



International Copper
Association India
Copper Alliance

Distribution Transformers (DTs)

The growth focus of Indian Economy is driving investments in power infrastructure. The envisaged thermal power generation capacity addition of 101 GW during 13th 5-year plan and ambitious plan of adding renewable energy will open huge growth opportunities for transformers.

The main issues faced by the users (mainly the public distribution companies) of distribution transformer are premature failures and high losses. The distribution losses range from almost 5-6% to as high as 35%. The failure rates of DTs also range from 1-2% to as high as 18-20%.

Strategic focus areas of ICA India's Distribution Transformer (DT) program

Reliability and less failures

The reliability issue is addressed through

- Promotion of quality improvement measures in manufacturing and repair practices of DTs for OEMs
- Guidance for good operating and maintenance practices for utilities.
- Investigating reasons of high DT failure in field and metal behaviour in winding
- Developing suitable business models for comprehensive asset management practices by the utilities through repairs / refurbishment of old legacy DTs

DISCOMs are concerned for comparatively higher failure rate (14% and above) of DTs w.r.t international benchmarks or even the standards (less than 0.5%) maintained by private utilities. One of the key KPI is reduction of aggregate technical and commercial (AT&C) losses (current national average of 17% as declared) by DISCOMs. Electricity network losses in transmission and distribution (T&D losses) are alarming with the utilities, especially public ones, and vary from 4-5% as high as 30% and more. Since, the DT is the most important element in the distribution network for transporting energy from Supply Company to the end consumers its continuous efficient operation is essential. There is significant scope for improvement, a major potential for reducing inherent losses in DTs, to both improve reliability and efficiency. The reliability and fail-safe operation, apart from low losses, is a prerequisite for the distribution company's revenue earning capacity and financial health.

Copper due to its better thermal and electrical properties aids in delivering a reliable product and gives design benefits in efficiency enhancements and loss reduction. These properties also boost the reliability of transformers complimented by other physical properties like corrosion resistance, etc.

Energy efficiency and low losses

The energy efficiency is addressed through

- Harmonisation of improved Standards and introduction of Minimum Efficiency Performance Standards (MEPS)
- Promotion of low-life-Cycle cost concept with the utilities against the present practice of choice based on lowest initial cost
- Copper is the logical choice to keep the size of completed units small enough to handle and transport it.
- The smaller size of copper transformer saves not only active material like conductors and core steel but also structural elements including the tank oil, cooling equipment and other accessories resulting in lower total material cost.
- Other physical properties of copper makes it a preferred choice due to ease of operation during manufacturing.
- Copper is stronger than aluminium and therefore, withstands stress imposed by fault currents better than aluminium.
- Because the coil is stronger and less likely to deform, owing to comparatively better creep behaviour of Copper, transformer life is extended and life cycle maintenance costs are reduced.
- Copper's better connectivity means that connections inside the unit stay tight, avoiding hot spot due to loose connection, reducing maintenance by avoiding premature failure.

The initial cost difference between copper and aluminium transformers is not significant, and lower maintenance and higher reliability make copper the lower-cost material over the life (generally 20-25 years of operation) of the transformer.