COMPARATIVE EVALUATION ON STATOR INSULATION METHODOLOGIES OF OLD LAXAPANA PRIOR AND AFTER REHABILITATION

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Degree of Master of Science

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Declaration of candidate and the supervisor

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Abstract

Key words: Stator**,** Ground wall insulation, Global Vaccum Pressure Impregnation, Vacuum Pressure Impregnation

All the hydro and thermal generators belonging to Ceylon Electricity Board, Sri Lanka are manufactured according to the Vacuum Pressure Impregnation (VPI) process except for the three new generators installed in Old Laxapana Power Station during the recent rehabilitation project (2012/2013). These three units replaced the previously existed VPI generators. The manufacturing process utilized for these generators is known as Global Vacuum Pressure Impregnation (GVPI). Even though GVPI process is more economical and offers many advantages, several cases of premature failures of GVPI generators have been reported worldwide. This influenced carrying out this study to assess the insulation condition of GVPI insulation comparatively with the VPI insulation. One new GVPI stator and two VPI stators were selected as test specimens. Removed stator of Old Laxapana and newly installed stator of Wimalasurendra Power Stations were selected to represent VPI insulation. During this research, the condition of the GVPI Stator was evaluated using the DC ramped high voltage test and Frequency Domain Spectroscopy (FDS) test. A mathematical model that has been established by both local and international research was utilized for separating the current components of the total measured current of the DC ramped high voltage test. By the current component separation it could be observed that minimum absorption current was required for the new GVPI insulation, which is an indication of superior quality of the insulation. The FDS test revealed important information of the dielectrics in the low frequency region. The results proved that minimum dielectric loss and minimum moisture absorption of all the three samples was for the GVPI insulation. The new VPI insulation had losses and moisture absorption lesser than the old VPI stator but nevertheless it could not match the low values of the GVPI insulation. Hence it could be clearly concluded that the GVPI insulation has better performance over VPI insulation.

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Abbreviations

AC	- Alternating Current
AESIEAP	-Association of the Electricity Supply Industry of the East Asia and West Pasific
CEB	-Ceylon Electricity Board
DC	-Direct Current
DIRANA	-Dielectric Response Analyser
ELCID	-Electromagnetic Core Imperfection Detection
FDS	-Frequency Domain Spectroscopy
GVPI	-Global Vacuum Pressure Impregnation
IEC	-International Electrotechnical Commission
IEEE	-Institute of Electronic and Electrical Engineers
kV	-Kilo Volts
MW	-Mega Watts
OLPS	-Old Laxapana Power Station
PD	-Partial Discharge
RMSE	-Root Mean Squared Error
SSE	-Sum of Squared Errors
UK	-United Kingdom
VPI	-Vacuum Pressure Impregnation
WPS	-Wimalasurendra Power Station

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