

ABSTRACT

Tyre pressure control is one of the major factors influencing tyre service life, operational cost efficiency, and fleet reliability of Off-Highway Trucks (OHT) in open-pit mining operations. This study aims to analyze the comparative operational performance of 24.00R35 tyres on Caterpillar 773D, 773E, and 775F Off-Highway Trucks between the conventional tyre inspection period and the Tyre Pressure Monitoring System (TPMS) implementation period at PT Cipta Kridatama site DMP, South Sumatra. Four parameters were evaluated, namely the incidence rate of low tyre pressure, service life, tread utilization rate (TUR), and cost per hour (CPH). Operational data were collected from 35 hauling units, comprising 105 tyre scrap events in 2024 (conventional period) and 91 events in 2025 (TPMS period). The Kolmogorov-Smirnov normality test indicated a non-normal distribution for most variables, so the analysis was conducted using the Mann-Whitney U Test with the effect size r measure. The test results showed significant differences across all variables ($p < 0.001$). The TPMS period exhibited a mean reduction in low tyre pressure of 6 percentage points, or 87.2%, a median increase in service life of 2,235 hours, or 29.2%, a median increase in tread utilization rate of 16.8%, and a reduction in median cost per hour of 22.6%. These findings confirm that TPMS implementation significantly improves tyre performance from both technical and economic perspectives, although mining road conditions remain a limiting factor in achieving the company's operational targets.

Keywords: *tyre pressure monitoring system, off-highway truck, service life, tread utilization rate, cost per hour.*

INTISARI

Pengendalian tekanan *tyre* merupakan salah satu faktor utama yang memengaruhi umur pakai *tyre*, efisiensi biaya operasional, dan keandalan armada *Off-Highway Truck* (OHT) pada kegiatan pertambangan terbuka. Penelitian ini bertujuan untuk menganalisis perbandingan performa operasional *tyre* ukuran 24.00R35 pada *Off-Highway Truck* Caterpillar 773D, 773E, dan 775F antara periode inspeksi *tyre* konvensional dan periode implementasi *Tyre Pressure Monitoring System* di PT Cipta Kridatama site DMP, Sumatera Selatan. Empat parameter yang dievaluasi meliputi persentase kejadian *low tyre pressure*, *service life*, *tread utilization rate* (TUR), dan *cost per hour* (CPH). Data operasional dikumpulkan dari 35 unit alat angkut dengan 105 *event tyre scrap* pada tahun 2024 (konvensional) dan 91 *event* pada tahun 2025 (TPMS). Uji normalitas Kolmogorov-Smirnov menunjukkan distribusi data yang tidak normal pada sebagian besar variabel sehingga analisis dilakukan menggunakan *Mann-Whitney U Test* dengan ukuran *effect size* r . Hasil pengujian menunjukkan perbedaan yang signifikan pada seluruh variabel ($p < 0,001$). Periode TPMS menunjukkan penurunan rata-rata *low tyre pressure* sebesar 87,2%, peningkatan median *service life* sebesar 2.235 jam atau 29,2%, peningkatan median *tread utilization rate* 16,8%, serta penurunan median *cost per hour* sebesar 22,6%. Temuan ini mengonfirmasi bahwa implementasi TPMS secara signifikan meningkatkan performa *tyre* dari aspek teknis maupun ekonomis, meskipun kondisi jalan tambang masih menjadi faktor pembatas dalam pencapaian target operasional perusahaan.

Kata kunci: *tyre pressure monitoring system, off-highway truck, service life, tread utilization rate, cost per hour.*