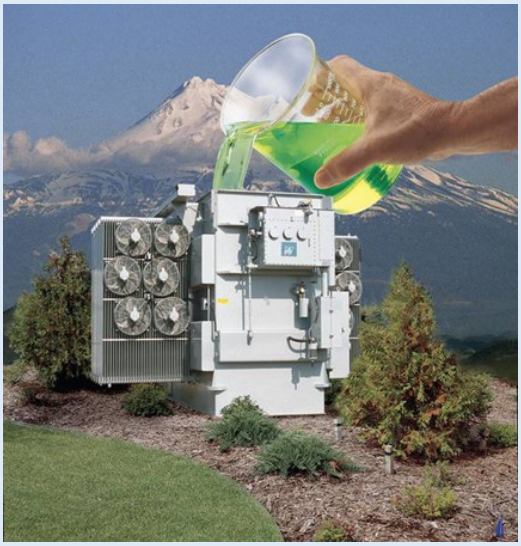
Supplemental Project Notice

FIRE CHARACTERISTICS OF MIDEL 7131 SYNTHETIC ESTER

Laboratory Testing (Phase 2)



PROJECT HIGHLIGHTS

- Laboratory testing to evaluate the fire characteristics of Midel 7131
- Develop information that may be utilized as part of a fire suppression requirement analysis

Background, Objectives, and New Learnings

Electric utilities operate numerous transformers in the transmission and distribution of electrical energy. These transformers contain coolant dielectric fluids that may be unintentionally released due to equipment failure, maintenance accidents, fires, etc. Releases of mineral oil from equipment present potential environmental and economic burdens, whereas ester dielectric fluids appear to present much less of a risk. Therefore, many utilities are or are considering replacing mineral oil dielectric coolant fluids with ester dielectric fluids to extend asset life, reduce costs and better protect human health and the environment. The ester dielectric fluids may be natural or synthetic in origin, deriving from commodity seed oils or inorganic feedstocks. Specific formulations are proprietary and include the ester dielectric fluids and additives. Ester dielectric fluids are believed to be readily biodegradable and have low toxicity to humans, wildlife, and aquatic life. As such, changing from mineral oils to ester dielectric fluids offers an opportunity to meet the growing demand for improved sustainability and use of environmentally friendly products along with improved fire safety. Ester dielectric fluids also are reported to have superior performance characteristics and may extend asset life.

Benefits

Use of alternative fluids has the potential to benefit the public by reducing the environmental footprint of operations associated with electric transformers in substations. These fluids are reported to be readily biodegradable and low or no toxicity. In addition, the claimed superior performance characteristics of these fluids may extend the life of the transformers, leading to improved system longevity and reliability.

EPRI members will benefit from having independent evaluations of the fire characteristics of synthetic ester fluids.

These evaluations are necessary to assist electrical utilities with evaluating the fire suppression requirements associated with alternative fluids such as Midel 7131.

Project Approach and Summary

This project may provide new insights into the fire characteristics of Midel 7131 fluid that could have applications to utility operational practices for fire suppression.

This research is designed to answer the questions:

- What energy levels are needed to start and sustain a fire of Midel 7131?
- Once ignited, what is the heat release rate and radiative flux of a Midel pool fire?
- Can existing fire suppression systems suppress Midel 7131 fires at half of the flow rate for mineral oil?
- Can Midel 7131 ignition potential from transformer internal arcing be tested in a laboratory?

The first phase of work included literature reviews of published information from peer-reviewed and gray literature on the fire characteristics and fire suppression requirements of Midel 7131 and compiled the physical characteristics of Midel 7131 that may be used to calculate fire characteristics. The information collected was used to develop a testing scope of work to be performed in a fire testing laboratory for Phase 2 of the work.

The Phase 2 objective is to execute the laboratory testing scope of work developed during Phase 1. Laboratory evaluation is designed to capture data for ignition time, burn time, chemical heat release rate, convective heat release rate, heat flux, and weight change from large pool fires. The laboratory testing includes the option to test a fire suppression system operating at half of the mineral oil design rate on a large pool fire of Midel 7131.

The project may also evaluate the feasibility and methodology of simulating an internal transformer fault that could cause dielectric fluid ignition, with the option to test a prototype of any methodology developed during the feasibility study.

Deliverables

Deliverables that may be published as part of this work include:

- Summary of literature review and laboratory testing results (3002026208)
- Methodology and laboratory analytical data collected from large-scale pool fire and fire suppression testing

Price of Project

The cost of Phase 2 is $280,000 per funder. The funding of the project can be split over 2024, 2025, and 2026. The project qualifies for self-directed funding.

A minimum of two funders are required to begin work.

Project Status and Schedule

The Phase 2 schedule is estimated at approximately 16 months.

Who Should Join

The project is of interest to electric utility fire engineering and environmental staff that are engaged in evaluations of alternatives to mineral oil dielectric fluids.

Contact Information

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