

ANALYZING ECONOMIC BENEFIT AND PERFORMANCE OF STEP-LAP CORES OVER CONVENTIONAL CORES IN DISTRIBUTION TRANSFORMERS

Master of Science Dissertation



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February 2011



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A dissertation submitted to the
Department of Electrical Engineering, University of Moratuwa
in partial fulfilment of the requirements for the
Degree of Master of Science



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February 2011

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Declaration

The work submitted in this dissertation is the result of my own investigation, except where otherwise stated.

It has not already been accepted for any degree, and is also not being concurrently submitted for any other degree.

UOM Verified Signature

T. C. D. A. Gunawardhana

Date: 09/02/11

We/I endorse the declaration by the candidate.

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Prof. J.R. Lucas 10/02/2011

Abbreviations

ANN	Artificial Neural Network
CEB	Ceylon Electricity Board
CRGO	Cold Rolled Grain Oriented
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
LECO	Lanka Electricity Company
LKR	Sri Lankan Rupees
LL	Load Loss
LTL	LTL Transformers (Pvt.) Ltd.
NLL	No Load Loss
SPP	Simple Payback Period
USD	United State Dollars



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Abstract

The step-lap core manufacturing technique for distribution transformers can be considered as an emerging technology in the transformer industry in the Asian region, but a well practiced design in the European and other developed countries where transformer industry is updated with modern facilities with high tech machinery in their production lines.

The LTL Transformers (Pvt.) Ltd., the sole manufacturer of distribution transformers in Sri Lanka has taken the initiative to purchase a modern core cutting line with the step-lap technology. This project focuses on studying the behaviour of core joint and does a comparative evaluation of the performance and economics of conventional cores and step-lap cores in distribution transformers.

In particular, the effects of core joints on core performance were studied. A Feasibility study was done on the LTL design cores. The Step-lap cores were manufactured using the available core cutting line and the performance data were compared with that of conventional type cores.



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The study shows that the core loss in distribution transformers can be reduced by about 8% with the introduction of the step-lap core. The study concludes by showing that replacing the conventional core cutting line with modern high-tech machine for producing step-lap cores is viable with a payback period of 7 to 8 years.

Acknowledgement

At the very beginning, I offer my sincerest gratitude to my supervisor, Professor Rohan Lucas, without his support and guidance given throughout, this project would not have been a success. My thanks should also go to Dr. J. P. Karunadasa, Head of the Department of Electrical Engineering, and the other members of the academic staff of the Department of Electrical Engineering, for their valuable suggestions and comments.

I would like to thank specially, the staff in the Department of Electrical Engineering and in the Post Graduate Division of the Faculty of Engineering of University of Moratuwa for their excellent support and cooperation.

I am specially thankful to my colleagues at LTL Transformers (Pvt.) Ltd. for providing assistance in numerous ways to carry out my project.

Finally, I would like to thank my family for their understanding, motivation and patience.



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