شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

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التوثيق الالكتروني والميكروفيلم

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بالرسالة صفحات

لم ترد بالاصل

University of El-Mansoura
Faculty of Engineering
Electrical Engineering Department

A study of Ferroresonance Phenomenon in Power Systems

By

Eng. Esam Ali Ali Saafan

A Thesis Submitted In Partial Fulfillment For The Requirements
Of The Degree Of Master Of Science In Electrical Engineering

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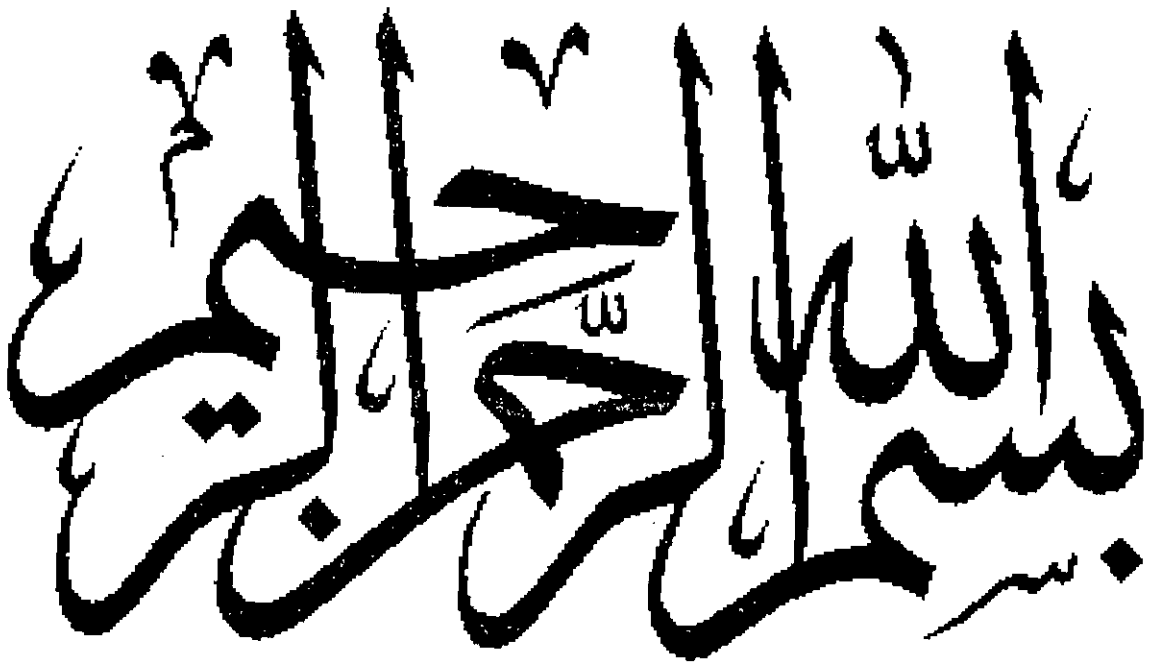
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Esam Ali Ali Saafan

ABSTRACT

Ferroresonance or nonlinear resonance is a complex electrical phenomenon, which may cause overvoltages and overcurrents with dangerous effects on electrical equipments. It causes protective devices, potential transformers and measuring instruments damages.

A reliable prediction of the ferroresonance overvoltages can provide valuable information to planners to design the system, engineers to specify the equipment and operators to run the system within all the design and tested criteria and capabilities. This comprehensive understanding can be achieved if all system parameters are available or can be estimated with reasonable accuracy. It can also indicate which parameters affect the phenomenon and could be used to control it. In our case study, these parameters are suspected to be source voltage magnitude, de-energization phase angle, transformer winding connections, and the capacitive coupling between bus conductors.

In this research, the system under study has been chosen from practice such that it has overvoltages and overcurrents which cause potential transformers damages. The system has been modeled using PSCAD. Detailed analysis is performed to investigate the relation between system parameters and the occurrence of the phenomenon. Based on this analysis many mitigation means are proposed. These mitigation means are Ferroresonance Suppression Circuit (FSC), controlling the capacitive coupling between bus conductors, and Metal-Oxide Varistor (MOV) arrester.

In case of FSC a feedback control system has been designed and constructed to detect and dampen ferroresonant oscillations. The design of the damping elements (resistors or inductors) has been undertaken to maximize damping effect and improve system performance.

Changing the bus capacitance has been also successfully undertaken as a mitigation means to the ferroresonance overvoltages. Also investigation of the implementation of MOV arrester has been performed to avoid the risk of the ferroresonance phenomenon.

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