# Testing the waste gas emissions of a Jeep Cherokee under different driving conditions under the Federal Test Guide, 40 CFR Part 86

The following is a brief description of the test procedure and the basic process involved. For exact procedures please reference the Federal Test Guide – 40 CFR Part 86. The Environmental Protection Agency uses this test to analyze and measure emissions from gas-fueled motor vehicles. The CVS/FTP tests consist of three phases that are modeled after normal on-road vehicle usage. This requires the vehicle to perform: a cold start (minimum 12 hours of no operation of the vehicle engine), starts and stops (similar to vehicle operations when approaching a stop sign, braking until reaching a full stop, and accelerating from a stopped position), hills (ascent of 10%+ grades), city driving (accelerating, braking, coasting, and complete stops), and highway- driving (accelerating, maintaining speeds of 55+ miles per hour for set periods of time, coasting, acceleration similar to passing at speeds above 45+ miles per hour). Samples of the emissions are collected in bags and analyzed for THC, CO, NOx, CO2 and fuel economy. All personnel, tests, testing equipment, and testing facilities used for these tests are both EPA and California Air Resource Board (CARB) certified. A third party (California Environmental Engineering) with no affiliation or business relationship with the company or supplier of the oil catalyst conducted these tests.

**TEST REVIEW**

1. Drain existing fuel in test vehicle
2. Fill tank to 40% with specified test fuel (Indolene)
3. Run Prep cycle
4. 12 - hour controlled soak
5. Run CVS/FTP test for baseline (1)
6. Run second Prep cycle
7. 12 - hour controlled soak
8. Run second CVS/FTP test for baseline (2)
9. Make sure the two baselines are repeatable within a 10% tolerance
10. Add liquid oil catalyst (**CerBond™**)
11. Drive 100 miles using AMA — Route
12. Reconstitute test fuel to 40%
13. Run Prep cycle
14. 12-hour controlled soak
15. Run CVS/FTP test with oil catalyst (1)
16. Run Prep cycle
17. 12 - hour controlled soak
18. Run CVS/FTP test with oil catalyst (2)
19. Compare average of baseline results without catalyst to average of results *with* liquid oil catalyst.

**TEST SUMMARY**

4 Preps
4 CVS/FTP with Bags

**TEST VEHICLE**
1988 Jeep Cherokee
V.I.N. 1JCMU77448JT07959

**TEST FACILITY**
California Environmental Engineering ("CEE")
2530 South Birch Street
Santa Ana, CA 92707

**TEST RESULTS**
The test results were extremely positive in terms of reduction in tailpipe emissions (note: the actual report from CEE is attached below). After treating the vehicle with the oil catalyst, test results indicate reductions across the board. The reductions and end results for this vehicle are as follows:

20 Total Hydrocarbons (THC) — reduction of 72.8%
* Measured as grams/mile (gr/m)
21 Carbon Monoxide (CO) — reduction of 92.0%
* Measured as grams/mile (gr/m)
22 NOx, reduction of 31.5%
* Measured as grams/mile (gr/m)
23 Fuel Economy - increase of 4.4%
* Measured as miles per gallon (mpg)

These results indicate that by using 2 oz. of **CerBond™** oil catalyst in the oil crankcase of gasoline powered vehicles, significant reductions in emissions can be achieved. These tests results are very similar to test results done on over 50 vehicles using the California State Smog Test (Smog Check Vehicle Inspection / ASM Emission Test) used for vehicle inspection, certification, and registration. In these tests, vehicles were tested for emissions at set speeds of 15 mph and 25 mph. At each speed, readings are taken for %CO2, %02, Hydrocarbons (HC) - measured by parts per million (PPM), CO (%), and NOx (NO) - measured by PPM. The CEE test results demonstrate that there is a lineal relationship between the two tests and the data collected. The CVS / FPT test is cumulative and measures the data as grams per mile vs. the ASM Emission Test that collects data based on two specific speeds ('15 mph., 25 mph) / engine loads and measures the data as a percentage and as PPM. The reductions in the CVS / FPT tests indicate similar percentage reductions as the ASM Emission tests in the studies done prior to this test. Both tests show that vehicles tested after introduction of the oil catalyst are achieving major reductions in vehicle emissions. At this point in testing and comparative analysis, it is clear that when the ASM / Emission test is positive (reducing emission % and PPM), the CVS / FPT tests are also consistently positive (reducing emission % as grams per mile). Further testing will have to be performed to determine the specific mathematical relationship between the two tests. This will be important for future testing and comparisons of future data.

It is important to note that savings can be achieved in the area of fuel economy. The EPA and CARB believe that any fuel savings or increases above 2.5% (mpg) are significant and are worthy of further investigation and analysis. The test results for fuel economy show increases of 4.4 % (mpg) after only "65" miles after the introduction of the **CerBond™** oil catalyst (metal treatment) vs. fuel economy of the vehicle without the

catalyst. This is a very positive finding and should lead to opportunities in businesses that utilize “fleets of vehicles" such as governments, the military, or municipalities. The impact could also be important for personal vehicle usage, especially with the rising costs of fuels worldwide.

LAB to: C.A.R.B.
EPA.

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July 8, 2005

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Combustion Technologies Division
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Hawthorne, Ca 90250

Attn: Charlie Stewart

RE: Proof of Concept testing using a Proprietary Liquid Oil Catalyst, Project # CEE-ML-1104

This report summarizes a light-duty gasoline vehicle test series conducted at the California Environmental Engineering (CEE) center for environmental research in Santa Ana, California. The program was designed to measure and compare exhaust (tailpipe) emissions and fuel consumption before and after use of an oil catalyst. A CVS (FTP)-75 test protocol was selected to obtain accurate, repeatable and verifiable comparative data validating the effect of the liquid oil catalyst on measured emissions and fuel consumption.

The CVS-75 test is a "three bag", "cold" test accomplished on a dual roll transient dynamometer. The test protocol is accepted to be a very reliable procedure for establishing a gasoline vehicle engine's emissions characteristics and fuel consumption.

A 1988 model year Jeep Cherokee was identified and selected as the candidate test vehicle. The single-owner, well-maintained vehicle had accumulated in excess of 100,000 miles. The test vehicle's existing fuel supply was drained and a 40% tank capacity of "Indolene" test fuel was introduced. Additionally, the oil and filter were changed. The vehicle was driven 106 miles on a prescribed test route to allow it to adapt to the test fuel characteristics. Preceded by preconditioning cycles, two baseline tests were conducted. After introducing the oil catalyst to the oil reservoir, an additional 106 miles were accumulated, the vehicle was preconditioned and two tests conducted with the Liquid Oil Catalyst. The baseline test(s) average was compared to the average figure(s) obtained with the oil catalyst. The results are shown in Figure #1.

| | | Grams / Mi. | | |
|---|---|---|---|---|
| | HC | CO | Nox | MPG |
| Baseline | 1.561 | 35.140 | 0.505 | 16.504 |
| With Catalyst | 0.424 | 2.828 | 0.346 | 17.265 |
| % Difference | -72.8 | -92.0 | -31.5 | 4.4 |

FIGURE 1 COMPARATIVE RESULTS