# CONDITION MONITORING OF METAL OXIDE SURGE ARRESTERS AT POWER DITRIBUTION

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**Degree of Master of Science**

**Department of Electrical Engineering**

**University of Moratuwa**

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**June 2018**

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Thesis submitted in partial fulfilment of the requirements for the degree of Master of Science

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## DECLARATION

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The above candidate has carried out research for the Masters Dissertation under my supervision.

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Dr. W.D.A.S. Rodrigo  Date

# ABSTRACT

Metal Oxide Surge Arresters (MOSA) are proven to be reliable protective devices for power distribution and electrical transmission system. MOSA are subjected to electrical ageing or degradation due to constant AC conduction or transient voltages. Leakage current measured from surge arresters are used to observe its degradation and the resistive leakage component is extracted from the total to determine the health of the surge arresters. If resistive current increases, life of the surge arresters decreases. Generally leakage current is measured using current shunts or current transformers where it's necessary to measure the applied voltage which is very hard to measure in online condition. This proposed study develops a simple but accurate method to separate the resistive leakage current from the total leakage current without any voltage measurements by using a technique called Modified Phase Shifted Method (MPSM) which is totally based on manipulation of the total leakage current waveform and simulated in Matlab & Simulink. A prototype device is designed and developed to sense the leakage current from a surge arrester and transmit those data to Matlab & Simulink to perform the MPSM and determine the its resistive leakage current. This method enables remote and an online monitoring system which can alert the utility whenever the health of the installed surge arrester becomes low.

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# LIST OF SYMBOLS & ABBREVIATIONS

MOSA – Metal Oxide Surge Arrester

MOV – Metal Oxide Varistor

ZnO – Zinc Oxide

SPD – Surge Protective Device

MPSM – Modified Phase Shifted Method

MCOV – Maximum Continues Operating Voltage

MCU – Micro Controller Unit

PIC – Peripheral Interface Controller

UART – Universal Asynchronous Receiver Transmitter

USB – Universal Serial Bus

MATLAB – Matrix Laboratory

PSCAD – Power System Computer Aided Design

RMS – Root Mean Square

Vc – Maximum Continues Operating Voltage

Vr – Rated Voltage

Vo – Operating Voltage

Vs – System Voltage