

TGV transformers with NOMEX® log over nine million km without failure in electrical insulating materials

When the French Railways' TGV high-speed trainsets entered service in 1981, the 6,4 kVA output transformers in the power cars operated on the SNCF's 25 kV 50 Hz electric system. The transformers were insulated with cellulose paper and cooled with mineral oil.

In 1984 an extension of the TGV line to Lausanne in Switzerland was opened. The power cars then had to be capable of operating on the Swiss Railways' 15 kV 16-2/3 Hz electric system. At this frequency, the core of a transformer designed to operate at 50 Hz will saturate, leading to a catastrophic transformer failure. To resolve this problem, the transformers needed a larger core. However, this left less space for the copper wind-

ings if the same overall transformer size was to be maintained – an absolute requirement, due to the severely limited space in a power car.

The resulting higher current density in the copper wires caused higher winding temperature rises, more than the 55 K temperature rise cellulose papers can withstand. For the solid insulation, the firm's engineers therefore turned to NOMEX® thermal technology. For the cooling medium they used silicone oil in a sealed environment, to avoid premature aging of the fluid.

Mr Patrice Boucharie, manager of the transformers section in the SNCF's electrotechnica division, comments: "Jeumont Schneider made about 16 of these transformers. They are insulated to Class H (180 °C) using DuPont™ NOMEX® thermal technology and, what's more, they also work at Class H temperatures, which is unusual, because few transformers allow a hot spot of 180 °C."

Boucharie adds: "These transformers are energised 24 hours a day, although they are in actual use only about 16 hours a

day. Nearly 20 years have passed since the TGV extension to Lausanne was inaugurated. TGV trainsets typically cover roughly 40'000 km a month, or, in other words, each trainset runs close on ten million km in 20 years. During this period we have not recorded a single instance of insulation failure or premature aging of the NOMEX® paper."

Application:

Power transformers in TGV power cars

Requirements:

Transformers originally designed for SNCF 25'000 V 50 Hz system redesigned to use SBB/CFF 15'000 V 16-2/3 Hz system

Configuration:

Silicone-oil-cooled, copper windings insulated with NOMEX® thermal technology

Track record:

The TGV trainsets with these transformers have covered nearly 10 million km each in their first 20 years of operation without insulation failure.



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Product safety information is available upon request.

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