

Hybrid Insulation System with Nomex® in 300 MVA Power Transformer

Application Profile

Hitachi Energy (formerly ABB), a worldwide leader in the manufacture of high-voltage power transformers, supplied a 300 MVA, 230 kV three-phase fluid-filled transformer to Escelsa, one of Brazil's major electrical energy providers. Escelsa built a 230 kV transmission line to connect two regions, Rio de Janeiro and Minas Gerais, into Brazil's national interconnect system.

The transformer used a hybrid insulation system based on NOMEX® thermal technology combined with conventional cellulose paper insulation. Weighing 330 tonnes, it is the biggest power transformer ever made with this system.



Before finalising their choice of transformer, Escelsa's Project Management unit evaluated 16 different configurations, including both single-phase and tree-phase transformer banks and various insulation options. Total configuration owning cost, reliability of the equipment, solutions to the problem of different secondary voltages in the regions to be connected and shortest possible reconnection time, were the main factors taken into consideration.

Escelsa's evaluation found that the three-phase unit with NOMEX® hybrid insulation was the most

reliable option and, at the same time, offered the lowest total cost of ownership (capital outlay plus routine maintenance plus operating cost).

The transformer also provided maximum flexibility with the shortest secondary-connection changeover time: two hours compared to 1.5 days with the nearest competing option. Last but not least, the NOMEX® hybrid insulation gave a bonus 28% of additional capacity without any loss of operating life-time. This means extra overload capacity is available now, and the system will allow future expansion with minimal investment.

The 300 MVA Hitachi Energy transformer is installed at the Mascarenhas hydraulic generation plant in Espírito Santo state in south-east Brazil. Escelsa's concession area covers 46000 km2 and has a population of three million. Escelsa, part of the Portuguese EDP Group, supplies 1,456 GW of electric energy to almost one million residential, commercial, industrial and



Technical description:

Property	Typical Value
Rated Power (Emergency)	300 / 380 MVA
Rated voltages (BIL)	230/138 & 138/13,8 kV
HV (BIL)	1050 kV
Max. oil temperature rise	65 K
Average winding temperature rise	65 (95) K
Total weight	330 tonnes

Application:

300/380 MVA (65/95K) power transformer connecting two regions in the Brazilian national interconnect system (extra emergency overload capacity)

Requirements:

- Reliability, minimised risk of downtime
- Maximum flexibility, to enable different secondary connections in two regional systems

Configuration:

Three-phase power transformer with hybrid insulation (NOMEX® thermal technology and cellulose paper) combined with mineral oil, according to IEC 60076-14.

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