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CASE STUDY • ÉTUDE DE CAS

OPTIMIZING PERFORMANCE OF INDUSTRIAL DIESEL ENGINE LUBRICANTS IN AN ALUMINUM SMELTER

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Introduction

Premature engine failure and reduced lubricant service life are common phenomena of vehicles operating in harsh industrial environments. Few environments are more demanding on equipment than what is found in aluminum smelters. High torque diesel engines that power massive mobile machines that are consistently subjected to high ambient temperatures, intense magnetic fields, as well as unavoidable contamination by extremely abrasive, highly reactive airborne aluminum dust particles. Extensive analysis using **COAT® System** Technology has determined that this unique set of circumstances creates a catalytic chemical reaction within the engine oils, causing rapid degradation leading to unscheduled and catastrophic engine failures.

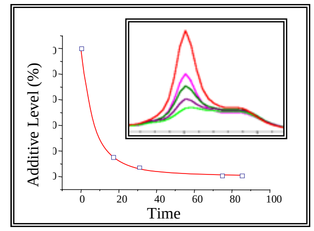

FIGURE 1: *Antioxidant decrease in used lubricants as measured by the* ***COAT® System*** *from their spectra*

Objectives

- To develop an engine oil capable of retarding the effects of the catalytic breakdown normally experienced under these harsh smelter conditions.
- To develop an Oil Condition Monitoring program that would ultimately extend engine life as well as the re-lubrication intervals.

Lubricant Life Extension Technology

- The **COAT® System** uses Fourier Transform Infrared (FTIR) technology for the analysis of lubricants. The **COAT® System** is capable of *detecting, determining,* and *replenishing* precise levels of performance-enhancing additives to their respective lubricants.
- Through real-time fluid monitoring, the service life of a lubricant may be extended by replenishing depleted additives before an irreversible degradation of the lube oil occurs.

Results and Discussion

PART 1: Three industrial lift trucks equipped with CAT3208 engines were selected. Two filled with Thermal-Lube's POLYON® 10W40, CG-4 motor oil, and the other filled with conventional 15W40, CG-4 mineral oil. All three machines were returned to normal service and oil samples were taken on a regular basis. **COAT®** analysis of the samples revealed a rapid depletion (>85% after only 17 hours of operation) of antioxidant in both oils [Figure 1]. A simulated laboratory experiment whereby new oil contaminated with aluminum dust and heated to 150°C showed a faster decrease in the level of antioxidant when compared to a non-contaminated sample [Figure 2].

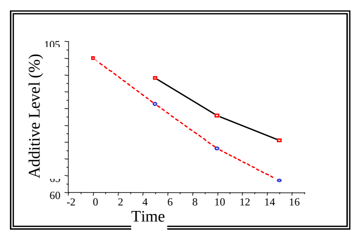

FIGURE 2: *Rate of antioxidant degradation in lab experiment after 16 hours of heating @ 150°C*

PART 2: Using the analytical diagnostic data feed-back generated by the **COAT®** System, a *semi-synthetic* version of the POLYON® lubricant was formulated with an antioxidant "cocktail" providing a higher resistance in the presence of aluminum dust. Test results showed that 90% of this new antioxidant was retained after 140 hours of service!

The following graphs [Figure 3] compare additive levels, viscosity, and soot loading for *semi-synthetic* POLYON® 10W40, CG-4 and the conventional petroleum based 15W 40, CG-4 motor oil.

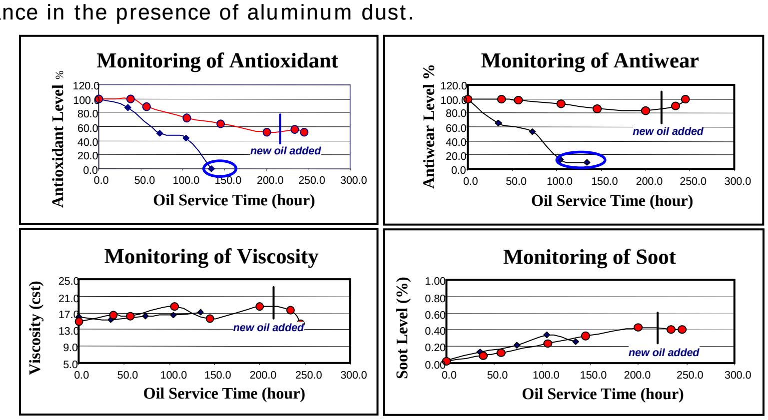

FIGURE 3:
10W40 mineral oil
Semi-synth. POLYON® *10W40*

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