ANALYSING OF VOLTAGE SURGES IN GRID SUBSTATION AUXILIARY SUPPLY

By

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Abstract

In Sri Lankan National Electricity Grid, severe voltage fluctuations have been noticed in the Grid Substation auxiliary supply. The auxiliary supply is quantitatively 200kVA, but very important to keep in good health because it provides power to all substation equipment installed in GSSs, such as battery charger units and power supply modules for various types of protective monitoring and measuring instruments. Due to these fluctuations, not only the protective equipment, but also the small power equipment such as computers, Air conditioners and substation lights are also had frequent failures. It is observed all these failures to the equipment and substation lights have been experienced just after the tr pping of feeders due to an earth fault.

The objective of the research is to analyze the problem of voltage fluctuations in the auxiliary supply in Grid Substations and find the possible remedies. The studies presented in this report are mainly focused on the Earthing Transformer, which provides the power to the Auxiliary equipments. The earthing transformers in bulk of the GSSs are a Zig-Zag wound transformer with an low voltage auxiliary winding.

Unfortunately, there are no models for Zig-Zag transformer readily available for simulation of the problem using computer software. Therefore the purpose of simulation of the problem in this report is mainly based on a Prototype transformer, which was wound specifically for the purpose.

The possible cause to the voltage surges experienced in the auxiliary supply at an earth fault is due to the extra flux in the grounding transformer limbs and the leakage flux of primary windings directly influencing the auxiliary winding, resulting an extra voltage induced in the auxiliary winding. The arrangement of the winding in each limb has made a huge impact on the problem.

The integration of two functions has created a negative impact on the performance of the transformer. As a solution, firstly, this report suggest to split the two functions integrated in the grounding transformer i e use separate transformer for grounding the 33kV side of the GSS and an other separate transformer for auxiliary and control supply for the GSS. Secondly, re-arrange the windings in such a way that the no resultant flux induces due to the fault current injected into the neutral of the grounding transformer

DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and behalf, it contains no material previously published or written by another person nor material, which to substantial extent, has been accepted for the award of any other academic qualification of an university or institute of higher learning except where acknowledgment is made in the text.

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UOM Verified Signature

Dr. J.P. Karunadasa
Project Supervisor
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JDKG Hemaratne
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Contents

ACRONYMS

CEB	-	Ceylon Electricity Board
MW	-	Mega Watt
kV	-	killo Volt
HV	-	High Voltage
LV	-	Low Voltage
GSS	-	Grid Substation
AVR	-	Automatic Voltage Regulator
AC	-	Air Conditioner
rms	-	Root Mean Square