ABSTRAK

Unit bor hidrolik merupakan komponen vital dalam operasi tambang semen dengan durasi operasional kerja hingga 15 jam per hari. Dengan populasi hanya tiga unit, gangguan pada salah satu unit berdampak langsung pada kelancaran operasional perusahaan. Berdasarkan data, *engine* tercatat memiliki total *downtime* terlama, dengan *fuel dilution* sebagai penyebab utama yang memiliki rataan *downtime* hingga 78 jam. *Fuel dilution* adalah kondisi pencampuran oli dengan bahan bakar yang menurunkan viskositas pelumas dan performa mesin. Penelitian ini bertujuan mengevaluasi dampak fenomena tersebut terhadap *engine*, terutama melalui analisis tren hasil *Scheduled Oil Sampling* (SOS), serta didukung oleh data *historical maintenance, condition monitoring*, uji *cut-out*, dan *leak test*. *Root Cause Analysis* (RCA) dilakukan menggunakan *fishbone* diagram dan 5 *Why Analysis* untuk mengidentifikasi penyebab utama. Hasil menunjukkan bahwa *fuel dilution* yang mencapai 51% menyebabkan kerusakan *pada bearing, camshaft*, dan *crankshaft* akibat pelumasan yang tidak optimal (*lack of lubrication*) hingga terbacanya alarm *low engine oil pressure* dan *high coolant temperature*. Berdasarkan RCA, penyebab utama adalah belum adanya target *lifetime* dan jadwal *overhaul*. Oleh karena itu, beberapa upaya pencegahannya adalah dengan membuat strategi penetapan target *lifetime* dan penggantian *secondary filter* setiap 250 hour meter sebagai tindakan prediktif..

Keyword : *Engine, Caterpillar C9, Fuel Dilution, Scheduled Oil Sampling, Root Cause Analysis*

ABSTRACT

The hydraulic drill unit is a critical component in cement mining operations, operating up to 15 hours per day. With only three units in operation, any disruption to one unit directly impacts overall productivity. Based on recorded data, the engine accounts for the longest total downtime, with fuel dilution identified as the primary cause, averaging up to 78 hours of downtime. Fuel dilution refers to the mixing of fuel with engine oil, which reduces oil viscosity and degrades engine performance. This study aims to evaluate the phenomenon on the engine, primarily through trend analysis of Scheduled Oil Sampling (SOS) results, supported by historical maintenance data, condition monitoring, cut-out tests, and leak tests. Root cause analysis was conducted using a fishbone diagram and 5 Why Analysis to identify the core issue. Results indicate that fuel dilution reaching 51% led to damage to the *bearing*s, camshaft, and crankshaft due to inadequate lubrication, as reflected by alarms such as low engine oil pressure and high coolant temperature. The RCA found that the root cause was the absence of defined component lifetime targets and scheduled overhauls. As a preventive actions, the study recommends implementing a component lifetime strategy and replacing the secondary fuel filter every 250 hour meters as a predictive action.

Keyword : *Engine, Caterpillar C9, Fuel Dilution, Scheduled Oil Sampling, Root Cause Analysis*