

LPITs for C4-FN – a matter of parameters

A3 – PS2 – Q13 – A variety of C4-FN based mixtures (...). With every manufacturer having its “proprietary gas” could “inter-operability” be realized? (...)

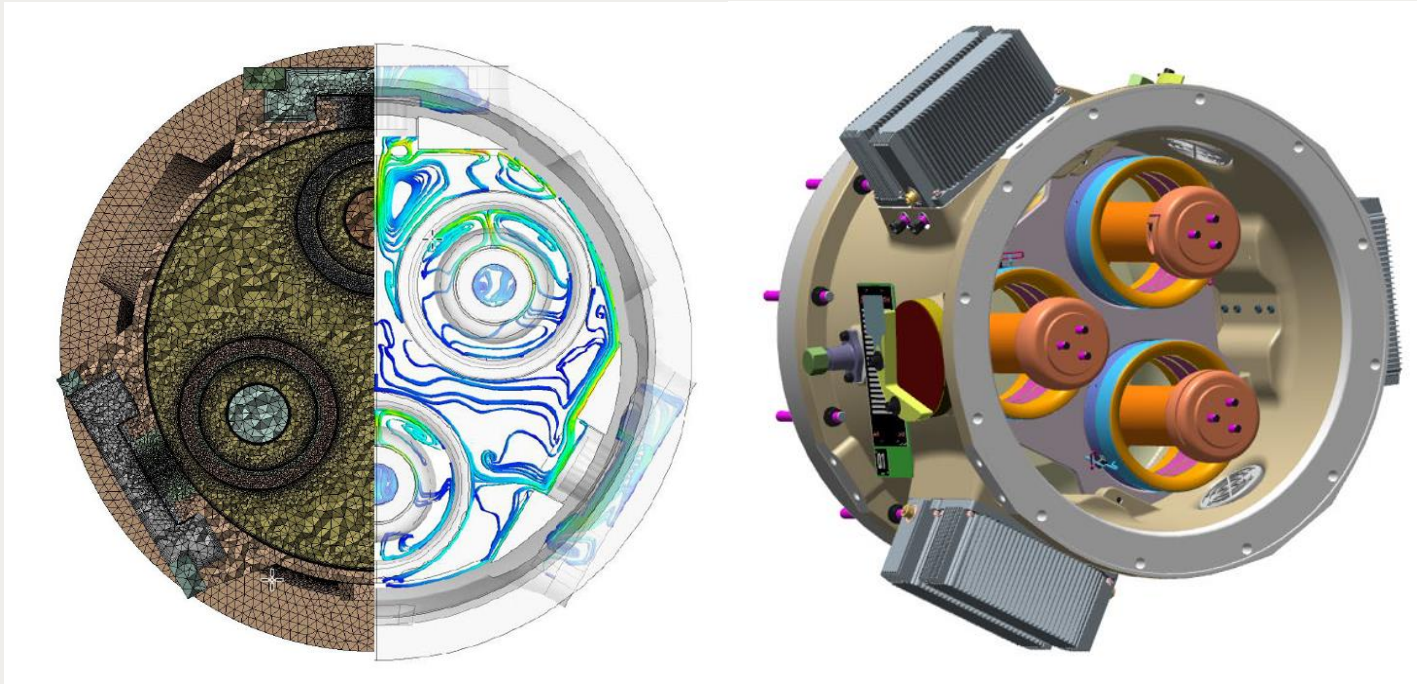
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Inspire the Next

LPITs work with almost any alternative insulation gas

- Unlike conventional instrument transformers, LPITs are customized by parameter sets
 - One hardware fits a variety of ratings. These parameters are determined by the application and are loaded during calibration at the factory or on-site during commissioning.
 - Another set of parameters is used for compensation algorithms to achieve the desired accuracy
 - The SF₆-based parameter structure can be re-used for alternative gas mixtures, the necessary parameters are derived from simulations and literature, and validated in type tests.
- Recently, a C4-FN-based GIS has been installed and commissioned in Iceland
 - Existing designs for SF₆ were re-used without hardware changes
 - Calibration was performed using parameter sets for the alternative gas mixture

Different gas properties are compensated



Adapted parameters to CF-FN:

Rogowski coil

- Temperature estimator

Voltage sensor

- Permittivity (ϵ_r) of the insulation gas as function of temperature and density
- Temperature estimator for conductor temperature

Simulation view and insight of a CP04 LPIT recently installed in Iceland. Thermal simulations (left) support the development and validation of the compensation algorithms necessary for reaching the desired accuracy.

Group Discussion Meeting

Conclusions

- LPITs for SF₆ GIS using Rogowski coils and capacitive voltage sensors can be easily adapted to any alternative gas by parameterization of
 - gas convection properties for temperature models and drift compensation
 - gas permittivity (ϵ_r) as function of density and temperature to compensate the drift of the h.v. voltage measurement capacitor.
- If the materials are compatible to the insulation gas, no hardware changes are required. Adaptation of LPITs is simpler than the adaptation of conventional instrument transformers.
- Today's LPITs work with various alternative insulation gas mixtures. Changes in insulation gas (e. g. “retrofill”, or the report’s “one-size-fits-all” gas) will most likely not require a change of the LPIT hardware. An LPIT may also be used in combination with equipment from different manufactures using different gas mixtures.