COMPUTER SIMULATION OF TRANSFORMER MAGNETIZING INRUSH CURRENT

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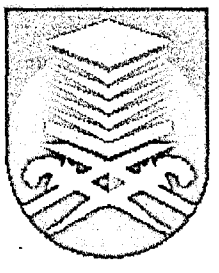

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ABSTRACT

Inrush currents in transformers, which are resulted from system transient, are difficult to observe and analyze. Measurements of this inrush current offer important data for power system operation and protection.

This paper proposes a simple method to simulate the calculation of magnetizing inrush current. The proposed method formulates a simplified model to present the inrush current under different loading conditions and switching angle.

A program was developed using MATLAB 6.0 to perform the calculation of the magnetizing inrush current and to provide the simulation for the proposed method.

Results obtained for the simulation shows that the developed method can provide faster calculation of magnetizing inrush current.

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INTRODUCTION

1.0 Introduction

A transformer is a device that changes electric power at one voltage level to electric power at another voltage level through the action of a magnetic field. It consists of two or more coils of wire wrapped around a common ferromagnetic core. These coils are not directly connected. The only connection between the coils is the common magnetic flux present within the core.

One of the transformer windings is connected to a source of ac electric power, and second winding supplies electric power to loads. The transformer winding connected to the power source is called the primary winding or input winding, and the winding connected to the loads is called the secondary winding or input winding. There are different types of transformers, such as single-phase transformer, autotransformers and three-phase transformers. The main uses of electrical transformers are for changing the magnitude of an ac voltage, providing electrical isolation and matching the load impedance to the source.

The phenomenon of magnetizing inrush current in transformers at energization has long been a problem in the design and performance of differential protective relays used in power transmission and distribution system.

The steady-state magnetizing current of a transformer may be only 1-2 percent of the rated current, but it may reach 10-20 times rated current when the transformer is switched on to a source. The transient effect may persist for several seconds before the steady state condition is reached and cause unnecessary tripping of a differential protective relay [4].