

INSULutions® DPE Paper is Top of the Class

ENHANCED THERMAL CLASS INSULATION FOR INCREASED TRANSFORMER PERFORMANCE

United Transformers Electric Company (UTEK) in Saudi Arabia is working in partnership with Weidmann Electrical Technology AG to develop enhanced thermal class distribution transformers for the Middle East.



SUMMARY

As a leading manufacturer of distribution transformers in the Middle East, UTEK understands the region's specific conditions and unique requirements including highly variable loads, wide temperature variations, and issues related to inverter-connected renewable energy generation systems, which lead to increased thermal, electrical and mechanical stresses on the transformers.

Weidmann's Engineered Paper, INSULutions® DPE (Diamond Printed Enhanced), is the ideal choice for UTEK transformer designs as a cost-effective insulation material for increased efficiency, reliability and performance, higher thermal capability, and lighter and more compact transformers.

DESCRIPTION

The performance and reliability of distribution network transformers, particularly in renewable energy generation applications, are critical for maximizing the efficiency and uptime of system operations under these unique and demanding stresses. The key transformer design factors to consider are:

- High thermal capability
- Improved dielectric performance
- Longer life under normal conditions
- Sustainable ingredients
- Optimized cost/high ROI

TECHNICAL CHALLENGE

The challenges identified by UTEK were to reduce the rate of aging and increase the life expectancy of the insulation system (by increasing the Thermal Class of the insulation material), and minimize the dangerous effects of elevated hotspot temperature from inverter generated harmonics.



By specifying INSULutions® DPE in their liquid-immersed distribution transformer designs, UTEC ensured industry-proven reliability and enhanced thermal rating, which reduced the risk of damage to their transformers. Other technical benefits of applying INSULutions® DPE include:

- Qualified per the IEEE C57.100™-2011 Standard Test Procedure as having a thermal class of 130°C in mineral oil systems and 140°C in ester liquid systems.
- The higher thermal class compared to traditional kraft and thermally upgraded kraft (TUK) papers provides longer life and greater resilience to overload operation.
- The higher thermal class can also be used to design more compact transformers.

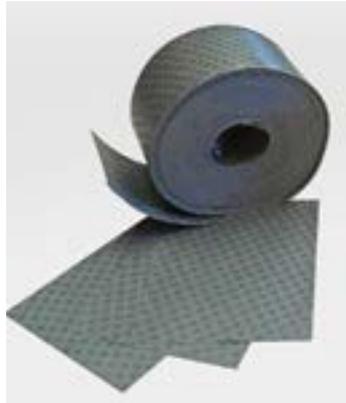


Table 2.0 Summary of DPE thermal rating parameters used in transformer design based on IEC terminology.

Insulation System	Insulating material and liquid	Transformer average winding temperature rise (AWR), K	Transformer hot-spot temperature rise, K	System thermal class, °C
Industry Proven System	Kraft in mineral oil	65 / 70	70	105
	TUK in mineral oil	75	90	120
DPE System	DPE in mineral oil	95	100	130
	DPE in ester liquid	95	110	140

RESULTS

Using INSULutions® DPE paper in the design, UTEC increased the reliability of the transformers for various applications such as renewable energy generation and other industrial and commercial energy systems. This material is compatible with mineral oil, natural and synthetic ester fluids, and offers increased resilience to overvoltage conditions. Our results also confirmed that by using special high temperature DPE material at the right location in the transformer to defend against elevated hotspot temperatures generated by harmonics and high ambient temperatures, UTEC achieved the required life expectancy for inverter duty transformers by eliminating the risk of premature failure.

CONCLUSIONS

INSULutions® DPE (Diamond Printed Enhanced) is a 100% cellulose-based insulation paper technology engineered to exceed the performance of traditional kraft and TUK papers used extensively in renewable energy transformers.

UTEC has developed a reliable solution with the help of this paper where enhanced thermal class materials are used for improved performance and life of transformers, such as in renewable energy generation.

