

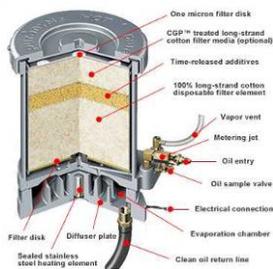


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Energy Efficiency and Renewable Energy

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**U.S. Department of Energy
FreedomCAR & Vehicle Technologies Program**

**Oil Bypass Filter Technology Evaluation
Final Report**



TECHNICAL REPORT

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Operated by Battelle Energy Alliance**

SUMMARY

This report is the final of twelve Oil Bypass Filter Technology Evaluation reports that document the feasibility of using oil bypass filter technologies on 17 vehicles in the Idaho National Laboratory (INL) fleet. This evaluation was conducted by INL for the U.S. Department of Energy's FreedomCAR & Vehicle Technologies Program. Almost 1.3 million test miles were accumulated, with the four-cycle diesel engine buses accumulating 982,548 test miles and the gasoline engine Chevrolet Tahoes accumulating 303,172 test miles. PuraDYN oil bypass filter systems were tested onboard eleven of the buses and the six Chevrolet Tahoes for 1,173,552 miles. Refined Global Solutions (RGS) oil bypass filter systems were tested onboard three buses for 112,168 miles. The performance of the puraDYN and RGS oil bypass filter systems are not compared; both were used as test mules to support the goal of reducing petroleum consumption by using oil bypass filter systems in government fleets.

The eight puraDYN systems were installed on the buses during the last 3 months of 2002, and the three RGS systems were installed on the buses during December 2004. The six puraDYN systems were installed on the Tahoes during December 2003. All testing was completed in November 2005. The bypass filters are still being used on the buses, but not the Tahoes.

The buses had regularly scheduled 12,000-mile servicing events, at which the two full-flow filters and one bypass filter on each bus was changed, and three oil analysis samples were taken. One oil sample each was sent to two oil analysis laboratories and the third sample was saved as the archive sample. The two oil analysis reports (one from each laboratory) presented the testing results for 28 variables, including the presence of desired additives and undesired wear metals such as iron and chrome, as well as soot, water, glycol, and fuel.

A total of 15 oil changes on the INL buses occurred during the 3-year evaluation. Seven oil changes were caused by mechanical or human problems: dipstick fitting failure, fuel dilution, mechanic error, injector failure, or intentional engine oil flushing. Eight oil changes were required due to degraded oil quality. Low Total Base Numbers (TBN) alone, or in conjunction with high oxidation/nitration levels, necessitated seven of the eight oil changes. One oil change was required due to high oxidation/nitration levels alone. Seventy-two bus engine oil servicing events occurred during the evaluation, and with eight oil changes required because of degraded oil qualities, 64 oil changes were avoided by using the oil bypass filter systems. The 64 avoided oil changes means 2,164 quarts (541 gallons) of new oil was not consumed nor generated as waste oil. This equates to an 89% reduction in oil changes.

The Tahoes were tested in several test periods. During the first period, the six Tahoes using bypass oil filters achieved a 75% reduction in oil changes and oil use from avoided oil changes. During a middle testing period, various problems, some caused by operations in subzero temperatures and some from human errors, resulted in poor oil-use-avoidance rates. However, during the third testing period, the Tahoes had an 86% reduction in oil changes and oil-change-oil-use when a premium grade of oil was used during the third testing period.

Depending on the assumptions employed, INL found that oil bypass filter systems for diesel engine equipped buses have a positive payback between 72,000 and 144,000 miles. The positive payback period for the gasoline engine Tahoes is between 66,000 and 69,000 miles.

For a complete history of the oil bypass evaluation, see the previous 11 Quarterly Reports and the Test Plan at: <http://avt.inl.gov/obp.shtml>.