INTISARI

ANALISIS *MEAN TIME BETWEEN FAILURE* DAN *RELIABILITY* PEMUTUS TENAGA 150 KV GARDU INDUK BANTUL MENGGUNAKAN METODE *MAXIMUM LIKELIHOOD ESTIMATION*

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Seiring kemajuan teknologi di era modern, kebutuhan dan konsumsi energi listrik di masyarakat mengalami peningkatan pesat. Dengan kebutuhan energi listrik terus meningkat, berbagai gangguan pada sistem kelistrikan, tidak dapat diprediksi kapan terjadi, termasuk di gardu induk. Pemutus Tenaga (PMT) merupakan peralatan vital dalam sistem tenaga listrik Gardu Induk 150 kV Bantul yang berfungsi untuk memutus rangkaian listrik dalam keadaan berbeban guna mencegah gangguan dan kerusakan pada peralatan serta memastikan kelancaran penyaluran energi listrik ke konsumen. Berdasarkan peranan PMT, perkiraan waktu kegagalan PMT masih belum dikaji secara mendalam. Penelitian ini bertujuan untuk menganalisis *Mean Time Between Failure* dan *Reliability* PMT Gardu Induk 150 kV Bantul. Metode yang digunakan dalam mengkaji usia pakai PMT yaitu *Maximum Likelihood Estimation*. Data yang digunakan adalah hasil pengamatan terhadap sepuluh PMT yang berbeda di Gardu Induk Bantul. Hasil analisis menunjukkan bahwa nilai rata-rata periode waktu antara kegagalan (MTBF) bervariasi antara PMT yang berbeda. Nilai MTBF tertinggi adalah PMT Wirobrajan 2 dengan jangka kerusakan sekitar 14,55 bulan, sedangkan MTBF terendah yaitu PMT Semanu 2 dengan jangka kerusakan 5,48 bulan. Hasil analisis probabilitas kegagalan, probabilitas kegagalan kumulatif, probabilitas keandalan, serta laju kerusakan PMT 150 kV menunjukkan variasi yang signifikan antar PMT yang berbeda. Nilai *Reliability* menghasilkan nilai terendah pada PMT Trafo 3. Sedangkan nilai *Reliability* tertinggi menghasilkan nilai tertinggi yaitu pada PMT Kopel. Dengan diketahui MTBF dan *Reliability* PMT 150 kV pada Gardu Induk Bantul, dapat digunakan sebagai dasar untuk pemeliharaan dan perawatan PMT dalam operasionalnya di Gardu Induk Bantul.

Kata kunci: Pemutus Tenaga*, Maximum Likelihood Estimation*, Keandalan, *Mean Time Between Failure, Distribusi Probabilitas*

ABSTRACT

ANALYSIS OF MEAN TIME BETWEEN FAILURE AND RELIABILITY OF 150 KV CIRCUIT BREAKERS AT BANTUL SUBSTATION USING MAXIMUM LIKELIHOOD ESTIMATION METHOD

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As technology advances in the modern era, the need and consumption of electrical energy in society has increased rapidly. With the need for electrical energy continuing to increase, various disturbances in the electrical system cannot be predicted when they will occur, including in substations. The Power Breaker (PMT) is a vital equipment in the Bantul 150 kV substation power system that functions to break the electrical circuit under load to prevent interference and damage to equipment and ensure the smooth distribution of electrical energy to consumers. Based on the role of PMT, the estimation of PMT failure time has not been studied in depth. This study aims to analyze the Mean Time Between Failure and Reliability of the Bantul 150 kV Substation PMT. The method used in assessing PMT life is Maximum Likelihood Estimation. The data used are the results of observations of ten different PMTs in Bantul Substation. The results of the analysis show that the average value of the time period between failures (MTBF) varies between different PMTs. The highest MTBF value is PMT Wirobrajan 2 with a damage period of about 14.55 months, while the lowest MTBF is PMT Semanu 2 with a damage period of 5.48 months. The results of the analysis of failure probability, cumulative failure probability, reliability probability, and damage rate of 150 kV PMTs show significant variations between different PMTs. Reliability value produces the lowest value on PMT Transformer 3. While the highest Reliability value produces the highest value, namely on PMT Kopel. With the known MTBF and Reliability of 150 kV PMT at Bantul Substation, it can be used as a basis for maintenance and maintenance of PMT in its operation at Bantul Substation.

Keyword: *Circuit breaker, Maximum Likelihood Estimation, Reliability, Mean Time Between Failure, Probability Distribution*