

ADSORPTIVE CAPACITY AND RETENTION CAPABILITIES OF A NEW MATERIAL DESIGNED TO REMOVE DIELECTRIC FLUIDS FROM WATER



Dielectric fluid floating on water in an oil-water separator

PROJECT HIGHLIGHTS

- Test adsorptive and retention capacity of oleo sponge with mineral oil and ester dielectric fluids
- Evaluate effectiveness of oleo sponge compared to available commercial materials
- Provide insights on whether oleo sponge could be used as pretreatment or polish for dewatering containment structures
- Evaluate whether oleo sponge has the potential to increase the lifespan of oil sorbents commonly deployed in containment structures

Background, Objectives, and New Learnings

Utilities operate numerous transformers, feeders, breakers, and other equipment for the transmission and distribution of energy. Transformers and other equipment contain dielectric fluids such as mineral oil and natural or synthetic esters for electrical insulation and cooling purposes. Unintended releases of fluid from equipment due to failures, maintenance incidents, fires, or other causes require response in compliance with federal, state, and local regulations.

There are various materials and equipment commercially available to respond to a release of dielectric fluid that come in different shapes, sizes, and absorptive capacities to allow flexibility for spill containment and remediation. A material developed by Argonne National Laboratory (ANL) called the Oleo Sponge is a new product that while not commercially available at this time shows potential for remediating oil spills to water. ANL purports that the oleo sponge is hydrophobic (does not absorb water), does not release dielectric fluid once it is absorbed, and is reusable.

This project proposes to evaluate the product effectiveness and durability of the oleo sponge developed by ANL and several other commercially available products under real-world conditions often encountered in transformer containment structures and during spill remediation.

Benefits

The Oleo Sponge may present an opportunity to improve the removal of dielectric fluids from water, lowering the potential for environmental impacts and improving environmental compliance. A reusable product employed in this manner could also provide improved operational sustainability by reducing waste generated during the treatment of waters containing dielectric fluids.

If successful, use of the Oleo Sponge within containment structures to pretreat or polish waters containing dielectric fluids has the potential to extend the life of other, larger sorptive media products such as pump-through and flow-through barriers and solidification plugs. Extending the lifespan of these products increases sustainability by decreasing waste while maintaining environmental regulatory compliance.

In addition, a better understanding of the performance of this material may benefit the public by providing a tested product that avoids the release of dielectric fluids into the environment and potential contact with the general population, and it is reusable so it may have a positive impact on cost that may translate into more affordable energy for the public.

Project Approach and Summary

This project may provide new insights into dielectric fluid absorption and retention capabilities of the Oleo Sponge with dielectric fluids commonly deployed in electricity transmission and distribution.

This research is designed to answer the questions:

- What is the absorptive capacity and retention capability of Oleo Sponge under still water conditions?
- What is the absorptive capacity and retention capability of Oleo Sponge under flowing water conditions?
- Is the Oleo Sponge reusable?
- How does Oleo Sponge performance compare to commercially available sorptive products?

The first phase of work is designed to investigate the adsorption and retention of dielectric fluids for Oleo Sponge and other commercially available materials.

The Phase 2 objective is to execute the laboratory testing to assess the dielectric fluid absorption and retention performance of Oleo Sponge and other materials under conditions commonly encountered during utility operations, such as static water in containment structures and flowing water that at velocities used during dewatering activities.

The project is also designed to assess the reusability of the Oleo Sponge and other products that claim to be reusable to assess potential for waste reduction.

Deliverables

Deliverables that may result from this work include:

- Project update meetings
- Technical report of results

Price of Project

The price per funder is \$143,000. 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 schedule is estimated at approximately 18 months.

Who Should Join

The project is of interest to electric utilities evaluating spill control and response materials, in addition to opportunities to improve treatment of dielectric fluids in water to improve operational sustainability through waste reduction.

Contact Information

For more information, contact the EPRI Customer Assistance Center at 800.313.3774 (askepri@epri.com).

Technical Contact

Lea Millet, P.G. at 470.747.2552 (lmillet@epri.com)

Contact a Technical Advisor in Your Region

Northeast: Dan Tavani at 704.595.2714 (dtavani@epri.com)

Southeast: Brian Long at 704.408.8139 (blong@epri.com)

Central: Jeff Hlavac at 972.556.6553 (jhlavac@epri.com)

West: David Welch at 650.855.1072 (dwelch@epri.com)