Contribution ID: **270** Type: **Poster Presentation**

Partial discharge and endurance test technologies for insulation of inverter-fed motors using impulse voltages

Wednesday 6 July 2016 14:40 (20 minutes)

The partial discharge inception voltage (PDIV) and insulation lifetime of the insulation systems for rotating machines driven by power electronics should be evaluated using repetitive impulsive voltages according to standards or technical specifications released by International Electrotechnical committee[1,2] . However, unlike the sophisticated technologies for partial discharge (PD) detection and endurance tests under sinusoidal voltage conditions, the PD measurement system design, the influence of voltage parameters on test results should be carefully considered when performing measurements at impulsive voltages. This paper introduce a generator developed for PD detection and endurance tests on the basis of high voltage solid state switchers. By using the generator, a large number of experiments were carried out on insulation models made up of enameled wires used in inverter-fed motor insulation to study the influence of impulsive voltage waveform parameters on partial discharge characteristics and insulation lifetime. Conclusions show that, the temperature, humidity and waveform parameters (rise time, full time, duty cycle, frequency) will influence the PD characteristics and insulation endurance significantly. When performing insulation evaluation under impulsive voltages, all the above influence should be carefully considered to obtain meaningful and objective results used for insulation qualification on inverter-fed motor insulation system.

1. IEC TS 60034-18-42: Rotating electrical machines –Part 18-42: Qualification and acceptance tests for partial discharge resistant electrical insulation systems (Type II) used in rotating electrical machines fed from voltage converters, 2008.
2. IEC 60034-18- 41: Rotating electrical machines - Part 18-41: Qualification and type tests for Type I electrical insulation systems used in rotating electrical machines fed from voltage converters, 2006.

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Session Classification: Poster 1-C

Track Classification: Dielectrics, Insulation, and Breakdown