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## Insulation deterioration of twisted pairs due to high frequency switching of power Electronic Converters (PECs)

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In Industries the motor speed are controlled with the help of PEC(power electronics converters)which are raised by the advancement in adjustable speed drive technology. This technology have paved way for dramatic changes in industrial control of motors. But the output waveforms of the PEC's are highly distorted which may affect significantly the reliability of electric motor insulation system. So the motor insulation must be designed in such a way that it can withstand these highly distorted waveforms. The cause for distortions are due to the non linear components which are used in PEC's generate harmonics and these harmonics are in turn responsible for the voltage distortion. Along with this effect the switching rates used in PEC's generate voltage overshoots which in turn leads to the premature failure of the motor's insulation. This overshoots are primarily due to the high frequency distortion, impedance mismatch and slew rate of the waveforms generated by the PEC's .Because of these reasons partial activity is accelerated ,which reduces the lifetime of the insulation,

The insulation failure or breakdown in motor insulation systems are to be studied by conducting test called breakdown tests. Our experiment focuses on testing the winding primary insulation first then with the secondary insulation made of modified polyester in addition to the primary one. Twisted pair are used to investigate the winding insulation. All the breakdowns tests are performed with these twisted pairs. A twisted pair is composed by two enameled wires wound as a plait according to ASTM D 2307 standards. These specimen are subjected to stresses provided by high frequency and power frequency waveforms .First the tests are made over the primary insulation of the twisted pair then over the coated secondary insulation and the comparison are to be made. The secondary insulation is also made with epoxy resin along with filler materials like aluminium trioxide ,zinc oxide and titanium oxide of various concentrations added to base epoxy.

In our experiment ,the electrical breakdown mechanism is observed by means of pure sinusoidal wave, sinusoidal PWM with high frequency switching pulses.

The fore mentioned waveforms will be generated by experimental setup. Generated waveforms will be applied on the twisted pair samples ,the failure times will be absorbed. The above observed results will be compared with testing done with sinusoidal waveforms. The sample with secondary insulation coating was observed to have higher insulation strength compared to the sample with primary insulation, for obvious reasons. Based on the comparison factors which were found experimentally ,lifetime model of insulation will be established.

### REFERENCE:

- 1.A.Cavalliani, D.Fabiani, and G.C.Montanari, "Power Electronics and Electrical Insulation Systems –Part 1: Phenomenology Overview", IEEE Electrical Insulation Magazine., vol.26 pp.6-14, May/June 2010
- 2.A.Cavalliani, D.Fabiani, and G.C.Montanari, "Power Electronics and Electrical Insulation Systems –Part 3: Phenomenology Overview", IEEE Electrical Insulation Magazine., vol.26 pp.30-40, September/October 2010

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