



MIDEL CASE STUDY

CESC chooses MIDEL transformer fluid for important retrofill projects to enhance fire safety and environmental protection in densely populated areas



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AS AN ALTERNATIVE TO FIRE PRONE MINERAL OIL TRANSFORMERS AND COSTLY DRY TYPE TRANSFORMERS, CESC IS CONSIDERING FIRE SAFE AND ENVIRONMENT-FRIENDLY ESTER OIL FILLED TRANSFORMERS AS A POSSIBLE SOLUTION

SITUATION

CESC Limited is a power utility providing electricity within 567 sq. km of the Kolkata area. More than a century old, it is the oldest power company in India, dealing with the entire span of electricity business including Generation, Transmission and Distribution. It serves approximately 3 million consumers including domestic, industrial and commercial users.

CESC operates on a wide range of assets in power generation and distribution. There are more than 8,000 distribution transformers in the system, the majority of which are rated between 315 and 500 KVA. CESC has been installing Dry Type transformers in densely populated areas since 1990. Today, around 25% of those assets are Dry Type Transformers. As an alternative to fire prone mineral oil transformers and costly dry type transformers, CESC is considering fire safe and environment-friendly ester oil filled transformers as a possible solution.

TRANSFORMER RETROFILL 1:

Location - Plastic factory in densely populated area (recently installed)

Retrofilling: On-site

Rating of Transformer - 400kva/11/6kV

Application - Fire safety, environmental protection and high temperature operation

TRANSFORMER RETROFILL SITUATION 2:

Location - Manufacturing workshop, close proximity to a school

Retrofilling: On-site

Rating of Transformer - 400kva/11/6kV

Application - Fire safety, environmental protection and high temperature operation

Aware of its responsibilities to the community and the environment in which it operates, particularly in terms of customer safety and environmental protection, CESC wanted to explore available options for improving the performance of these transformers. M&I Materials was able to advise CESC regarding the option of retrofilling the transformers with an alternative fluid, rather than the traditional mineral oil.

THE SOLUTION - RETROFILLING

The electrical power transmission and distribution industry is now seeing a rapidly growing interest in less flammable, environmentally friendly dielectric fluids as viable alternatives to mineral oil. Manufactured by M&I Materials, MIDEL 7131 (synthetic organic ester) has been specifically formulated to provide a safe, superior alternative to mineral oil. MIDEL 7131 has a proven track record and is used in thousands of new and retrofilled transformers.

Why CESC chose retrofilling with MIDEL 7131:

FIRE SAFETY

MIDEL 7131 has a much higher fire point (316°C) than mineral oil (170°C). Replacing mineral oil greatly enhances fire safety – a critical consideration in populated or sensitive areas. The cost of retrofilling for fire safety reasons is often less than the cost of installing or upgrading fire safety systems for insurance purposes.

ENVIRONMENTAL PROTECTION

Synthetic organic ester is officially classified as readily and fully biodegradable and is considered to be much more environmentally friendly than mineral oil. Replacing mineral oil with MIDEL 7131 will greatly reduce the environmental impact in the event of spillage.

MOISTURE TOLERANCE

Ester fluids are much more tolerant of moisture ingress than mineral oil. In areas prone to wet conditions, retrofilling transformers with ester fluids will lead to increased reliability.



PROLONGING SOLID INSULATION LONGEVITY

Many technical papers have been published explaining that cellulose insulation lasts longer in ester fluids than in mineral oil. In part this effect may be explained by the ability of ester fluids to retain moisture. Replacing mineral oil with an ester fluid will shift the position of equilibrium of moisture between paper and fluid, such that the fluid will draw more moisture into itself. This should not cause problems with electrical safety as these fluids are more moisture tolerant. Thus, asset managers may be able to delay the purchase of a new transformer, meaning cost savings and improved budgetary control.

WHAT'S NEXT FOR CESC?

After rigorous testing by CESC, the two transformers are now in full operation and contributing to the reliable service that CESC is committed to providing to its customers in Kolkata. CESC has also purchased more than 6,000 litres of MIDEL 7131 and is scheduling more distribution transformers for retrofilling.

CONCLUSION

Mr. Nitin Satija of M&I Materials commented "We worked very closely with CESC officials to demonstrate how MIDEL 7131 could provide enhanced levels of fire safety and environmental protection for transformers. In addition, the proposal made financial sense, as the transformers will now have a longer operational life and will perform at a higher level than before."



HIGHLIGHTS

MIDEL 7131

- High fire point
- Readily biodegradable - environmentally friendly
- Very oxidation stable
- Improves transformer performance and operational life
- Long track record
- Excellent technical support

Also available from M&I Materials

- Retrofilling Guide (updated 2016)
- Video: "Retrofilling a Transformer" (2016)

CESC HAS ALSO PURCHASED MORE THAN 6,000 LITRES OF MIDEL 7131 AND IS SCHEDULING MORE DISTRIBUTION TRANSFORMERS FOR RETROFILLING

MIDEL Selection Guide

The data presented in this table are typical values. The product specifications are listed in the product brochures

Property	ISO/IEC	Typical Values			
		MIDEL eN 1215	MIDEL eN 1204	MIDEL 7131	Mineral Oil
Physical					
Colour		0.5	0.5		0.5
Flash Point PMCC (°C)	ISO 2719	>260	>260	260	150
Flash Point COC (°C)	ISO 2592	>315	>315	275	160
Fire Point (°C)	ISO 2592	>350	>350	316	170
Net Calorific Value (MJ/kg)		37.2	37.5	30.8	46.0
IEC Classification	IEC 61039	K2	K2	K3	O1
Pour Point (°C)	ISO 3016	-18	-31	-56	-50
Density at 20°C (g/cm³)	ISO 3675	0.92	0.92	0.97	0.88
Viscosity (mm²/sec)	ISO 3104				
@100°C		7.6	9.3	5.3	2.6
@40°C		32	37	29	8.7
@0°C		206	232	233	70
@-20°C		Solid	1485	1440	400
Biodegradation	OECD 301	readily biodegradeable	readily biodegradeable	readily biodegradeable	non biodegradeable
Electrical					
Dielectric Breakdown (kV)		≥30	≥30	47	43
Dielectric Breakdown (kV)					
1mm gap		30	45	46	47
2mm gap		51	57	71	65
2.5mm gap	IEC60156	>75	>75	>75	>70
Gassing Tendency (µl/min)		-31.9	-46.1	+26.0	<+30.0
Dissipation Factor at 90°C	IEC60247	<0.03	<0.03	<0.008	<0.001
Chemical					
Corrosive Sulphur	IEC 62535	non-corrosive	non-corrosive	non-corrosive	non-corrosive
Water Content (mg/kg)	IEC 60814	50	50	50	10
Acid Number (mg KOH/g)	IEC 62021.3	≤0.04	<0.04	<0.03	<0.01
PCB Content (mg/kg)		not detectable	not detectable	not detectable	not detectable

The displayed typical values are average values – not to be identified as acceptance values.

MIDEL ACROSS THE GLOBE

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UL Classified as to fire hazard only. Classed 4 to 5 less hazardous than paraffin oil in respect to fire hazard. © M&I Materials 2016.