INL: Developing New Ideas – Improving Existing Technologies

Oil Bypass Filter and Diesel Engine Idling Wear-Rate Evaluations

Funded by U.S. Department of Energy's FreedomCAR & Vehicle Technologies Program

Oil Bypass Filter Evaluation

Oil Bypass Filter Technology Evaluation

- Funded by U.S. Department of Energy's FreedomCAR & Vehicle Technologies Program
- Performed by Idaho National Laboratory's (INL) Transportation Technology and Fleet Operations departments
- Support DOE's efforts to reduce petroleum consumption and ensure energy security of the United States

Objectives

- Test concept that oil bypass filters minimize engine oil changes and oil use.
- Demonstrate economics of oil bypass filter systems
- Estimate potential engine oil saving from bypass filter technologies that can be achieved by INL, DOE complex, & Federal Fleets

Bypass Filters

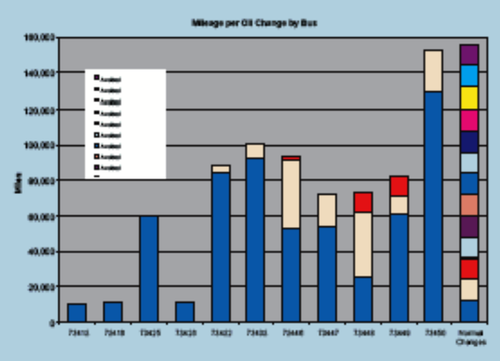
- Secondary filter system
- Filters a partial flow of oil (6 to 8 gallons per hour)
- Removes particles as small as 1 micron

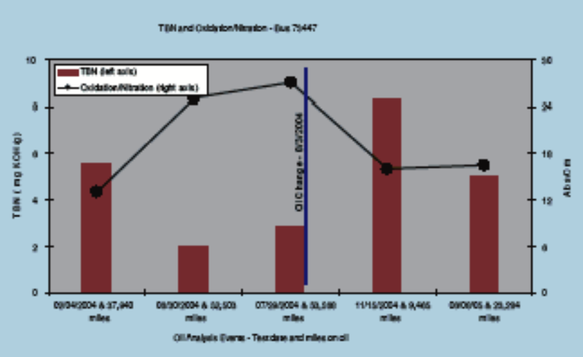
Benefits of Bypass Filters

- Extends oil drain intervals
- 80+% less oil use
- 80+% less waste oil
- Less maintenance time
- Return of investment: varies with vehicle

puraDYNE system in bus engine bay

RGS system in the bus engine bay





- Indicates an oil change
  CTC or Stavely Services Fluids Analysis Laboratory provided the oil analysis reports
  Buses 73413, 73416, 73425, 73426: No changes yet
  Bus 73432 and 73433 had an oil change on 2/22/05 to begin the idle test with new oil
  Bus 73446 had oil changes on 6/2/04 and 3/22/05 due to oil quality, 4/20/05 due to injector failure
  Bus 73447 had oil change on 8/3/04
  Bus 73448 had an accidential oil change on 9/16/03 and one on 11/17/04 due to oil quality
  Bus 73449 had an accidential oil change on 5/17/05 and one on 12/20/04 due to oil quality
  Bus 73450 had oil change on 8/3/04 due to oil quality.

Diesel Engine Idling Wear-Rate Evaluation

Evaluation Objectives:

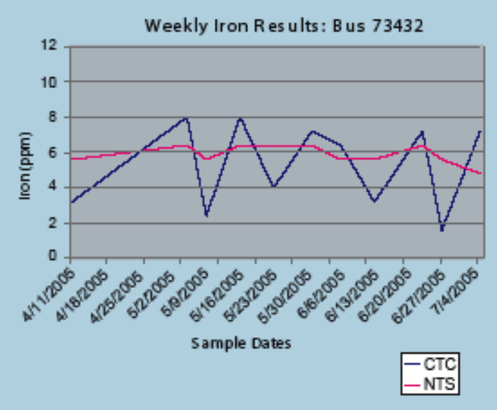
- Support DOE's effort to minimize time diesel engine trucks idle
- Characterize metal wear generation rates and accumulated wear metal volumes
- Measure oil degradation rates and oil lubricating property trends
- Compare metal wear and oil degradation results between engine idling and bypass filter evaluations

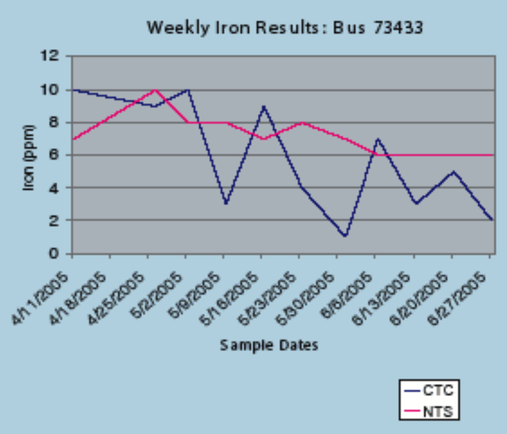
Test Buses

- Equipped with four cycle diesel engines
- Documented history of maintenance and fuel usage
- Consistently scheduled maintenance

The test consisted of the following tasks:

- Break-in (age) new oil with 6,000 over-the-road miles
- Idle two buses 1,000 hours each with weekly 120 miles runs to "blow out" carbon buildup
- Weekly oil analysis
- Destructively analyze filters at end of 6,000 miles, as well as 400, 800, and 1,000 hours for wear metals and oil degradation
- Analysis of filter media to measure particles caught by filters
- Use of ferrograms to measure iron particle contents
- Use oxidation, nitration, total base number evaluation, x-ray florescence, and hepthane/pentane insoluble tests to measure oil quality
- On-board data loggers tacked actual idling and mileage
- Use commercial grade oil: Shell Rotello-T 15W-40
- Send oil analysis samples to two different laboratories





INL Test Vehicles

11 four-cycle diesel-engine buses

- 8 equipped with puraDYN oil bypass filters
- 3 equipped with Refined Global Solutions oil bypass filters
- Buses accumulated 828,868 total test miles (6/05) since 10/02
- Buses avoided 55 oil changes or 481 gallons new oil
- Buses avoided 481 gallons of waste oil generation.
- 6 INL gasoline Chevrolet Tahoes
- Tahoes accumulated 260,116 total test miles (6/05) since 12/03

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