Utilities Deploying Ester Oil Filled Distribution Transformers

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- For insulation and cooling purposes, mineral oils are being used in transformer industry for nearly a century but in recent times several other fluids have also been developed by transformer manufacturers.
- An electric utility in the Philippines named Meralco recently began to replace mineral oil in the existing installed base of distribution transformers with natural ester oil.
- The trend of growth in the market share and revenues of transformer OEMs (original equipment manufacturers) offering such solutions is expected to gain further momentum in the future.

For insulation and cooling purposes, mineral oils are being used in transformer industry for nearly a century but in recent times several other fluids have also been developed by transformer manufacturers. These fluids are serving as an alternative to mineral oil for transformer applications including ester fluids, bio-based hydrocarbons and recycled mineral oil. The availability of these fluids has significantly improved over the years and as the technology matured, the price of transformers with alternative fluids has dropped as well which in turn is supporting the adoption of sustainable and environment friendly transformers.

Ester oil is one of the alternative fluids that is utilized in transformers for cooling and insulation purposes as mentioned earlier. It is a biodegradable fluid which provides moisture tolerance with reduced footprint and lower fire risk. Additionally, deployment of ester oil-based transformers leads to cost reduction as the risk of oil spills is reduced so there is no need to set up safety equipment.

As far as the applications of ester-filled transformers are concerned, they include densely populated areas (to reduce the risk of fire), offshore installations, environment-sensitive power installations (wind and solar power projects), and mobile emergency units.

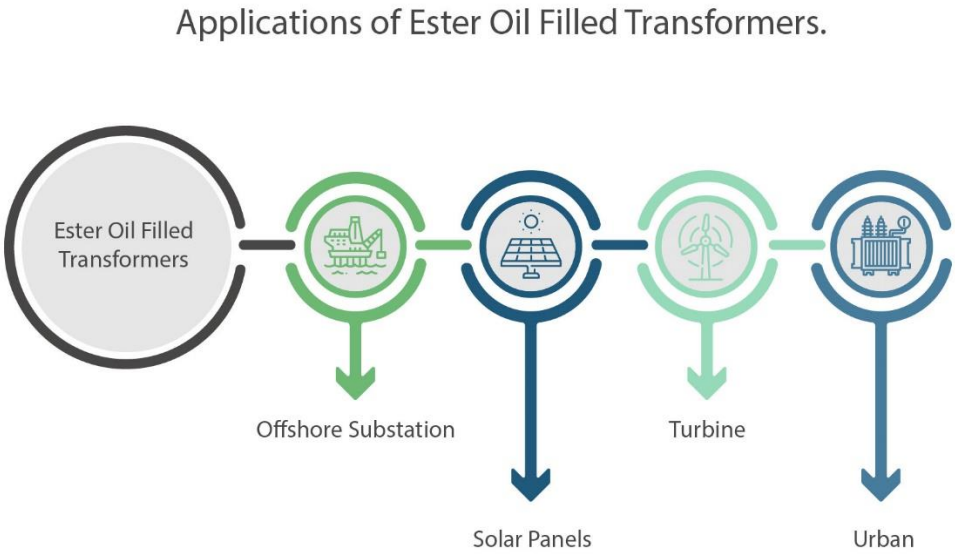

Figure 1: Applications of Ester Oil Filled Transformers.
Source: Power Technology Research

Recent Developments in the Transformer Industry

In recent times ester filled transformers are being installed by several utilities specifically in countries that are tilted towards renewables while certain utilities are opting for replacement of mineral oil with ester oil. On the supply side, key players in the market of ester oil filled distribution transformers include Schneider Electric, Hitachi Energy, Efacec, Ormazabal and Koncar.

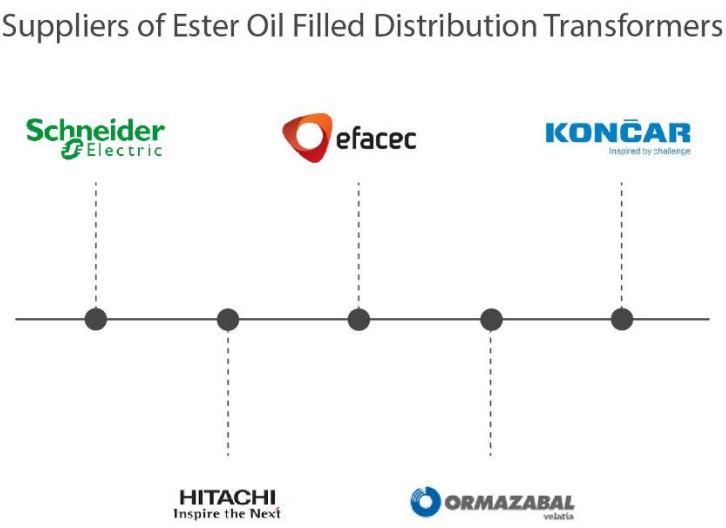

Figure 2: Suppliers of Ester Oil Filled Distribution Transformers,
Source: Power Technology Research

An electric transformer specifically designed for solar parks that utilizes biodegradable fuels, emits less CO_2 and requires fewer materials for its construction is expected to drastically change the landscape of the transformer industry. The transformer has been designed and developed by a collaboration among WESTRAFO, EUROLAM, Technology-DTV and the Engineering Division at EGP. It will be deployed at VIDCO solar plant in Spain that is currently under construction.

The deployment of this transformer will lead to savings of more than 45 metric tons of CO_2, 14 metric tons of several raw materials including iron, aluminum and insulating papers that are used in construction. Furthermore, with the use of Natural Ester Cargill FR3 for insulation purpose, leakage and fire risk associated with the mineral oil based transformer will be greatly reduced followed by increase in the ability to withstand high temperatures.

It is noteworthy that Spain has a negligible installed base of ester filled transformers but if other renewable generation plants move towards installation of ester filled transformers this could signal a change in the transformer market of the country.

An electric utility in the Philippines named Meralco recently began to replace mineral oil in the existing installed base of distribution transformers with natural ester oil MIDEL eN 1204 manufactured by M&I Materials. Meralco plans to replace the insulating fluids in 220,000 distribution transformers with the help of MIESCOR which is a subsidiary of Meralco and a leading EPC (Engineering Procurement and Construction) contractor in the energy sector of the country.

A three-year contract has been given to M&I Materials for the supply of MIDEL eN 1204 natural ester transformer fluid. The green transformers that were launched last year were made from 100% recyclable and biodegradable materials which will not only assist distribution companies in reducing their system losses but their carbon footprint as well.

On the other hand, Itaipu Transformadores has partnered with Cargill BioIndustrial to launch an ecological transformer line which is designed to meet environmental safety standards. The utilization of ester oil is expected to reduce the risks linked with the leakage of oil which contaminates the nearby water bodies followed by reduction in the fire risk from the mineral oil. That is the reason ester is fast becoming the insulation of choice for the transformer manufacturers that are focusing on introducing sustainable technologies in the market.

Looking Ahead

So to achieve climate goals economies across the globe are shifting towards renewable energy from conventional sources of energy. This will not help in achieving net zero emissions pledged under the Paris Agreement until and unless sustainable technologies are adopted for countries' power grid infrastructure as well. Utilities and industries in this regard are working to reduce their carbon footprint and deploying technologies that will help them achieve the climate goals set by their respective countries and regions. As Power Technology Research's assessment, transformer manufacturers that are offering environment-friendly and sustainable technological solutions are gaining traction and observing an increase in their market share and revenues. The trend of growth in the market share and revenues of transformer OEMs offering such solutions is expected to gain further momentum in the future as well.

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