AUTOMATIC LOAD BALANCING FOR DISTRIBUTION TRANSFORMERS

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Degree of Master of Science in Electrical Engineering

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Dissertation submitted in partial fulfillment of the requirements for the Degree Master of Science in Electrical Engineering

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DECLARATION

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The above candidate has carried out the research for the Master thesis under my supervision.

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Prof.W.D.A.S Wijayapala

Signature of the supervisor: Date:

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Prof. J.P.Karunadasa

ABSTRACT

Automatic load balancer is power electronic based equipment that balances the unbalanced current in the distribution transformers. This is achieved by employing an AC /DC/AC bidirectional current controlling system. The basic principle of this equipment is to draw currents from lightly loaded phases and inject it to heavily loaded phases in such a way that the currents in three phases at the transformer are balanced.

The Automatic Load Balancer proposed in this research consists of a main controller and a bidirectional-inverter. The main controller monitors the current in each phase and computes the unbalanced current that should be injected to or drawn out from individual phases. The computed currents are then injected or delivered as appropriate through the bidirectional-inverter using current control PWM. Therefore, any unbalance in current caused by the loads is rapidly and successfully corrected to ensure balanced three-phase currents at the transformer output, all the time.

Performance of the load-balancer was tested under both the steady-state and dynamic unbalanced current conditions. The results showed excellent performance under both conditions. Thus, the developed load-balancer is a sustainable and advanced solution for the rough manual load-balancing done at present.

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LIST OF ABBREVIATION

PWM	Pulse Width Modulation
HB	Hysteresis Band
RMS	Root mean Square
MOSFET	Metal Oxide Semiconductor Field Effect Transistor
HBCC	Hysteresis Band Current Controller
PLL	Phase Locked Loop
A/D	Analogue to Digital
DAC	Digital to Analogue Converter

OBJECTIVES

The main objective of this research is to develop a power electronic based solution for automatic load balancing for a distribution transformer, and thereby to minimize distribution losses, preserving economic viability.