

CASE STUDY



PROJECT: Wind turbine transformers | Global
ESTER TYPE: MIDEL 7131 synthetic ester
PURPOSE: Support new compact design, high-power transformer

[OVERVIEW]

Wind turbines require a compact and high-power transformer solution in order to provide the maximum output with the smallest weight. In wind power's earlier days, most turbines that had on-board transformers used cast resin technology. However, increases in power ratings and higher voltages have meant that cast resin is no longer always suitable. In addition, the reliability of cast resin transformers has been called into question following a number of high-profile failures during operation.

CG Power set about developing a compact transformer, in partnership with DuPont, with the aim of fitting it through the tower door on a modern multi-megawatt turbine. This transformer was dubbed the SLIM.

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CASE STUDY



[SITUATION]

For the first range of SLIM transformers, CG Power used silicone oil, a K-class fluid with good high temperature characteristics. However, silicone oil has serious shortcomings in terms of its poor biodegradability and tendency to leak through gasket seals.

A new fluid filled solution was needed for wind turbines, so CG Power searched for a more environmentally friendly-solution which appeared in the shape of MIDEL 7131. Since MIDEL 7131 is readily biodegradable it has far less impact on the environment if spilled than non-biodegradable silicone oil. It is also more compatible with most sealing materials and so less likely to leak. In the wind turbine world both these attributes are beneficial since many wind farms are located in environmentally sensitive areas, such as rural areas or offshore.

[RESULT]

CG Power used MIDEL 7131 to great effect in the next generation of their SLIM transformers, naming them Bio-SLIM. M&I Materials collaborated extensively with CG Power and DuPont in Bio-SLIM's development, providing laboratory testing for materials compatibility and long-term high temperature testing of MIDEL 7131. M&I Materials also worked to develop the market for a fluid filled wind turbine transformer, a sub-sector previously dominated by cast resin transformers.

In the second round of development, Bio-SLIM transformers were optimised to have a smaller footprint than the silicone designs, while retaining the same or higher power output. This was possible due to the superior thermal and electrical properties of MIDEL 7131, when compared to silicone oil.

There are several thousand Bio-SLIM transformers now in operation around the world. The latest transformers in the Bio-SLIM range have ratings up to 7MVA and voltages up to 72.5kV.

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

