



Oil Analysis Identifies Cause for Wheel Loader Fuel Injection System Failures

OVERVIEW

Industry: **Aggregates/Mining**

Est. OA Spend on This Event: \$792/year: **\$792/year**

Est. Event Cost: **\$115,000 - \$145,000** in rentals & lost revenue

Overall Potential for Loss: **\$25,000/engine + rentals & lost revenue for 22 units in service**

Overall Total Monthly OA Program Cost: **\$46,000**

Calculated & Normalized Total Monthly Potential for Loss: **\$1,400,000**

SYNOPSIS

This study illustrates how oil analysis identified a design flaw within the fuel injection system of a particular model series of wheel loaders, correctly identifying multiple failures as maintenance issues eligible for coverage under OEM warranty.

BACKGROUND

A national aggregates/mining company purchased multiple units in this wheel loader model series, placing them at various worksites throughout the United States. At multiple locations, fuel dilution results for that model were consistently hitting, or exceeding, the OEM's fuel flagging limits.



However, because each worksite was only looking at the wheel loaders for their individual worksite, each case was believed to be an “isolated” issue. Looking at each location’s data independently resulted in a misclassification under OEM warranty.

Citing “operator error,” multiple fuel injector repair and replacement warranty claims were rejected, requiring the company to cover the expense. Not until the model was compared with others across all company locations did it appear to be a much different – much bigger – problem.

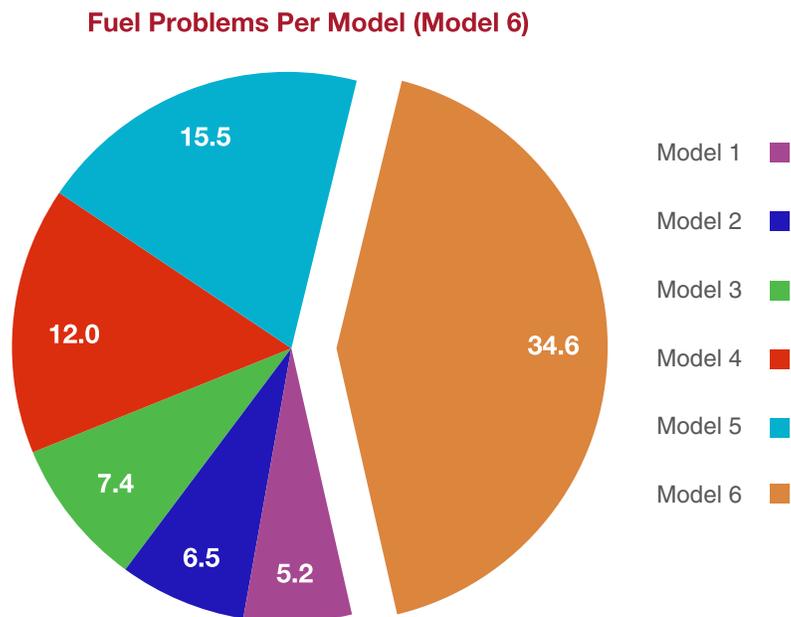


Figure 1

CASE STUDY

In reviewing oil analysis reports on the same model (see Model 6, Figure 1) at all locations across the country and then comparing them to all wheel loader models in use, a company field engineer discovered a definite pattern in abnormally high fuel dilution results for the model in question. What was assumed to be a small, localized problem had suddenly become a much larger issue

The OEM requirements for fuel dilution allowed results no higher than 3-4%. The majority of Model 6 results were 3-5% - clearly pushing the alarm limits set by the OEM. Considering the unit’s high operational pressure and sensitive fuel injection system, it was decided that the severity level for monitoring fuel dilution would be moved to 2-3%. A significant drop in viscosity was also cause for switching from the FTIR method for detecting fuel dilution to Gas Chromatography (GC) – FTIR only detects the presence of fuel – GC determines the amount.

Downtime was planned for fixing the fuel system in the field so as not to run them to failure. The original injectors were resealed or replaced with an O-ring injector that was a slight dimensional change in material. A more formal, detailed Product Improvement Plan (PIP) was developed at a later date and implemented to permanently resolve the issue.

THE VALUE OF DATA MINING VS. INDIVIDUAL OIL ANALYSIS REPORTS

Oil analysis only saves money if it is saving equipment. The ability to compare performance by manufacturer model across an entire fleet of wheel loaders was key in determining that what was believed to be an isolated maintenance issue actually had the potential for becoming a series of catastrophic failures company-wide.

Identifying and preventing these failures would not have been possible without the laboratory's data mining and diagnostic reporting capabilities. Together, they give oil analysis users quick access to the comprehensive data that can elevate an oil analysis program to higher levels of performance. Documenting that performance can justify the maintenance budgets necessary for successfully managing a world-class sampling program.

THE VALUE OF OIL ANALYSIS

If allowed to run to failure, the repair or rebuild, the cost of rentals and the loss of revenue in the interim had the potential of exceeding hundreds of thousands of dollars. The cost of replacing the engine alone can be estimated at \$25,000. Rentals and losses in revenue could have totaled \$115,000-\$145,000 – conservatively. At the same time, the liability of these failures was shifted from the company to the OEM warranty.



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