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PARTIAL DISCHARGES IN ENAMELLED WIRES USED IN DOMESTIC MOTORS FOR POWER ELECTRONIC APPLICATIONS

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Abstract — **In High Voltage (HV) electrical power system the quality of insulation plays an important role in HV power equipment. Different types of materials like solid, gaseous, liquid and combination of these material are used for insulation purpose. In HV power equipment most of insulating material are not perfect in all respect and always contain some impurities. Due to the presence of air-bubbles, voids are formed within the insulating material. It weakens the insulation region and responsible for partial discharge and finally the insulation properties of such material enormously degrades its quality. In this work enameled copper wires are used to study the PDIV and BDV activity. The wires are bend for different angles and cut into different lengths.**

Keywords-component; formatting; style; styling; insert (key words) (minimum 5 keyword require) [10pt, Times new roman,Italic, line spacing 1.0]

I. INTRODUCTION

Partial Discharge (PD) measurements have been made various electrical equipments for over 40 years. The electrical insulation of windings maybe prone to PD activity as a result of surface or slot discharges. Detection of PD helps to improve the quality of insulation. It also helps in assessing the condition of windings. PD can be measured in both on-line and off-line conditions.

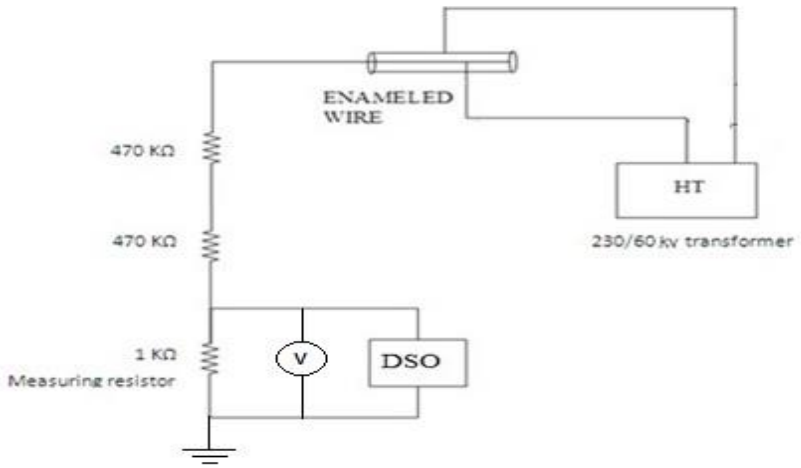
To determine Partial Discharge Inception Voltage (PDIV) and Breakdown Voltage (BDV) for different kinds of enameled wires. To obtain PDIV and BDV for different lengths and bend angles.

The quality of insulation plays an important role in HV power equipment. Different types of materials like solid, gaseous, liquid and combination of these materials are used for insulation purpose in high voltage power equipment. The insulation gradually degrades due to the cumulative effects of electrical, chemical and mechanical stresses caused by the partial discharges. The insulation of the equipment isa sensitive zone.Most of the insulators is not in pure form and contains some impurity. Due to the presence of air bubbles, voids are formed within the insulating material. It weakens the insulation region and responsible for PD. The insulation of equipment is monitored, designed and safely handled by power engineer time to time. The insulation failure arises due to presence of PDs in high voltage power equipment. Partial discharges always originate at void, poor conductor profiles in high voltage equipments. Because of the above reason PD detection and measurement is necessary to protect the equipment from insulation damage and to assure a long-term operation.

Enameled wires are widely used for the domestic purposes. In the home appliances like mixers, fans etc. in order to improve its insulations and breakdown due to sudden increase in voltage, PDIV and BDV are measured to take necessary remedies to increase the life of the machines. Enameled wires are used in electromagnets and induction motors with less capacity. By conducting the experiments for the measurement of PDIV and BDV for different lengths, diameters and different bend angles so that we can choose the best wire with suitable length, diameter and bend angle with high PDIV and BDV which increases the life of the machine.

