

INTISARI

Unit Epiroc DM30 XC DR109 mengalami konsumsi oli yang tinggi pada *Engine Caterpillar C15* selama periode 18 April hingga 25 Juni 2025, dengan total penambahan oli sebesar 154,5 liter dalam 579 jam operasi. Kondisi ini menyebabkan *overhaul* dilakukan lebih awal pada *Hour Meter* 5.398, jauh di bawah umur pakai normal, sehingga mengakibatkan biaya penggantian komponen sebesar Rp730.851.174. Penelitian ini bertujuan untuk mengidentifikasi indikasi awal terjadinya *high oil consumption*, menentukan komponen kritis, mengidentifikasi akar penyebab masalah, serta menyusun rekomendasi tindakan perbaikan.

Analisis dilakukan menggunakan data Program Analisa Pelumas (PAP), hasil inspeksi *engine*, hasil *engine performance test*, dan hasil *blow-by test*. Metode yang digunakan dalam penelitian ini adalah *Failure Mode and Effects Analysis* (FMEA), diagram *Pareto*, dan *Fault Tree Analysis* (FTA). Hasil Program Analisa Pelumas menunjukkan bahwa kontaminasi Silicon (Si) didominasi oleh kategori *critical* dengan nilai tertinggi mencapai 136 ppm, disertai peningkatan *wear metal Fe* hingga 219 ppm, yang mengindikasikan terjadinya keausan abrasif pada komponen internal *engine*. Berdasarkan hasil FMEA, *cylinder liner* dan *piston* diidentifikasi sebagai komponen kritis dengan nilai *Risk Priority Number* (RPN) tertinggi sebesar 175, yang kemudian dikonfirmasi melalui diagram *Pareto*.

Berdasarkan analisis FTA, ditemukan bahwa akar penyebab masalah berasal dari dua *basic event* yang terjadi secara bersamaan, yaitu *dust control* dan kinerja *pre-cleaner* pada unit yang belum optimal. Kondisi tersebut menyebabkan debu hasil *drilling* masuk ke sistem pelumasan dan memicu keausan progresif pada komponen internal *engine*. Sebagai langkah perbaikan, direkomendasikan penerapan sistem *dust suppression* melalui penyemprotan air di area pengeboran serta modifikasi *pre-cleaner* menggunakan tipe *cyclone* atau *multiclone* untuk mengoptimalkan efektivitas penyaringan udara.

Kata kunci: *high oil consumption*, Program Analisa Pelumas, *Failure Mode and Effects Analysis*, *Fault Tree Analysis*, keausan abrasif.

ABSTRACT

The Epiroc DM30 XC DR109 unit experienced high oil consumption in the Caterpillar C15 engine during the period of April 18 to June 25, 2025, with a total engine oil top-up of 154.5 liters over 579 operating hours. This condition caused a premature engine overhaul at 5,398 operating hours, which was significantly lower than the normal service life, resulting in a component replacement cost of IDR 730,851,174. This study aimed to identify the early indication of high oil consumption, determine the critical components, identify the root cause of the problem, and propose corrective actions.

The analysis was conducted using Program Analisa Pelumas (PAP) data, engine inspection results, engine performance test results, and blow-by test results. The methods used in this study were Failure Mode and Effects Analysis (FMEA), Pareto diagram, and Fault Tree Analysis (FTA). The Program Analisa Pelumas results showed that Silicon (Si) contamination was mostly in the critical category, with the highest value reaching 136 ppm, accompanied by an increase in iron (Fe) wear metal up to 219 ppm, indicating abrasive wear on the internal engine components. Based on the FMEA results, the cylinder liner and piston were identified as the critical components with the highest Risk Priority Number (RPN) of 175, which was further confirmed by the Pareto diagram.

The FTA results indicated that the root cause of the problem was two basic events occurring simultaneously, namely inadequate dust control and the suboptimal performance of the unit's pre-cleaner. These conditions allowed drilling dust to enter the lubrication system and caused progressive wear of the internal engine components. Therefore, the recommended corrective actions were the implementation of a dust suppression system by spraying water around the drilling area and modifying the pre-cleaner using a cyclone or multiclone type to improve the effectiveness of air filtration.

Keywords: *high oil consumption, Oil Analysis Program, Failure Mode and Effects Analysis, Fault Tree Analysis, abrasive wear.*