Ain shams university
Faculty of engineering
Electric power and Machines department

STUDY OF THE APPLICATION OF FIBERGLASS REINFORCED POLES IN MEDIUM VOLTAGE SYSTEM IN EGYPT

A Thesis Submitted in Partial Fulfillment for the requirement of The Degree Of Master Of Science In Electrical Engineering

By

Mai Samir Ramadan El Shiekh

B.Sc. Electrical Engineering, Ain Shams University, 2005

Supervised By

Prof Dr. Soliman Mohamed El Debeiky
Electric Power and Machines Department
Faculty of Engineering, Ain Shams University

Dr. Salem Mahmoud El Khodary
Electric Power and Machines Department
Faculty of Engineering, Ain Shams University

Dr. Nahed Ahmed Abuo Heggy
Egyptian electricity holding company

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Ain Shams University-Faculty of Engineering
Electric Power and Machines Department

Agreement Report

Student Name : Mai Samir Ramadan El Shiekh

Thesis title : study of the application of fiberglass reinforced poles in medium voltage system in Egypt.

Degree Name : Master of Science in Electrical Engineering

Supervised by

Prof. Dr. Soliman Mohamed El- Debeiky
Electric Power and Machine Department,
Faculty of Engineering, Ain Shams University

Dr. Salem Mahmoud ElKhodary
Electric Power and Machine Department,
Faculty of Engineering, Ain Shams University.

Dr. Nahed Ahmed Abuo Heggy
Egyptian Electricity Holding Company.

Examiners Committee:

Prof. Dr. Mahmoud Abdel Hamed Moustafa
Faculty of Engineering, Ain Shams University.

A. Prof. Dr. Loai Saad El-Deen Nasrat
Vice Deen Faculty of Engineering, South Valley University.

Prof. Dr. Soliman Mohamed El- Debeiky
Faculty of Engineering, Ain Shams University

Dr. Salem Mahmoud ElKhodary
Faculty of Engineering, Ain Shams University

} Supervision committee

STATEMENT

This disseration is submitted to Ain Shams University for the degree of Master in Electrical Engineering.

The work included in this thesis was carried out by the author. No part of this thesis has been submitted for a degree or a qualification.

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ABSTRACT

The fiberglass reinforced distribution pole was recently introduced to power distribution systems as they have many advantages such as they are lightweight, nonmagnetic, corrosion resistance, thermally and electrically nonconductive. As a result of the development which has taken place recently; these composite materials can be produced with various electrical, thermal and mechanical properties according to their intended purpose.

Fiberglass reinforced polymers are subjected to a variety of enviromental stresses such as heat, sunlight (Ultra violet), moisture and contamination which can cause degradation of their characteristics. It is important to assess the effects of the various enviromental degradation factors on the surface flashover voltage and erosion performance of the material in use. Hence, the present work will present experimental results obtained regarding the electrical and mechanical performance of Fiberglass reinforced polymers material under enviromental conditions.

Flashover characteristics (impulse and AC flashovers) were investigated for FRP specimens in clean and dry condition, and after immersing in salty water with different salinities and then dried to simulate the effect of marine conditions.

For the purpose of studying the effect of chemical pollution, several specimens of FRP were individually immersed in sulphuric acid as well as in nitric acid with 10%, 30%, and 50% concentrations for one week. Afterthat, each specimen was taken off from the solution and then

investigated electrically, visually by scanning electron microscope (SEM), mechanically by measuring the compression failing load, and physically by measuring the swelling effect.

Electric and magnetic field between the applied FRP poles and between traditional steel poles were measured to detect the right of way (ROW), which is another factor to assure the technical properties of the application of the designed FRP poles in medium voltage system in Egypt.

Based on the obtained results of the electrical, mechanical and physical properties of the selected composition of the fiberglass reinforced poles, they are recommended for use in the medium voltage network of Egypt.

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LIST OF APPREVIATIONS

FRP	: Fiber glass Reinforced Polymer
ROW	: Right Of Way
OHTL	: Overhead Transmission Lines
AC	: Alternating Current
SEM	: Scanning Electron Microscope
IEC	: International Electrotechnical Commission
CEA	: Canadian Electric Association
CERRE	: Centre de Recherché de Reseau Exterior
EDM	: Engineering Data Management
MV	: Medium Voltage
CFO	: Critical Flashover
HCL	: Hydrochloric Acid
NO_2	: Nitrogen Dioxide
SO_2	: Sulphur Dioxide
SO_4^{2-}	: Sulphate
NO_3^-	: Nitrate

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