

ABSTRAK

Penelitian ini bertujuan untuk menganalisis keandalan mesin LVB CNC di PT PAL Indonesia dengan menggunakan pendekatan *Reliability Centered Maintenance* (RCM). Permasalahan yang sering terjadi pada mesin ini mencakup kerusakan pada komponen seperti crossrail, slideway, table, AC panel, thermal trip, dan servo alarm Z axis. Untuk mengidentifikasi dan mengevaluasi penyebab kegagalan, metode *Failure Mode and Effect Analysis* (FMEA) digunakan dengan penilaian berdasarkan nilai Risk Priority Number (RPN), sedangkan metode *Logic Tree Analysis* (LTA) diterapkan untuk mengkategorikan tingkat kritikalitas kerusakan.

Data kerusakan mesin dikumpulkan berdasarkan catatan downtime selama tahun 2022 hingga 2023. Hasil analisis menunjukkan bahwa komponen crossrail merupakan komponen dengan tingkat kerusakan tertinggi, dengan nilai RPN sebesar 210. Pengujian distribusi keandalan menggunakan software Minitab mengindikasikan bahwa pola kerusakan komponen crossrail mengikuti distribusi Weibull. Dari analisis ini, diperoleh nilai Mean Time to Failure (MTTF), Mean Time to Repair (MTTR), serta estimasi biaya harapan perawatan menggunakan pendekatan *Unit Expected Cost* (UEC).

Berdasarkan hasil tersebut, disusunlah strategi perawatan yang optimal dan usulan interval waktu penggantian komponen guna meningkatkan keandalan sistem dan meminimalkan downtime. Pendekatan RCM terbukti efektif dalam mengidentifikasi prioritas tindakan pemeliharaan serta memberikan kontribusi dalam pengambilan keputusan teknis yang lebih terarah dan ekonomis.

Kata kunci: Reliability Centered Maintenance (RCM), FMEA, LTA, Keandalan Mesin, LVB CNC, MTTF, MTTR, Weibull, UEC.

ABSTRACT

This study aims to analyze the reliability of the LVB CNC machine at PT PAL Indonesia using the Reliability Centered Maintenance (RCM) approach. Common failures on this machine include issues with components such as the crossrail, slideway, table, AC panel, thermal trip, and Z-axis servo alarm. To identify and evaluate the root causes of failure, the Failure Mode and Effect Analysis (FMEA) method was used, based on the Risk Priority Number (RPN), while the Logic Tree Analysis (LTA) method was applied to categorize the criticality level of each failure.

Machine failure data was collected from downtime records during 2022 to 2023. The analysis revealed that the crossrail was the most failure-prone component, with the highest RPN value of 210. Reliability distribution testing using Minitab software indicated that the failure pattern of the crossrail component follows a Weibull distribution. Based on this analysis, the Mean Time to Failure (MTTF), Mean Time to Repair (MTTR), and estimated preventive maintenance cost were calculated using the Unit Expected Cost (UEC) approach.

As a result, an optimal maintenance strategy and proposed component replacement intervals were formulated to improve system reliability and minimize downtime. The RCM approach proved effective in identifying maintenance priorities and contributed to more targeted and cost-efficient technical decision-making.

Keywords: *Reliability Centered Maintenance (RCM), FMEA, LTA, Machine Reliability, LVB CNC, MTTF, MTTR, Weibull, UEC.*