ANALISIS PREVENTIVE MAINTENANCE PADA TURBIN FRANCIS TIPE HORIZONTAL KAPASITAS 6 MW DENGAN METODE *MEAN TIME BETWEEN FAILURE* (MTBF) DAN *MEAN TIME TO REPAIR* (MTTR) DI PLTA PAKKAT PT. ENERGY SAKTI SENTOSA

ABSTRAK

Keandalan turbin merupakan faktor penting dalam menjaga kontinuitas operasi Pembangkit Listrik Tenaga Air (PLTA). Penelitian ini bertujuan untuk menganalisis efektivitas *preventive maintenance* pada turbin Francis tipe horizontal berkapasitas 6 MW di PLTA Pakkat PT. Energi Sakti Sentosa menggunakan metode *Mean Time Between Failure* (MTBF) dan *Mean Time To Repair* (MTTR). Penelitian menggunakan pendekatan kuantitatif dengan memanfaatkan data historis operasi dan pemeliharaan turbin selama periode Mei 2025 hingga Mei 2026. Data diperoleh melalui observasi lapangan, wawancara, studi dokumentasi, dan studi literatur. Analisis dilakukan dengan menghitung nilai MTBF, MTTR, dan *availability* sebagai indikator keandalan dan kinerja sistem pemeliharaan. Hasil penelitian menunjukkan bahwa nilai MTBF sebesar 558,19 jam, MTTR sebesar 2,30 jam, dan *availability* sebesar 92,24%. Berdasarkan nilai MTBF, interval *preventive maintenance* yang direkomendasikan adalah setiap 446,55 jam operasi atau sekitar 18–19 hari operasi kontinu. Hasil tersebut menunjukkan bahwa sistem *preventive maintenance* yang diterapkan telah memberikan tingkat keandalan yang cukup baik, namun masih perlu dioptimalkan melalui penjadwalan pemeliharaan yang lebih efektif, pemantauan kondisi komponen secara berkala, dan penerapan pendekatan *condition-based maintenance* untuk meningkatkan *availability* serta mengurangi *downtime* akibat kerusakan mendadak.

Kata kunci: *Preventive Maintenance*, Turbin Francis, MTBF, MTTR, *Availability.*

ANALYSIS OF PREVENTIVE MAINTENANCE ON 6 MW HORIZONTAL TYPE FRANCIS TURBINE USING THE MEAN TIME BETWEEN FAILURE (MTBF) AND MEAN TIME TO REPAIR (MTTR) METHODS AT THE PAKKAT HYDROPOWER PLANT OF PT.ENERGY SAKTI SENTOSA

ABSTRACT

The reliability of a turbine is a crucial factor in ensuring the continuous operation of a hydropower plant. This study aims to analyze the effectiveness of preventive maintenance on a 6 MW horizontal Francis turbine at Pakkat Hydropower Plant, PT. Energi Sakti Sentosa, using the Mean Time Between Failure (MTBF) and Mean Time To Repair (MTTR) methods. A quantitative approach was employed using historical turbine operation and maintenance data collected from May 2025 to May 2026. The data were obtained through field observations, interviews, documentation, and literature review. The analysis was conducted by calculating MTBF, MTTR, and availability as indicators of equipment reliability and maintenance performance. The results show that the turbine achieved an MTBF value of 558.19 hours, an MTTR value of 2.30 hours, and an availability of 92.24%. Based on the MTBF value, the recommended preventive maintenance interval is 446.55 operating hours, equivalent to approximately 18–19 days of continuous operation. These findings indicate that the existing preventive maintenance program has provided a satisfactory level of reliability. However, further improvement can be achieved by optimizing maintenance scheduling, performing regular condition monitoring of critical components, and implementing a condition-based maintenance approach to enhance equipment availability and reduce unplanned downtime.

Keywords: *Preventive Maintenance, Francis Turbine, MTBF, MTTR, Availability.*