



# **CONDITION MONITORING OF POWER TRANSFORMERS USING FREQUENCY RESPONSE ANALYSIS**

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## Abstract

Power transformers are the most expensive and important equipment of a high voltage power system. Therefore it is essential to have a suitable and effective condition monitoring system to assess the conditions of power transformers well in advance to maintain the reliability of the power system by averting unexpected expensive failures.

Conventional condition monitoring techniques do not conclusively indicate mechanical conditions of the transformer such as winding movement, loss of clamping pressure, disc movements etc. which can take place during handling and transport, short circuit forces, faults in the power system network near the transformer or a high voltage stress which affects inductance or capacitance.

This project thesis deals with Frequency Response Analysis technique for condition monitoring of power transformers, which is suitable for detecting the deformation of transformer windings.



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A mathematical model for obtaining frequency response characteristics has been developed for a typical transformer, and the effect of variation of parameters on frequency response has been examined. Case studies based on frequency response tests on typical 31.5 MVA, 132/33 kV grid transformers have been presented.

Case studies reveal that any mechanical deformation in the transformer winding is clearly reflected in the frequency response characteristics. The frequency response characteristics obtained in the field for different aged power transformers are found to be somewhat similar in nature to those obtained analytically using ladder network equivalent circuit.

# DECLARATIONS

I certify that this thesis has not been previously presented in whole or part to a University or Institution for a higher degree.



R. P. Tilakeratne  
August 2004


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