

INTISARI

Track Roller merupakan komponen kritis pada sistem undercarriage *Crawler Dozer* Komatsu D375A-6 yang beroperasi di area pertambangan batu bara Kutai Timur dengan kontribusi sebesar 23% terhadap total kegagalan komponen undercarriage. Tingginya frekuensi kegagalan tersebut menuntut adanya strategi preventive maintenance berbasis analisis keandalan agar penggantian komponen dapat dilakukan secara optimal. Penelitian ini bertujuan menganalisis reliabilitas komponen *Track Roller Single Flange* dan *Double Flange* menggunakan distribusi *Weibull* dua parameter dan distribusi *Lognormal* pada data tersensor Tipe III periode Mei 2023 hingga Agustus 2025. Estimasi parameter dilakukan menggunakan metode Maximum Likelihood Estimation (MLE), sedangkan pemilihan model distribusi terbaik dilakukan berdasarkan Relative Maximum Likelihood (RML), Akaike Information Criterion (AIC), dan uji Anderson–Darling (AD).

Hasil penelitian menunjukkan bahwa distribusi *Lognormal* secara konsisten memberikan kecocokan terbaik untuk kedua jenis *Track Roller* berdasarkan ketiga indikator goodness-of-fit tersebut. Meskipun demikian, distribusi *Weibull* tetap digunakan sebagai dasar penentuan interval penggantian karena parameter bentuk (β) memiliki interpretasi fisik yang kuat untuk pengambilan keputusan pemeliharaan. Estimasi parameter *Weibull* menghasilkan nilai β sebesar 4,85 untuk *Track Roller Single Flange* dan 6,01 untuk *Track Roller Double Flange*, yang mengindikasikan kedua komponen telah memasuki fase wear-out dengan laju kegagalan (hazard rate) yang meningkat seiring bertambahnya umur operasi. Selain itu, distribusi *Weibull* didasarkan pada weakest-link theory, yaitu konsep bahwa kegagalan sistem atau komponen dipicu oleh bagian yang paling lemah akibat akumulasi cacat atau kerusakan material. Berdasarkan distribusi *Weibull*, interval penggantian preventif yang direkomendasikan menggunakan kriteria B10 Life dengan batas bawah Confidence Interval 90% adalah 2.937 jam operasi untuk *Track Roller Single Flange* dan 3.382 jam operasi untuk *Track Roller Double Flange*.

ABSTRACT

Track Roller is a critical component of the undercarriage system of the Komatsu D375A-6 Crawler Dozer operating in the East Kutai coal mining area, contributing 23% of the total undercarriage component failures. This high failure frequency necessitates a preventive maintenance strategy based on reliability analysis to optimize component replacement. This study aims to analyze the reliability of Track Roller Single Flange and Double Flange components using the two-parameter Weibull distribution and the Lognormal distribution with Type III censored data collected from May 2023 to August 2025. Parameter estimation was performed using the Maximum Likelihood Estimation (MLE) method, while the best-fitting distribution model was selected based on Relative Maximum Likelihood (RML), Akaike Information Criterion (AIC), and the Anderson–Darling (AD) goodness-of-fit test.

The results showed that the Lognormal distribution consistently provided the best fit for both types of Track Rollers based on all three goodness-of-fit indicators. Nevertheless, the Weibull distribution was selected as the basis for determining the preventive replacement interval because its shape parameter (β) provides a strong physical interpretation for maintenance decision-making. The estimated Weibull shape parameter (β) was 4.85 for the Single Flange Track Roller and 6.01 for the Double Flange Track Roller, indicating that both components had entered the wear-out phase, where the hazard rate increases with operating age. Furthermore, the Weibull distribution is based on the weakest-link theory, which assumes that system or component failure is initiated by its weakest region due to the accumulation of defects or material degradation. Based on the Weibull distribution, the recommended preventive replacement intervals using the B10 Life criterion with the lower bound of the 90% confidence interval were 2,937 operating hours for the Single Flange Track Roller and 3,382 operating hours for the Double Flange Track Roller.