

## Technical Committee Recommendations for S & L - Distribution Transformer

1. Range of products – Identified oil immersed, naturally cooled, out door type distribution transformers with 25kVA, 63kVA, 100kVA, 160kVA & 200 kVA ratings in the initial phase as these ratings forms approx. 84-90% of SEB purchases of the distribution transformers and SEB purchases approx. 80% out of total distribution transformers.
2. Limits of temperature rise: Reduce the temperature rise limits of top oil and transformer winding from the existing {IS 1180 (part 1)} level of 45<sup>0C</sup> & 55<sup>0C</sup> to 35<sup>0C</sup> & 40<sup>0C</sup>. This will help to reduce the current failure rate.
3. Test procedure: The testing code and procedure for distribution transformer would be as per IS 1180 (part 1), 1989.
4. Limits of temperature rise: Reduce the temperature rise limits of top oil and transformer winding from the existing {IS 1180 (part 1)} level of 45<sup>0C</sup> & 55<sup>0C</sup> to 35<sup>0C</sup> & 40<sup>0C</sup>. This will help to reduce the current failure rate.
5. Efficiency values: The existing efficiency or the loss standards are as per IS 1180 formulated in 1989 and the same are followed by REC and SEBs during purchases. This standard defines load losses and no load losses separately. Committee has defined the total losses at 50% and 100% load. The economic efficiencies for amorphous core material occur at around 15% to 20% and the same for CRGO material occurs between 25% to 46% with various grades of CRGO core materials and copper and aluminum winding material. It is seen the cost of transformer increases disproportionately when one tries to design a transformer beyond the economic value. The transformer loading is dynamic. The Utility should plan for future growth and hence efficiency should be high at all operating loads. That is why the efficiency at 100% is also specified. The basis of watt loss specification at 100% is arrived for one star from the current IS levels and on the basis of conventional DT design using M – 3, M - 4 CRGO material and copper and aluminum as the winding material. The basis for star rating plan is as follows:

Case	Basis of losses (Total at 50% Load Condition)
Base case Star 1	Current purchasing practice (IS 1180 Max Losses)
Star 2	Some utility purchase specs like AP, NDPL
Star 3	Losses from TOC design (Moderate)
Star 4	Losses from lowest TOC design
Star 5	High efficiency design

On the above basis, and after looking at the international practice, the committee has formulated the rating plan and the same is reproduced below:

Phases	kVA	Star Rating	Max Losses at 50% (Watts)	Max Losses at 100% (watts)	Phases	kVA	Star Rating	Max Losses at 50% (Watts)	Max Losses at 100% (watts)
1	10	1	100	265	3	16	1	200	555
		2	90	240			2	165	485
		3	80	210			3	150	455
		4	70	180			4	135	425
		5	60	155			5	120	395
1	15	1	130	335	3	25	1	290	785
		2	115	305			2	235	675
		3	100	275			3	210	625
		4	85	245			4	185	575
		5	70	215			5	160	525
1	25	1	200	430	3	63	1	490	1415
		2	180	400			2	430	1295
		3	160	365			3	380	1195
		4	140	330			4	330	1095
		5	120	300			5	280	995
					3	100	1	700	2020
							2	610	1840
							3	520	1660
							4	440	1500
							5	360	1340
					3	160	1	1000	2800
							2	880	2560
							3	770	2340
							4	670	2140
							5	570	1940
					3	200	1	1130	3300
							2	1010	3060
							3	890	2820
							4	780	2600
							5	670	2380

6. The highest loss segment is defined as star 1 and lowest loss segment is defined as star 5. The existing IS 1180 specification losses is the base case with star 1.
7. Approved laboratories: The approved NABL accredited test facilities for BEE S & L testing are
  - a. Central Power Research Institute, Bangalore & Nagpur.
  - b. Electrical Research & Development Association (ERDA), Vadodhra
Utilities and distribution companies have been recommended to upgrade the existing facilities and get NABL accreditation. Utilities are also recommended to have their NABL accredited mobile test units.

8. Contents of the label – The contents of the label with dimensions and technical details have been frozen.
9. No positive tolerance shall be allowed on the displayed label values.
10. Certification Testing: Parameters for initial testing approved by the committee are the type test parameters set out in the relevant IS standards.
11. Challenge Testing Protocol: Protocol for initial, challenge and check testing of motors under S&L Programme have been discussed in the appropriate committees.
12. Utility Purchases - Utility to improve MEPS from star 1(IS) to Min star 3. Adopt TOC formula to evaluate the vendor bids within the bandwidth of star 3 label.
13. Committee also has worked on economic analysis and national energy savings potential for these recommendations.

**PENDING TASK:**

1. The technical committee recommendations were presented to Ministry of Power on 16.09.2003. The Ministry of Power had directed the committee to make presentations to the utilities and get their comments. Accordingly the technical committee visited 9 utilities and their comments have been incorporated in the final report. BEE had also sent the technical committee report to 30 utilities and Electricity Regulatory Commissions to obtain their views in October 2004 and further reminded them in January 2005. The observations and the comments of the utilities have been incorporated in the final recommendations.
2. At a meeting organised under APRDP, BEE was requested to expand the star rating plan to single phase transformers and also to include the rating plan upto 630 kVA. The work on single phase and the rating plan for three phase from 200 kVA to 630 kVA is expected to be finalised in June 2005.
3. Although the laboratories approved by NABL have been identified, after the label regulation is notified, recognition of laboratories would be done as per the regulation.
4. All other activities are complete in respect of labelling programme for distribution transformers.