ABSTRAK

ANALISA KINERJA SISTEM SENTRALISASI DC *SOURCE* PADA SISTEM PROTEKSI DAN *STARTING* MESIN DIESEL PLTD SAWAI BARU

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Sistem suplai arus searah (DC) memiliki peran penting dalam menjaga keandalan sistem proteksi dan *starting* mesin pada pembangkit listrik tenaga diesel (PLTD). Pada PLTD Sawai Baru, setiap unit mesin Mitsubishi S16R PTA-S masih menggunakan sumber DC yang terpisah antar mesin sehingga menyebabkan efisiensi energi rendah, kompleksitas pemeliharaan meningkat, serta menurunkan keandalan sistem akibat tidak adanya redundansi suplai daya. Penelitian ini bertujuan untuk menganalisis kinerja sistem sentralisasi DC *source* yang digunakan secara bersama pada sistem proteksi dan *starting* beberapa unit mesin diesel di PLTD Sawai Baru. Metode penelitian yang digunakan meliputi studi literatur teknis, pengumpulan data lapangan, pemetaan kebutuhan daya DC, analisis rugi tegangan dan efisiensi distribusi daya, serta evaluasi keandalan sistem menggunakan pendekatan perhitungan *availability* dan analisis risiko gangguan. Pengujian dilakukan dengan membandingkan parameter kelistrikan dan operasional antara sistem DC terpisah dan sistem DC terpusat. Hasil penelitian menunjukkan bahwa penerapan sistem sentralisasi DC *source* mampu menurunkan rugi tegangan distribusi sebesar 2,14% pada unit 7 dan 1,64% pada unit 8, sehingga masih berada dalam batas standar distribusi tegangan DC. Selain itu, sistem sentralisasi DC meningkatkan nilai *availability* sistem dari 98,6% pada sistem eksisting menjadi 99,9%. Penerapan sistem ini juga meningkatkan fleksibilitas suplai daya, optimalisasi pemanfaatan baterai dan *charger* DC, serta mempermudah proses pemeliharaan sistem. Hasil penelitian ini menunjukkan bahwa sistem sentralisasi DC source berpotensi meningkatkan keandalan operasi pembangkit dan dapat dijadikan referensi pengembangan sistem suplai DC pada PLTD sejenis.

Kata kunci: Sistem DC, sistem proteksi, sistem *starting* , sentralisasi DC, PLTD Sawai Baru, keandalan sistem.

ABSTRACT

PERFORMANCE ANALYSIS OF A CENTRALIZED DC SOURCE SYSTEM FOR PROTECTION AND DIESEL ENGINE STARTING SYSTEMS AT PLTD SAWAI BARU

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The direct current (DC) supply system plays an important role in maintaining the reliability of protection and starting systems in diesel power plants (PLTD). At PLTD Sawai Baru, each Mitsubishi S16R PTA-S diesel engine unit still utilizes a separate DC power source. This condition results in low energy efficiency, increased maintenance complexity, and reduced system reliability due to the absence of power supply redundancy. This study aims to analyze the performance of a centralized DC source system used collectively for protection and starting systems of multiple diesel engine units at PLTD Sawai Baru. The research method includes technical literature study, field data collection, DC power demand mapping, voltage drop and distribution efficiency analysis, and system reliability evaluation using availability calculation and fault risk analysis approaches. Testing was conducted by comparing electrical and operational parameters between the separated DC system and the centralized DC system. The results show that the implementation of a centralized DC source system reduces distribution voltage drop by 2.14% in Unit 7 and 1.64% in Unit 8, which remains within acceptable DC voltage distribution standards. Furthermore, the centralized DC system improves system availability from 98.6% in the existing system to 99.9%. The implementation of this system also enhances power supply flexibility, optimizes battery and DC charger utilization, and simplifies maintenance processes. The findings indicate that the centralized DC source system has significant potential to improve power plant operational reliability and can be used as a reference for DC supply system development in similar diesel power plants.
Keywords: *DC system, protection system, starting system, centralized DC source, PLTD Sawai Baru, system reliability.*