

## INTISARI

### **ANALISIS PREDIKSI UMUR *BUCKET TOOTH* KOMATSU PC 300-8M0 PADA PT PRIMA JAYA PERSADA NUSANTARA SITE MELAK MENGGUNAKAN PENDEKATAN MODIFIED WEIBULL ANALYSIS**

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Komponen *bucket tooth* pada *excavator* Komatsu PC300-8M0 di PT Prima Jaya Persada Nusantara Site Melak mengalami tingkat kegagalan tertinggi sebesar 28% dari total kerusakan komponen, sehingga diperlukan model prediktif untuk memperkirakan umur pakai dan kebutuhan *spare part* secara akurat. Penelitian ini menggunakan pendekatan distribusi Weibull standar dan Weibull *Accelerated Failure Time* (AFT) untuk menganalisis data *Time to Failure* (TTF) dari enam unit alat berat, dengan estimasi parameter menggunakan metode *Maximum Likelihood Estimation* (MLE) dan evaluasi model melalui uji Anderson-Darling, AIC, BIC, serta akurasi prediksi menggunakan MSE dan RMSE. Hasil menunjukkan bahwa model AFT memberikan estimasi umur pakai (MTTF) tertinggi sebesar 124,21 jam (unit PJ EX-035) dan laju kerusakan terendah 0,0223, sementara laju kerusakan tertinggi tercatat pada PJ EX-036 sebesar 0,0715. Pada ambang keandalan 60%, waktu penggantian tercepat terjadi pada PJ EX-024 (47,93 jam) dan terlama pada PJ EX-035 (110,40 jam). Dari segi akurasi, model AFT memiliki nilai MSE sebesar 9,92 dan RMSE sebesar 11,72, lebih baik dibandingkan model Weibull standar dengan MSE 15,88 dan RMSE 18,54. Nilai *C-index* model AFT lebih mendekati 1. Dengan demikian, pendekatan AFT terbukti lebih unggul dalam memprediksi umur komponen serta mendukung implementasi strategi *predictive maintenance* dan pengadaan *spare part* berbasis data.

Kata Kunci : Weibull Analysis, prediksi umur, *bucket tooth*, *excavator*

## **ABSTRACT**

### ***ANALYSIS OF THE PREDICTED LIFETIME OF THE KOMATSU PC 300-8M0 BUCKET TOOTH AT PT PRIMA JAYA PERSADA NUSANTARA SITE MELAK USING THE MODIFIED WEIBULL ANALYSIS APPROACH***

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*Bucket tooth component of the Komatsu PC300-8M0 excavator at PT Prima Jaya Persada Nusantara Site Melak accounts for the highest failure rate, comprising 28% of total component breakdowns, necessitating a predictive model to accurately estimate service life and spare part requirements. This study employed both the standard Weibull distribution and the Weibull Accelerated Failure Time (AFT) approach to analyse Time to Failure (TTF) data from six heavy equipment units. Parameter estimation was conducted using the Maximum Likelihood Estimation (MLE) method, and model evaluation was based on the Anderson-Darling test, AIC, BIC, as well as prediction accuracy using MSE and RMSE. The results indicated that the AFT model provided the highest Mean Time to Failure (MTTF) of 124.21 hours (unit PJ EX-035) with the lowest failure rate of 0.0223, while the highest failure rate was observed in PJ EX-036 at 0.0715. At a reliability threshold of 60%, the earliest replacement time occurred in PJ EX-024 (47.93 hours) and the latest in PJ EX-035 (110.40 hours). In terms of prediction accuracy, the AFT model achieved an MSE of 9.92 and RMSE of 11.72, outperforming the standard Weibull model which yielded MSE and RMSE values of 15.88 and 18.54, respectively; furthermore, the AFT model exhibited a higher C-index, closer to 1. Therefore, the AFT approach is proven to be superior in predicting component lifespan and supports the implementation of predictive maintenance and data-driven spare part procurement strategies.*

*Keywords : Weibull Analysis, lifetime prediction, bucket tooth, excavator*