CASE STUDY

[MIDEL®]
SAFETY INSIDE

PROJECT: **ITER nuclear fusion transformers | France**

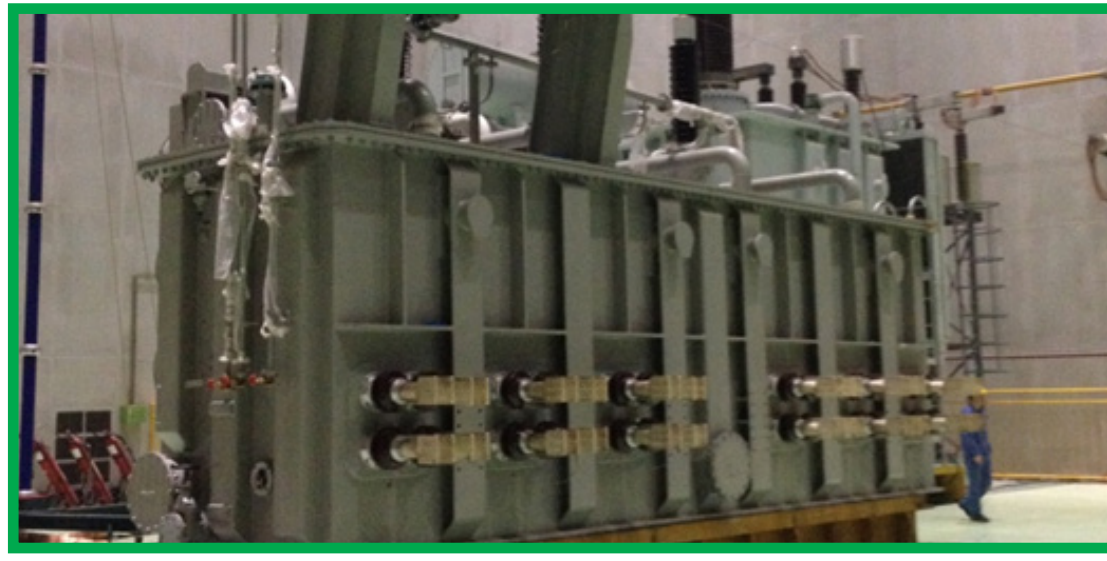
ESTER TYPE: MIDEL 7131 synthetic ester

PURPOSE: Mitigate fire risk for transformers located near reactor

[OVERVIEW]

One possible solution for the long term supply of electricity is nuclear fusion. Such fusion reactors have a number of advantages over existing nuclear power stations, which operate on the principle of nuclear fission. Nuclear fusion produces very little in the way of waste, with helium being the predominant by-product of the reaction. It also uses very small quantities of fuel to produce very large amounts of energy.

One major international project looking to produce viable energy from nuclear fusion is the International Thermonuclear Experimental Reactor (ITER). Located in France, this project involves collaboration between China, the EU, India, Japan, Korea, Russia and the USA. The aim is to produce a power output of 500MW for an input of 50MW, in order to make this a viable alternative to current power station technology.



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[SITUATION]

To trigger nuclear fusion, a hot gas plasma has to be formed with a temperature of 150 million° C and large superconducting magnets are needed to keep this confined away from the walls of the reactor. Producing this temperature and the magnetic fields takes a very large amount of energy and it has been calculated that the ITER plant and facilities will need 110MW of electricity, rising up to 620MW during plasma operation.

As part of the supply a number of specialised power transformers are needed to transfer the electricity from the substation to the reactor.

When considering which transformer technology to use, the designers at the ITER project needed to find a fire safe, reliable solution as these transformers would be located close to the reactor due to their high output current rating. The specification for the transformers therefore called for K-class fluid (meaning a fluid with a fire point in excess of 300°C), in order to provide the best level of fire safety.

[RESULT]

Through collaboration with partners in China and France, it was proposed that MIDEL 7131 would be the ideal fluid solution for these transformers.

The outcome of this work is that fourteen 82MVA MIDEL 7131 filled transformers will be manufactured in China, with the first few units already made and under test. These transformers will have an output current rating of 60kA and a short circuit withstand of 360kA. The use of MIDEL 7131 in such a high profile project demonstrates the fluid's excellent properties and track record.

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