

0-6626: Fleet Equipment Performance Measure Preventive Maintenance Model

Background

The Texas Department of Transportation (TxDOT) operates a large fleet of on-road and off-road equipment. Consequently, fleet maintenance procedures (specifically preventive maintenance such as oil changes) represent a significant cost to the agency. TxDOT currently uses a preventive maintenance schedule dependent on simple variables such as vehicle miles or operational hours logged. However, with newer engines and vehicles that are equipped with onboard diagnostic systems, there is the possibility of tracking these parameters or performance measures over time and correlating them to oil degradation levels to determine the need for preventive maintenance.

The aim of this research is to:

- Provide a proof of concept for this idea by studying whether a statistical approach to recommending oil changes in TxDOT's fleet vehicles can be achieved based on collection of engine data (through onboard diagnostics) and oil sampling analysis.
- Assess whether predictive intervals can improve preventive maintenance practices and save money.

What the Researchers Did

After conducting a literature review, the research team also studied TxDOT's fleet to recommend a vehicle category for study based on parameters such as oil expense, vehicle usage, and availability of data collection mechanisms. The final selection of Sterling dump trucks (Figure 1) with MBE-4000 diesel engines was made, and a data collection plan was developed and deployed. The data collection plan included:

- The periodic collection of oil samples that were sent to a third-party laboratory for analysis.
- The collection of engine operation data using engine data loggers.

Detailed data and statistical analyses were conducted to assess oil degradation levels and their link to engine operation.

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Figure 1. Sterling Dump Truck with MBE-4000 Engine.

What They Found

The findings from the study indicated that there were very low levels of oil degradation, even in vehicles where oil change intervals were extended beyond the 10,000-mile mark (current TxDOT practice). This is attributable to the engine operations that were observed to be predominantly low-load operations with high levels of idling. The findings from the data indicate that a combination of optimal oil temperature, low oil pressures, and predominantly idle conditions have resulted in a very small impact on oil degradation.

What This Means

The findings support replacing the 10,000-mile oil change guidance with manufacturer

recommendations of an oil change every 15,000 miles for annual use of 6,000–60,000 miles and an oil change every 10,000 miles for trucks traveling under 6,000 miles driven under severe service conditions. This can result in savings through less frequent oil changes. The study can also be replicated for other categories of vehicles or equipment that could benefit from this approach.

Another possible area for TxDOT to target based on the findings from this project is idle reduction applications for emissions reduction and fuel savings to target the predominant idling mode observed in the test vehicles.

For More Information

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