

ABSTRAK

PEMODELAN *ADAPTIVE NEURO-FUZZY INFERENCE SYSTEM* UNTUK RELAY DIFFERENSIAL TRANSFORMATOR DAYA 56 MVA DI PLTG *MPP* TARAHAH

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Abstrak-Transformator daya adalah salah satu peralatan penting dalam operasi sistem tenaga. Oleh karenanya, semakin meningkatnya kebutuhan energi listrik keandalan transformator daya harus terjaga. Transformator daya diperlengkapi dengan sistem proteksi yang berfungsi meminimalisir terjadinya kerusakan akibat gangguan, salah satu di antaranya adalah relay differensial. Sensitivitas kerja relay differensial terhadap gangguan yang terjadi pada transformator daya menjadi perhatian penting. Tujuan dari penelitian ini adalah untuk pemodelan relay differensial berbasis sistem cerdas *Adaptive Neuro-Fuzzy Inference System (ANFIS)*. Studi kasus yang digunakan adalah transformator daya di Pembangkit Listrik Tenaga Gas (PLTG) *Mobile Power Plant (MPP)* Tarahan. Simulasi kerja relay differensial pada berbagai kondisi gangguan internal dilakukan menggunakan perangkat lunak Matlab Simulink. Uji validasi data untuk berbagai kondisi gangguan sebelum dan sesudah digantikan oleh sistem cerdas *ANFIS* dilakukan dengan nilai total kesalahan kuadrat rata-rata (*root mean square error/RMSE*). Setelah dilakukan simulasi dan uji validasi, diperoleh hasil perbandingan nilai maksimum arus perbedaan dari masing-masing fasa di sisi primer dan sekunder transformator daya pada berbagai jenis gangguan sebelum dan sesudah digantikan oleh sistem cerdas *ANFIS* menghasilkan nilai total *RMSE* pada masing-masing fasa sebesar R=0,000004; fasa S=0,000015; dan fasa T=0,000003. Maka dari hasil tersebut dapat disimpulkan bahwa dengan pemodelan metode *ANFIS* yang dipilih dapat digunakan untuk menggantikan relay differensial original untuk memprediksi saat kondisi normal maupun saat diberikan gangguan internal.

Kata Kunci : Transformator Daya, Relay Differensial, Gangguan Internal, *Adaptive Neuro-Fuzzy Inference System*, *Root Mean Square Error*

ABSTRACT

MODELING OF ADAPTIVE NEURO-FUZZY INFERENCE SYSTEM FOR A 56 MVA POWER TRANSFORMER DIFFERENTIAL RELAY AT PLTG MPP TARAHAH

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Abstract- The power transformer is one of the important equipments in the operation of the power system. Therefore, the increasing demand for electrical energy, the reliability of the power transformer must be maintained. The power transformer is equipped with a protection system that functions to minimize the occurrence of damage due to interference, one of which is a differential relay. The work sensitivity of differential relays to disturbances that occur in power transformers is an important concern. The purpose of this research is to model differential relays based on the Adaptive Neuro-Fuzzy Inference System (ANFIS) intelligent system. The case study used is a power transformer at the Tarahan Mobile Power Plant (MPP) Gas Power Plant (PLTG). Differential relay working simulation on various internal fault conditions was carried out using Matlab Simulink software. Data validation tests for various disturbance conditions before and after being replaced by the ANFIS intelligent system were carried out with the root mean square error (RMSE). After simulation and validation tests have been carried out, the results of the comparison of the maximum value of the difference current of each phase on the primary and secondary sides of the power transformer on various types of faults before and after being replaced by the ANFIS intelligent system produce a total RMSE value for each phase of R = 0.000004; phase S=0.000015; and phase T=0.000003. So from these results it can be concluded that the modeling of the selected ANFIS method can be used to replace the original differential relay to predict when conditions are normal or when an internal fault is given.

Keywords: Power Transformer, Differential Relay, Short Circuit Interference, Fuzzy Inference System, Root Mean Square Error