

## **ABSTRACT**

*This study evaluates the implementation of Condition-Based Maintenance (CBM) on reduction gearbox bearings of UD Trucks Quester CWE 280 mixer trucks at PT Surya Karya Setiabudi. Prior to CBM implementation, the fleet predominantly applied corrective maintenance, which resulted in high downtime, frequent bearing failures, and reduced operational productivity accompanied by increased maintenance costs. The CBM program utilizes simple field-based condition indicators integrated into a Gearbox Health Index (GHI), namely gearbox housing temperature, vibration (RMS), oil leakage, and discharge time. A quantitative case study compares pre-CBM data (October 2024–February 2025) and post-CBM data (March–August 2025). Key performance indicators (KPIs) include bearing lifetime, Mean Time Between Failure (MTBF), Mean Time To Repair (MTTR), Mechanical Availability (MA), component cost savings, and potential lost cost due to lost trips (ritase).*

*The results show that average bearing lifetime increases from about 580–590 hours meter before CBM to 935–950 hours meter after CBM, an improvement of around 58–60% and close to the 950 hours meter target. MA rises from roughly 68–72% to 75–90%, while MTTR decreases significantly because many post-CBM events are short-duration planned oil changes instead of long unplanned bearing failures (~14 days). MTBF numerically decreases because oil changes are also counted as failure predictive maintenance, increasing breakdown frequency while reducing severity and downtime per event. Total component cost drops from IDR 208,406,250 to IDR 131,768,750, yielding savings of IDR 76,637,500 (~36.8%). Potential lost cost ritase decreases from about IDR 11.66 billion to IDR 7.06 billion, a reduction of approximately IDR 4.60 billion (~39.5%). These findings demonstrate that a practical CBM approach using simple inspections and a GHI dashboard can improve component reliability, fleet availability, and maintenance cost efficiency in mixer truck operations.*

**Keywords:** *condition-based maintenance, reduction gearbox bearing, mixer truck, Gearbox Health Index, availability, maintenance cost*

## INTISARI

Penelitian ini menganalisis implementasi *Condition Based Maintenance* (CBM) pada bantalan *gearbox* reduksi truk mixer UD Trucks Quester CWE 280 di PT Surya Karya Setiabudi. Sebelum penerapan CBM, sistem perawatan didominasi oleh *corrective maintenance* yang menyebabkan tingginya *downtime*, frekuensi kerusakan bantalan, serta penurunan produktivitas operasi dan peningkatan biaya perawatan. Program CBM dalam penelitian ini menggunakan indikator kondisi lapangan sederhana yang terintegrasi dalam *Gearbox Health Index* (GHI), meliputi suhu *housing gearbox*, getaran (RMS), kebocoran oli, dan waktu *discharge*.

Metode penelitian yang digunakan adalah studi kasus kuantitatif dengan membandingkan data sebelum dan sesudah penerapan CBM. Evaluasi kinerja dilakukan menggunakan indikator umur pakai bantalan, *Mean Time Between Failures* (MTBF), *Mean Time To Repair* (MTTR), *Mechanical Availability* (MA), penghematan biaya komponen (*saving cost component*), serta potensi kerugian biaya akibat hilangnya ritase.

Hasil penelitian menunjukkan bahwa umur rata-rata bantalan meningkat dari sekitar 580–590 jam meter sebelum CBM menjadi 935–950 jam meter setelah CBM, peningkatan sekitar 58–60% dan mendekati target 950 jam meter. MA meningkat dari sekitar 68–72% menjadi 75–90%, sementara MTTR menurun secara signifikan. MTBF secara numerik menurun karena penggantian oli juga dihitung sebagai *failure predictive maintenance*, sehingga meningkatkan frekuensi kegagalan. Biaya komponen total turun dari Rp 208.406.250 menjadi Rp 131.768.750, menghasilkan penghematan sebesar Rp 76.637.500 (36,8%). Biaya kerugian *potensial* ritase berkurang dari sekitar Rp 11,66 miliar menjadi Rp 7,06 miliar, penurunan sebesar Rp 4,60 miliar (39,5%). Temuan ini menunjukkan bahwa penerapan metode CBM praktis menggunakan inspeksi sederhana dan *dashboard* GHI dapat meningkatkan reliabilitas komponen, ketersediaan armada, dan efisiensi biaya pemeliharaan dalam operasi truk *mixer*.

**Kata kunci:** *condition-based maintenance*, bantalan *gearbox*, truk *mixer*, *Gearbox Health Index*, ketersediaan, biaya pemeliharaan