MODELLING OF MAGNETIC HYSTERESIS OF A THREE PHASE TRANSFORMER UNDER DYNAMIC CONDITIONS

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Degree of Master of Science in Electrical Engineering

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Declaration of the Candidate and Supervisor

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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

Name of the supervisor: Prof. J.P. Karunadasa

Signature of the supervisor: *UOM Verified Signature* Date: 20. 05. 2022

Abstract

The phenomenon of magnetic hysteresis effect of the core material of a transformer plays an important role when representing the transformer in a simulated environment.

Input-output behavior of a transformer is critically correlated with the magnetic properties of the core material which is influenced by the magnetic hysteresis effect. To analyze the magnetizing characteristics of the core material of a transformer, it is required to develop a mathematical model for simulating the hysteresis phenomenon.

As the outcome of this research, reliable representation of magnetizing characteristics of a three-phase transformer core, without considering any core material related parameters, a test based mathematical model is simulated. Mathematical model, which capable of producing magnetic characteristics for any given voltage level is designed by conducting two tests separately for a single phase transformer and three limbs of a three phase transformer.

In the scope of this research, magnetizing characteristic model is developed using Matlab Simulink. Test data required to develop the proposed model is obtained using single phase and three transformer. Results obtained from the developed model is validated with the practically obtained outputs. Practical tests executed on transformer show close connectivity with simulated results evidencing the extensiveness of the designed model.

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List of Abbreviations

B	Magnetic Flux
H	Magnetic Field
JA	Jiles-Atherton
FE	Finite Element
PM	Preisach Model