

SECTOR PROFILE



PROJECT: Rolling stock transformers | EU & USA

ESTER TYPE: MIDEL 7131 synthetic ester

PURPOSE: Higher power output with fire safety

[OVERVIEW]

The electrification of railways started in the early 20th century. DC supplied at relatively low voltages of 600V to 3kV was initially used as it allowed direct feed of power to the traction motors and speed control of the trains with relatively simple resistor technology. However, there are two serious drawbacks to using DC. Firstly, supply current needs to be very high (several thousand amperes) and as a consequence the cables used for the overhead catenary need a large cross-section to keep losses down. This means the cables are very heavy and expensive. The second drawback to DC power is the need for regular feeding substations to maintain power levels. In the case of 750V third rail systems, these were needed approximately every 2.5km.

The answer to these DC drawbacks was to switch to AC transmission and increase the voltage via transformers so that the current could be lowered; leading to overhead lines becoming lighter and much less expensive. The feeder substations could also be spaced much further apart, in 25kV system the distance between them could be as much as 50km.



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[SITUATION]

To enable the use of higher transmission voltages there had to be a change in technology onboard the rolling stock, and this led to the introduction of traction transformers. These onboard units step down the voltage from the overhead of up to 25kV to a more usable 1-2kV.

As time has gone on there has been greater demand on traction transformers and they have had to adapt to enable higher power output with lower weight. In addition, fire safety is a major concern for transformers onboard rolling stock, especially for passenger trains, which means using flammable mineral oil is not an attractive proposition. This is why alternative fluids that are more fire safe have started to be adopted. In addition, the technical specification CEN/TS 45545 has been introduced in Europe, requiring the use of less flammable fluids, such as MIDEL 7131.

[RESULT]

Since the early 1980s, MIDEL 7131 has been used in rolling stock transformer projects around the world. For example New Jersey Transit in the USA has been successfully running MIDEL filled, breathing transformers for nearly 20 years, without any fluid changes.

The ability of MIDEL 7131 to perform at high temperatures means that the size and weight of rolling stock transformers has reduced dramatically, enabling them to be roof mounted, such as on the Alstom X60 trains. MIDEL filled transformers can also be designed to be mounted under carriages, in trains such as the Siemens Mobility Velaro. In this case, fire safety is critical since the transformer is directly under the populated carriage.

In addition, larger transformers, like those on the Deutsche Bahn BR185 freight locos, have used MIDEL 7131 for many years. Based on the Bombardier TRAXX platform there are currently 400 of these locos in service, hauling cargo across central Europe.

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The use of MIDEL ester fluids in this project supports the following UN Sustainable Development Goals:

