ABSTRAK

PT. Tri Cahya Purnama Batang merupakan Perusahaan yang bergerak di bidang industri pengolahan kayu dengan produk utama berupa plywood. Salah satu mesin yang berperan penting dalam proses produksi adalah mesin *Rotary Spindle* yang berfungsi mengupas kayu log menjadi lembaran veneer. Tingginya frekuensi kerusakan pada mesin menyebabkan *downtime* yang menghambat proses produksi, menurunkan produktivitas, serta meningkatkan biaya perawatan. Berdasarkan data historis periode Desember 2025 hingga Mei 2026, tercatat sebanyak 51 kejadian breakdown dengan total *downtime* sebesar 86,13 jam. Kondisi tersebut menunjukkan bahwa sistem perawatan yang diterapkan masih bersifat korektif sehingga belum mampu mengendalikan tingkat kegagalan komponen secara optimal. Oleh karena itu, diperlukan penjadwalan maintenance yang tepat untuk meningkatkan keandalan mesin, meminimalkan downtime, dan menekan biaya perawatan.

Penelitian ini bertujuan menentukan penjadwalan maintenance yang optimal pada mesin *Rotary Spindle* menggunakan metode Reliability Centered Maintenance (RCM II). Tahapan penelitian meliputi identifikasi sistem menggunakan Functional Block Diagram (FBD) dan *System Breakdown Structure* (SBS), identifikasi mode kegagalan dan tingkat kekritisan komponen menggunakan FMECA, klasifikasi konsekuensi kegagalan melalui *Logic Tree Analysis* (LTA), analisis distribusi *Time to Failure* (TTF) dan *Time to Repair* (TTR), perhitungan Mean *Time to Failure* (MTTF) dan Mean *Time to Repair* (MTTR), penentuan interval waktu preventive maintenance, penyusunan RCM Decision Worksheet, serta analisis perbandingan biaya corrective maintenance dan preventive maintenance.

Hasil penelitian menunjukkan bahwa *Bearing Roll* merupakan komponen paling kritis dengan nilai Risk Priority Number (RPN) sebesar 245, sedangkan *Shaft Roll* memiliki nilai MTTF terendah sebesar 282,538 jam sehingga menjadi komponen dengan tingkat keandalan terendah. Penjadwalan preventive maintenance menghasilkan interval perawatan optimal pada setiap komponen, yaitu 9 hari, 10 hari, 11 hari, 13 hari, dan 21 hari sesuai tingkat keandalan masing-masing komponen. Penerapan jadwal preventive maintenance mampu menurunkan total *downtime* mesin *Rotary Spindle* dari 86,13 jam menjadi 24,84 jam, sehingga diperoleh minimasi *downtime* sebesar 64.72%. Berdasarkan hasil analisis biaya, penerapan preventive maintenance meningkatkan biaya maintenance sebesar Rp229.172,63 (24,21%) dibandingkan corrective maintenance karena kegiatan pemeliharaan dilakukan secara terjadwal sesuai interval yang diusulkan. Namun, penerapan preventive maintenance mampu menurunkan biaya kehilangan produksi sebesar Rp131.325.843,60 (71,15%) melalui pengurangan downtime mesin. Dengan demikian, preventive maintenance lebih efektif untuk diterapkan karena mampu meningkatkan keandalan mesin serta memberikan penghematan biaya operasional perusahaan secara keseluruhan.

Kata Kunci: Reliability Centered Maintenance (RCM II), Failure Mode, Effects and Criticality Analysis (FMECA), *Rotary Spindle*, Preventive Maintenance, Downtime.

ABSTRACT

PT. Tri Cahya Purnama Batang is a company engaged in the wood processing industry, with plywood as its main product. One of the critical machines in the production process is the Rotary Spindle machine, which functions to peel wood logs into veneer sheets. The high frequency of machine failures has resulted in increased downtime, disrupting the production process, reducing productivity, and increasing maintenance costs. Based on historical data from December 2025 to May 2026, there were 51 breakdowns with a total downtime of 86.13 hours. These conditions indicate that the existing maintenance system is predominantly corrective and has not been able to effectively control component failures. Therefore, an appropriate maintenance scheduling strategy is required to improve machine reliability, minimize downtime, and reduce maintenance costs.

This study aims to determine the optimal maintenance schedule for the Rotary Spindle machine using the Reliability Centered Maintenance (RCM II) approach. The research stages include system identification using the Functional Block Diagram (FBD) and System Breakdown Structure (SBS), identification of failure modes and component criticality using Failure Mode, Effects and Criticality Analysis (FMECA), failure consequence classification through Logic Tree Analysis (LTA), analysis of Time to Failure (TTF) and Time to Repair (TTR) distributions, calculation of Mean Time to Failure (MTTF) and Mean Time to Repair (MTTR), determination of preventive maintenance intervals, preparation of the RCM Decision Worksheet, and comparison of corrective and preventive maintenance costs.

The results indicate that the Bearing Roll is the most critical component with a Risk Priority Number (RPN) of 245, while the Shaft Roll has the lowest Mean Time to Failure (MTTF) of 282.538 hours, indicating the lowest level of reliability. The proposed preventive maintenance schedule resulted in optimal maintenance intervals of 9, 10, 11, 13, and 21 days, depending on the reliability level of each component. The implementation of the proposed preventive maintenance schedule reduced the total machine downtime from 86.13 hours to 24.84 hours, representing a downtime reduction of 64.72%. Although preventive maintenance increased maintenance costs by Rp229,172.63 (24.21%) compared with corrective maintenance due to scheduled maintenance activities, it reduced production loss costs by Rp131,325,843.60 (71.15%) through significant downtime reduction. Therefore, preventive maintenance is considered more effective in improving machine reliability and reducing the company's overall operational costs.

Keywords: Reliability Centered Maintenance (RCM II), Failure Mode, Effects and Criticality Analysis (FMECA), Rotary Spindle, Preventive Maintenance, Downtime.