Experimental Set Up

- In reference to IEEE paper [3], the standard resistance value for PD measurement should be 1MΩ. So, we divided this standard resistor value into three series standard resistance values as two 470K Ω and one 1KΩ. DSO was connected across 1KΩ in order to record the output**.**



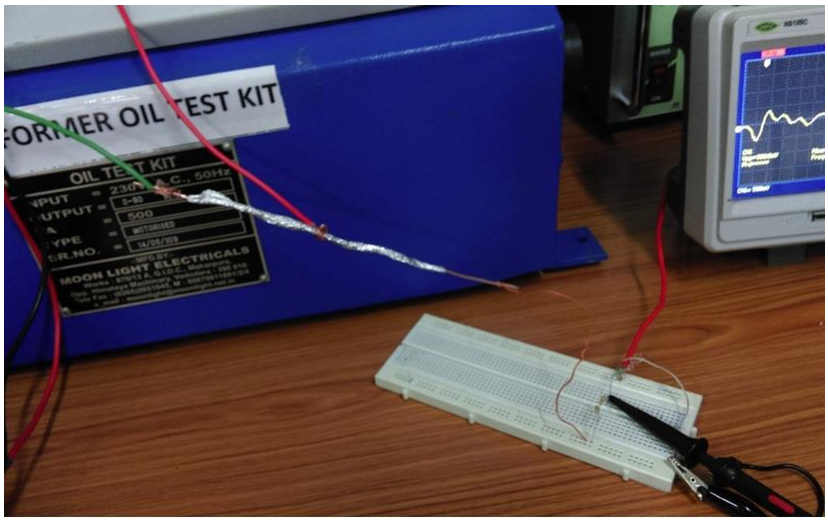
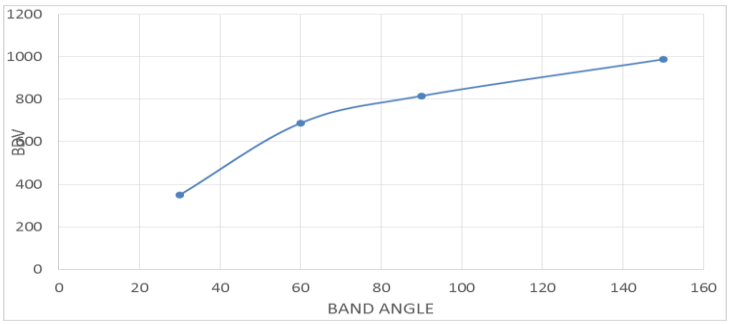


Image of SET-UP

Specimen: 1

- **Length of wire 15cm**
- **Diameter of conductor 1.5mm**

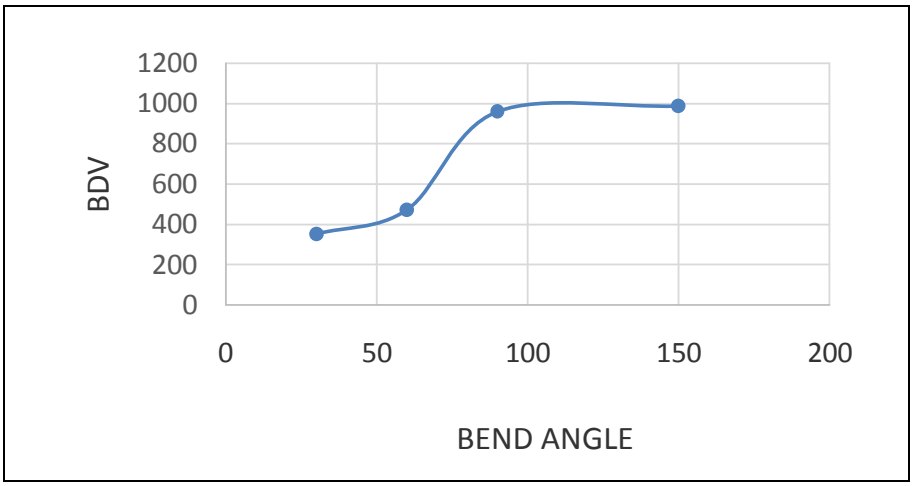
SR. NO	HV SOURCE INPUT VOLTAGE(KV)	BEND ANGLE	BDV (mV)
1	0.1	30°	350
2	0.2	60°	688
3	0.3	90°	816
4	0.4	150°	988



Specimen: 2

- **Length of wire 21cm**
- **Diameter of conductor 2.5mm**

SR. NO	HV SOURCE INPUT VOLTAGE(KV)	BEND ANGLE	BDV (mV)
1	0.1	30°	352
2	0.2	60°	472
3	0.3	90°	960
4	0.4	150°	988



CONCLUSION

Partial discharges are a major source of insulation failure in high voltage power system which needs to be monitored continuously to avoid incipient failure in the power system network. To understand PD activity, series of experiments were conducted for different types of enameled wires. It was seen that as bend angle decreases and BDV decreased as stresses increased. When a single wire of different lengths was subjected to HV and BDV increased with increase in length.

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