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Transforming Tomorrow

**3M™ Flexible Insulation Solutions
Help Today's Electrical Transformers
Evolve to Meet a Growing Market Segment**

As the world becomes increasingly digital, we believe the demand for reliable, constant electricity continues to grow. From the macro-impact of modernized electrical grids to the smaller—yet equally significant—needs of individual data centers, transformers play a critical role in meeting the world's evolving electrical needs. Now more than ever, dry-type transformers need to be efficient, durable, long-lasting, and reliable.

According to a study by Global Market Insights, Inc., the global transformers market size is set to reach beyond \$24.5 billion in valuation through 2027¹. This white paper will explore how 3M™ Flexible Insulation Solutions can help transformers evolve to meet these needs.

Grid Modernization

As aging grid infrastructure is modernized throughout the world, liquid-immersed transformers are being upgraded to dry-type transformers for their many benefits. Liquid-immersed transformers, sometimes preferred for higher efficiency, may pose safety hazards. The flammability of mineral-based, liquid-immersed transformers may limit their use near people or inside buildings.

Dry-type transformers do not contain oil that can spill, so they may have a lower environmental impact—and they can be made more efficient with the addition of flexible insulation like the solutions offered by 3M. 3M™ Flexible Insulation can also help improve a transformer's reliability, performance, and longevity—all significant to supplying increasing amounts of electricity.^{6, 7, 8}



And as power grids evolve to accommodate renewable energy resources, transformers remain a key part of them. According to Alternative Energy HQ, "(T)ransformers, likely the most essential elements of the grid, will play a central role in this modernization. Businesses in the transformer industry that understand how transformers fit into grid modernization will be essential."²

With high thermal conductivity, flexible insulation solutions like 3M™ ThermaVolt Laminates or 3M™ ThermaVolt AR Papers can help transformers run cooler and more efficiently. They'll also be able to exhibit greater voltage endurance under continuous electrical stress.

One study, as reported in Electrical Business Magazine, found the number one reason for grid transformer failure is a breakdown of solid insulation, caused primarily by heat, transformer age, and repeated surges.³ 3M™ Inorganic Insulating Materials retain a high percentage of dielectric strength, even after long-term exposure to high operating temperature.

Data Centers

Cloud services, 5G, cryptocurrencies, e-commerce, and so many more things that keep the world interconnected are driving unprecedented growth in data centers.

Data centers today require more power than before, and transformers are evolving to meet their needs. According to a report published by Grand View Research, the global data center transformer market is expected to grow at a compound annual growth rate (CAGR) of 6.3% from 2020 to 2027, to reach over \$9 million by 2027. For dry-type transformers, the CAGR is even higher—7.2%.⁴ The higher growth rate can be attributed to the increased safety and reliability of these types of transformers compared to their liquid-immersed counterparts.

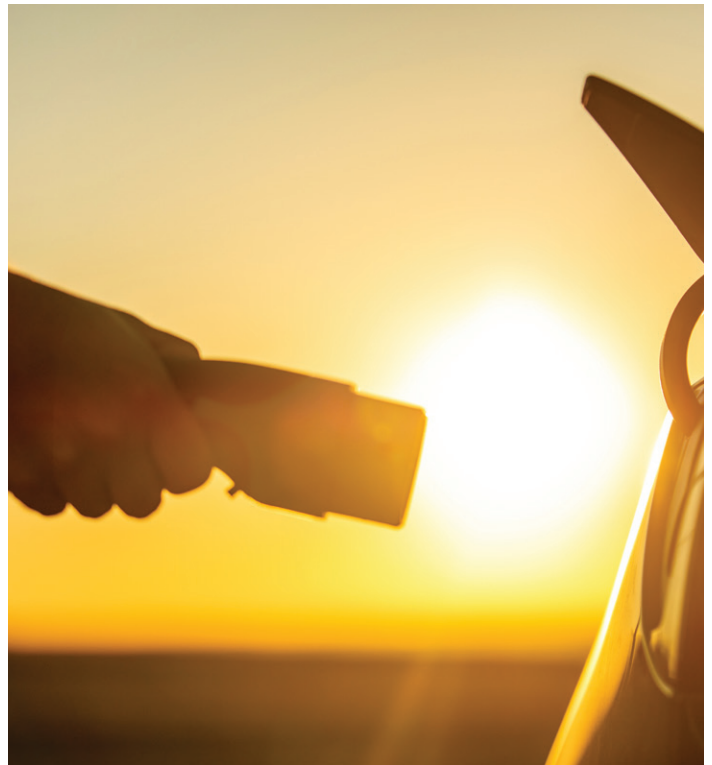
Data center transformers have non-linear loads that generate excess heat, increasing the need for effective insulation to extend transformer life. Transformers can operate at a cooler temperature when incorporating 3M™ Flexible Insulation thanks to its excellent thermal conductivity performance.

Inorganic content, like in 3M™ ThermaVolt Calendered Inorganic Insulating Paper, makes the material more resistant to damage caused by partial discharge, which may increase the reliability and life of data center transformers.

With so much critical infrastructure relying on data centers to maintain power, transformer failure is not an option. 3M™ Flexible Insulation Solutions can help data centers keep their transformers running longer.

EV Charging Stations

A growing number of people today are increasingly using more power than ever before. This includes the increasing proliferation of electric vehicles (EVs). Level 1 and Level 2 charging stations, like those found in homes or parking lots, don't require their own transformers. However, more transformers will be necessary to deliver power to the charging stations. And high speed, high voltage charging systems, which are becoming more prevalent, do require small transformers to distribute the higher voltage delivered at increased speeds. As those voltage levels move higher and charging stations become more common, so will the need for transformers.



As noted in T&D World, “Even small increases in the number of EVs with their associated high charge rates can cause a sudden and unexpected surge in loads on transformers, leading to overloads and outages.”⁵

Once again, 3M™ Flexible Insulation Solutions, like 3M™ ThermaVolt Calendered Inorganic Insulating Paper, can help dry-type transformers keep up with the demands of new technology. With a long list of features that help improve transformer reliability and longevity, these insulations can also help lower temperature rise and reduce conductor losses. Benefits include:



- Inorganic content for improved voltage endurance and resistance to damage caused by partial discharge



- High thermal conductivity, which can enable transformers to run cooler and more efficiently



- Improved varnish absorption

As the world's electrical needs evolve, 3M™ Flexible Insulation Solutions can help transformers deliver more resilient and reliable power transmission.

Sources:

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