

ABSTRACT

Lifetime Analysis And Spare Part Requirement Estimation Of Excavator Berkapasitas 200 Ton Bucket Tooth Using Weibull Distribution

The bucket tooth component of the Excavator Berkapasitas 200 Ton excavator at PT Bumi Suksesindo (PT BSI) is part of the Ground Engaging Tools that directly interacts with mining material, making it highly susceptible to wear and failure. This study aims to analyze the lifetime and estimate the spare part requirements of bucket teeth on EX2001 and EX2002 units based on historical replacement data from May to December 2025.

The method used in this research is reliability analysis with a two-parameter Weibull distribution, including data verification, data cleaning, Time To Failure (TTF) calculation, goodness-of-fit testing, Weibull parameter estimation, Mean Time To Failure (MTTF) calculation, reliability analysis, failure rate analysis, and spare part requirement estimation.

The results show that EX2001 has 13 valid TTF data with an average of 361.62 hours, while EX2002 has 15 valid TTF data with an average of 346.80 hours. The MTTF value of EX2001 is 365.366 hours, while EX2002 has an MTTF of 339.708 hours. The shape parameter β values of both units are greater than one, indicating a wear-out failure pattern. The recommended preventive maintenance interval is approximately 300 operating hours, with an estimated requirement of 6 bucket teeth for both units at this interval.

Keyword: bucket tooth, excavator, distribusi Weibull, MTTF, spare part

INTISARI

Analisis Lifetime Dan Kebutuhan Spare Part Bucket Tooth Excavator Berkapasitas 200 Ton Menggunakan Distribusi Weibull

Komponen *bucket tooth* pada excavator Excavator Berkapasitas 200 Ton di PT Bumi Suksesindo (PT BSI) merupakan bagian dari *Ground Engaging Tools* yang bekerja langsung bersentuhan dengan material tambang sehingga rentan mengalami keausan dan kegagalan. Penelitian ini bertujuan untuk menganalisis *lifetime* serta mengestimasi kebutuhan *spare part bucket tooth* pada unit EX2001 dan EX2002 berdasarkan data historis penggantian periode Mei–Desember 2025.

Metode yang digunakan adalah analisis keandalan dengan distribusi Weibull dua parameter melalui tahapan verifikasi data, *data cleaning*, perhitungan *Time To Failure* (TTF), uji kesesuaian distribusi, estimasi parameter Weibull, perhitungan *Mean Time To Failure* (MTTF), analisis *reliability*, *failure rate*, dan estimasi kebutuhan *spare part*.

Hasil penelitian menunjukkan bahwa EX2001 memiliki 13 data TTF valid dengan rata-rata 361,62 jam, sedangkan EX2002 memiliki 15 data TTF valid dengan rata-rata 346,80 jam. Nilai MTTF EX2001 sebesar 365,366 jam dan EX2002 sebesar 339,708 jam. Nilai parameter bentuk β pada kedua unit lebih dari satu, sehingga pola kegagalan termasuk kategori *wear-out failure*. Rekomendasi interval *preventive maintenance* adalah sekitar 300 jam operasi, dengan kebutuhan *spare part* sebanyak 6 buah *bucket tooth* untuk kedua unit pada interval tersebut.

Kata kunci: *bucket tooth*, *excavator*, distribusi Weibull, MTTF, *spare part*