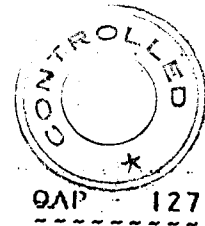


ANDREW YULE & CO. LTD.
T & S UNIT
MADRAS 600 096.




MATERIAL INSPECTION PLAN
TRANSFORMER OIL

Method of inspection:

1. Verification of manufacturer's test certificate for the following parameters.
 - a) Physical properties
Appearance
Density
Flash point
Kinematic viscosity
Pour point
 - b) Electrical properties
Dissipation factor
Electric strength
 - c) Chemical property
Water content
Neutralization value
Corrosive sulphur
Anti oxidant additives
Oxidation stability
Total acidity
Sludge % by mass
Gassing tendency
2. Check on the material at our works
 - 1). Break down voltage.

Prepared by : B. Muralitharan
Designation : A M QC
Date : 30/8/95

Approved by : 
Designation : D M - QC
Date : 30/8/95



SPECIFICATION FOR TRANSFORMER OIL

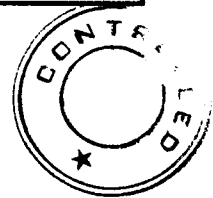
I. GENERAL REQUIREMENTS

1. Type : Mineral oil
2. Application : Used as insulating and cooling medium in transformers & switchgears

II. SPECIFICATIONS

1. Reference standard : IS 335/1993 ; BS 148
2. Material composition : Napthanic /Parafinic based low viscosity mineral oil
3. Material properties : The properties/characteristics of the transformer oil is as follows:

CHARACTERISTICS	UNIT	REQUIRED VALUE	TOLERANCE
Appearance		clear, transparent	
Density at 29.5°C	g/cc	0.89	MAX
Kinematic Viscosity at 27°C	cst	27	MAX
Interfacial tension at 27°C	N/m	0.04	MIN
Flash point, Penkys-Marten (closed)	°C	140	MIN
Pour point	°C	-30/-10 (Napthanic/Parafinic)	MAX
Neutralization value			
a) Total acidity	MgKOH/gm	0.03	MAX
b) Inorganic Acidity/alkalinity		NIL	
Corrosive sulphur		Non-corrosive	
Electric strength			
a) New unfiltered oil	KVrms	50	MIN
b) After filtration	KVrms	70	MIN



Revision	Description	Prepared	Approved	Date
0	THIRD ISSUE	<i>R. G. S.</i>	<i>(Signature)</i>	10.1.97

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CHARACTERISTICS	UNIT	REQUIRED VALUE	TOLERANCE
Dielectric dissipation factor (tan delta) at 90°C		0.0015	MAX
Specific resistance a) At 90°C b) At 27°C	Ohm.cm Ohm.cm	50x10 ¹² 2000x10 ¹²	MIN MIN
Oxidation Stability a) Neutralization value after oxidation for 164 Hrs at 100°C b) Total sludge 164 Hrs at 100°C	MgKOH/gm %	0.40 0.10	MAX MAX
Ageing characteristics after accelerated ageing for 96 Hrs at 115°C (open breaker method with copper catalyst) a. Specific resistance at 27°C b. Specific resistance at 90°C c. Dielectric dissipation factor (tan delta) at 90°C d. Total acidity Total Sludge value	Ohm.cm Ohm.cm MgKOH/gm %	2.5x10 ¹² 0.2x10 ¹² 0.2 0.05 0.05	MIN MIN MAX MAX MAX
Anti oxidant Additives		Shall not contain antioxidant additives	
Water content	Ppm	35	MAX
S.K. Value	%	4 to 8	

III. TESTS

Routine tests shall be conducted for the characteristics mentioned in Clause II.3

IV. EXTENT OF CHECK

Sampling as per IS 6855.



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V. PACKING

Transformer oil shall be supplied in road tankers or in non-returnable steel drums of 210 lts capacity clearly marked. It shall accompany with a typed certificate giving the following information:

- i. Manufacturer's name
- ii. Quantity in litres
- iii. Name of the material
- iv. Batch no and date

VI. DOCUMENTS

Test certificate should accompany each consignment

VII. ACCEPTANCE CRITERIA

As per SPT 116 (For Internal use only).



Revision	Description	Prepared	Approved	Date
0	THIRD ISSUE	<i>K. J. S.</i>	<i>(S)</i>	10.1.97

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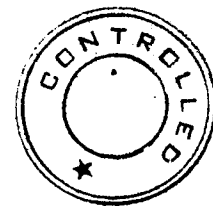
SPEC. No. SPT 116

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SPT 116

II. ACCEPTANCE CRITERIA FOR TRANSFORMER OIL FOR SPEC.NO.SMI 101

SL.NO	CHARACTERISTICS	UNIT	REQUIRED VALUE	TOLERANCE
01	Flash point pensky marten (closed)	°C	140	MIN
02	Pour point	°C	-30/-10 (NAPHTHENIC/PARAFINIC)	MAX
03	Electric strength a) New unfiltered oil	KVrms	50	MIN
04	Dielectric dissipation factor	-	0.0015	MAX
05	Water content	ppm	35	MAX
06	Specific resistivity at 90 °C	ohm.cm	50x10 ¹²	MIN
07	Oxidation stability			
	e) Neutralisation value after oxidation for 164 Hrs. at 100°C	mg KOH/gm	0.40	MAX
	f) Total sludge 164 Hrs at 100°C	%	0.10	MAX



0	FIRST ISSUE	<i>K. Yule</i>	(82)	10.1.97
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