance</u> | | |
| | 17 | Oxidation stability | IS 12422 (Method C) (U) Uninhibited oil : 164 h |
| | | (a) Total Acidity | 1.9.4 of IS 12422 0.4 mg KOH/g, (Max) |
| | | (b) Sludge | 1.9.1 of IS 12422 0.1%, (Max) |
| | | (c) DDF at 90 ⁰ C | 1.9.6 of IS 12422 0.200, (Max) |
| D | <u>Health, Safety and Environment (HSE)</u> | | |
| | 18 | Flash Point | IS 1448 (Part 21) 140 ⁰ C, (Min) |
| | 19 | PCA content | IP 346 3% (Max) |
| | 20 | PCB content | IS 16082 Not detectable (<2 mg/kg) |

3.0 DRUMS: The oil shall be supplied in strong, mild steel, epoxy coated air tight, moisture and dust proof sealed drums conforming to IS:1783/1983 and any amendment thereof. The capacity of each drum shall be about 209 liters. It shall be numbered and properly marked as property of PVVNL. The drum shall be coated from inside with suitable coating resistant to insulating oil. The outer surface of the drum may be coated with suitable primer and finishing paint for protection against atmospheric corrosion. The drum shall be effectively sealed immediately after filling the oil to avoid ingress of moisture. The drum supplied with oil shall be non-returnable.

4.0 TESTING: The oil shall be tested before dispatch in accordance with the IS: 335/2018 and any amendment thereof and the value should not be less than the specified in IS and technical specification.

The tenderers are required to submit descriptive literature on the insulating oil offered containing technical details and recommendations on maintenance etc.

The tenderer should fill in the **Schedule 'R'** of technical particulars failing which the tenders may not be considered.

Further sample from the first lot, duly marked by PVVNL representatives, will be tested at **CPRI/ERDA** in the presence of PVVNL representative.

5.0 INSPECTION AND DISPATCH- The insulating oil and drums shall be inspected at the work of manufacturer by the authorized representative of PVVNL before dispatch of insulating oil. All tests shall be carried out in the presence of above representative as per IS: 335/2018 and IS: 1783/1983 and any amendment thereof.

The oil shall be dispatched only after obtaining dispatch authorization form representative of Superintending Engineer (DQC) PVVNL & issue of DI by Superintending Engineer (MM-I) PVVNL, Victoria Park, Meerut. The manufacturer shall submit detailed test certificate of drums from their supplier which may show that the drums are conforming to IS: 1783/1983 and any amendment thereof.