

## Evaluation of dielectric performance

### SC D1 Materials and Emerging Test Techniques

PS2, Q2.04 - Is testing under high temperature representative enough for the determination of thermal index of insulating materials? (...) How can dielectric performance (e.g. withstand voltages) of an insulation system/design be qualified?

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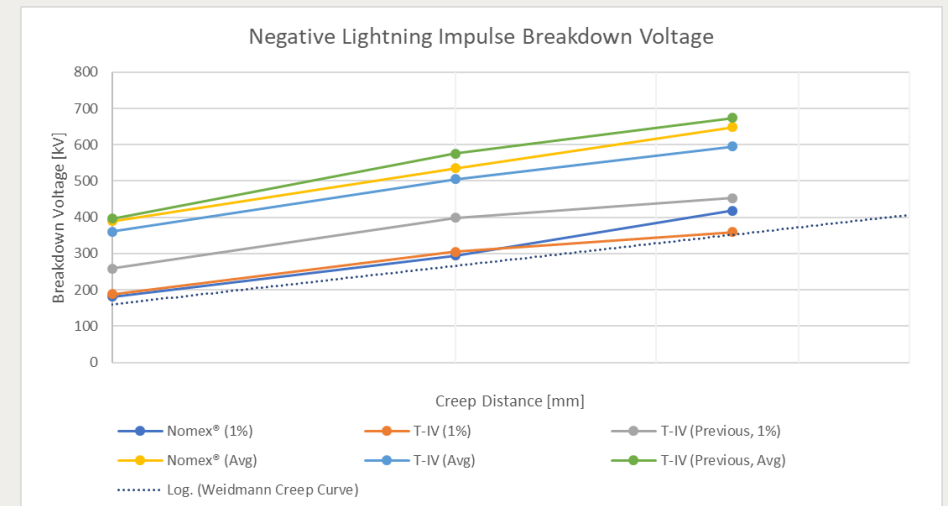
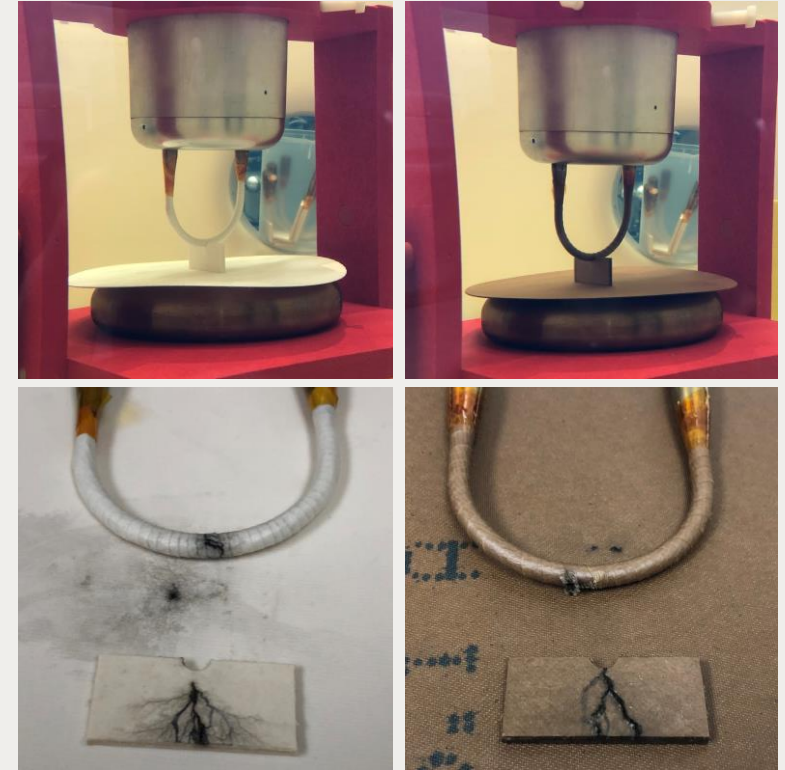


# Summary

- Dielectric evaluation of alternative insulation systems shall be done by **comparison to incumbent insulation systems or materials**, because the design rules are typically established based on conventional insulation systems.
  - Example is given of dielectric creep strength evaluation by comparison between aramid-based system vs. cellulose-based system.
  - Comparative testing also verifies the test method used in the past.
- **Dielectric testing at elevated temperatures is difficult** due to test equipment limitations and lack of experience.
  - Example is given for test program where insulation material was verified for PDIV at elevated temperatures for high temperature transformer application.

# Comparative dielectric creep testing

- Example of dielectric evaluation of creep strength for aramid pressboard vs. cellulose pressboard.
- Test configuration reflecting real arrangement possible in transformer construction.
- Same test done for both insulation systems for direct comparison of results between the two systems.
- Test on cellulose board also verifies the results vs. historical data generated in the past.
- Although test performed for high temperature insulation system, lack of suitable equipment forced the testing only at room temperature.



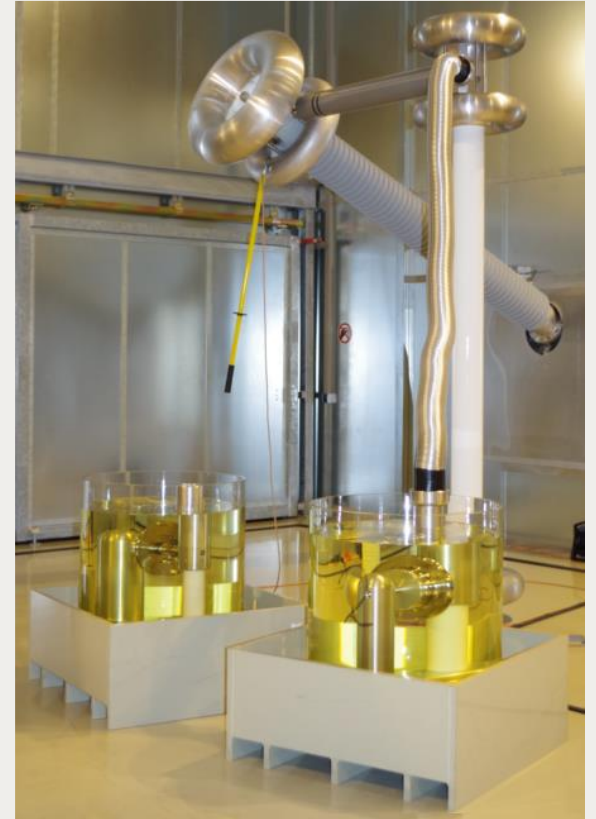
Group Discussion Meeting

# Dielectric testing at higher temperature

Test for PDIV on laminated aramid pressboard for high temperature transformer application.

- Limited scope of testing due to limited equipment available.
- Safety concerns for testing in oil at higher temperatures (testing in esters helps in safety).
- Test at various temperatures to see if test results are ok at intermediate temperature levels (RT – 50 – 90 - 120°C).
- **Difficult interpretation of results – unknown if any questionable results could be related to material performance (solid, liquid) or rather test equipment not suitable for higher temperatures. (PD testing may be specifically sensitive to temperature.)**

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Example of laminated aramid board tested for PDIV at temperatures up to 120°C.