

## **ABSTRAK**

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### **ANALISIS SISTEM PROTEKSI TRANSFORMATOR DENGAN MENGGUNAKAN RELAY DIFFERENTIAL PADA PEMBANGKIT LISTRIK TENAGA DIESEL AMPENAN**

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Transformator daya berkapasitas 10 MVA dengan tegangan 20 kV/6,3 kV di Pembangkit Listrik Tenaga Diesel (PLTD) Ampenan merupakan peralatan vital yang memerlukan sistem proteksi andal. Penelitian ini menganalisis sistem proteksi transformator menggunakan relay diferensial sebagai proteksi utama untuk mendeteksi gangguan internal seperti hubung singkat antar lilitan atau kerusakan isolasi, dengan tujuan mengetahui setting relay eksisting, menentukan metode setting yang tepat, serta mengevaluasi kinerja sistem proteksi agar mampu bekerja cepat, selektif, dan andal. Metode penelitian meliputi pengumpulan data spesifikasi transformator, log gangguan, hasil pengukuran operasi, perhitungan arus nominal, arus CT, arus ratio dan simulasi menggunakan perangkat lunak ETAP 19.01 untuk memverifikasi perhitungan arus nominal, rasio current transformer, serta respon relay diferensial terhadap kondisi normal, gangguan internal, dan eksternal. Hasil analisis menunjukkan bahwa gangguan dominan adalah internal seperti kerusakan tap changer dan trip diferensial, dengan arus nominal transformator sebesar 916,4 A pada sisi primer dan 288,7 A pada sisi sekunder, serta relay diferensial terbukti selektif dan efektif dalam mendeteksi gangguan internal tanpa trip palsu pada kondisi normal. Kesimpulan penelitian menyatakan sistem proteksi relay diferensial memiliki keandalan tinggi dalam menjaga keandalan transformator, dengan saran untuk pengelolaan pembebanan yang lebih ketat, evaluasi setting berkala, dan peningkatan pemantauan kondisi transformator guna memperpanjang umur operasi peralatan.

Kata Kunci : Relay Diferensial, Transformator Daya, Sistem Proteksi, PLTD Ampenan, Keandalan Sistem

## ***ABSTRACT***

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### *TRANSFORMER PROTECTION SYSTEM ANALYSIS USING DIFFERENTIAL RELAY IN THE AMPENNAN DIESEL POWER PLANT*

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*The 10 MVA power transformer with 20 kV/6.3 kV voltage at the Ampenan Diesel Power Plant (PLTD) is a vital piece of equipment that requires a reliable protection system. This study analyzes the transformer protection system using a differential relay as the primary protection to detect internal faults such as short circuits between windings or insulation damage, with the objectives of determining the existing relay settings, establishing the appropriate setting method, and evaluating the protection system's performance to ensure it operates quickly, selectively, and reliably. The research methods include collecting transformer specification data, fault logs, operational measurement results, calculations of nominal current, CT current, current ratio, and simulations using ETAP 19.01 software to verify the nominal current calculations, current transformer ratio, and the differential relay's response to normal conditions, internal faults, and external faults. The analysis results show that the dominant faults are internal, such as tap changer damage and differential trips, with the transformer's nominal current at 916.4 A on the primary side and 288.7 A on the secondary side, and the differential relay proves to be selective and effective in detecting internal faults without false trips under normal conditions. The study concludes that the differential relay protection system has high reliability in maintaining transformer reliability, with recommendations for stricter load management, periodic setting evaluations, and enhanced transformer condition monitoring to extend the equipment's operational lifespan.*

*Keywords: Differential Relay, Power Transformer, Protection System, Ampenan Diesel Power Plant, System Reliability*