ABSTRACT

This study aims to optimize the physical availability and reliability of dump trucks by implementing an Integrated Maintenance Strategy (IMS), which combines Reliability-Centered Maintenance (RCM), age replacement models, and inventory control methods. The research focuses on the brake system components—Slack Adjuster, Brake Chamber, and Lining Brake—at PT Sinar Baru Wijaya Perkasa. Through Failure Mode and Effect Analysis (FMEA), Logic Tree Analysis (LTA), and task selection, preventive maintenance strategies were developed based on the criticality and failure modes of each component. The optimal replacement intervals were calculated using Time to Failure (TTF) data with normal distribution fitting. Post-maintenance evaluations showed significant improvements in availability (up to 99.94%) and reliability (up to 20.63%), especially on components previously prone to failure. Furthermore, inventory optimization using Economic Order Quantity (EOQ) and Reorder Point (ROP) methods led to more efficient spare parts management. The findings demonstrate that the IMS approach effectively reduces unexpected downtime, improves operational performance, and ensures the sustainability of heavy equipment operations in coal mining.

Keywords: *Integrated Maintenance Strategy, Reliability-Centered Maintenance, Preventive Maintenance, Brake System, Inventory Optimization*

INTISARI

Penelitian ini bertujuan untuk mengoptimalkan ketersediaan fisik dan keandalan unit dump truck melalui penerapan *Integrated Maintenance Strategy* (IMS), yaitu strategi pemeliharaan terintegrasi yang menggabungkan pendekatan *Reliability Centered Maintenance* (RCM), model penggantian berbasis usia (age replacement), serta metode pengendalian persediaan. Fokus penelitian ini adalah pada komponen sistem pengereman, yaitu *slack adjuster, brake chamber*, dan *lining brake* di PT Sinar Baru Wijaya Perkasa. Melalui metode *Failure Mode and Effect Analysis* (FMEA), Logic Tree Analysis (LTA), dan pemilihan tugas (*task selection*), strategi pemeliharaan preventif dikembangkan berdasarkan tingkat kritikalitas dan mode kegagalan dari masing-masing komponen. Interval penggantian optimal ditentukan berdasarkan data *Time to Failure* (TTF) dengan pendekatan distribusi normal. Evaluasi pasca pemeliharaan menunjukkan peningkatan signifikan dalam hal *availability* (hingga 99,94%) dan *reliability* (hingga 20,63%), terutama pada komponen yang sebelumnya sering mengalami kerusakan. Selain itu, pengelolaan persediaan suku cadang menjadi lebih efisien dengan penerapan metode *Economic Order Quantity* (EOQ) dan *Reorder Point* (ROP). Hasil penelitian ini membuktikan bahwa pendekatan IMS secara efektif mampu mengurangi *downtime* tak terduga, meningkatkan kinerja operasional, serta menjamin keberlanjutan operasional alat berat dalam kegiatan pertambangan batubara.

Kata Kunci: *Integrated Maintenance Strategy, Reliability-Centered Maintenance, Preventive Maintenance, Brake System,* Manajemen Gudang.