

## **NTRD Program Disclaimers**

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7/18/05

**Texas Commission on Environmental Quality  
New Technology Research & Development (NTRD) Program  
Monthly Project Status Report**

Contract Number: 528-5-70807-M030

Grantee: Extengine Transport Systems, LLC

Date Submitted: 7/15/05

Report for the **Monthly** period:

Starting Date 5/31/05 Ending Date 6/30/05

**Section I. Accomplishments** *(Please provide a bulleted list of project accomplishments as well as a description of their importance to the project.)*

Task 1: Develop EPA FTP Transient Test Protocol to establish emissions and fuel economy effects:

- Test agreement signed with Olson-Ecologic Engine Testing Laboratories.
- For both fuels (D-2 reference fuel and Extengine LowNOx Biodiesel) the test procedure will be a minimum of 1 cold start and 3 hot start tests. The cold and hot portions are combined using a weighting factor of 1/7 for cold and 6/7 for the hot start average.
- Tests shall meet the EPA criteria for mapping and conformance of target to actual speed and torque and other requirements related to sampling and calibration.
- Reference fuel will be a commercially available fuel meeting local California specifications for D2 diesel fuel (not ultra-low sulfur fuel)
- Candidate fuel will be Extengine LoNox biodiesel blended from a commercially available California specification ultra-low sulfur fuel, a commercially available vegetable oil based biodiesel fuel, and the Extengine additive formulation.
- Reference fuel tests will be performed after 25 hours of variable speed/load operation.
- Extengine fuel tests will be performed after 40 hours of stabilization and engine conditioning time. (approximately 75 hours are generally required for complete stabilization).

Task 2: Validation Testing

- A 1991 DD60 engine has been acquired
- The engine has been reconditioned by a Detroit Diesel dealer (Valley power systems in California).
- Preliminary baseline tests have been conducted; HC, CO, NOx meet emission standards, however PM is above standards.

	HC	CO	NOx	PM	Fuel Consumption
3 hot tests	0.154	3.548	4.847	0.772	0.417
Cold test	0.217	4.020	5.867	0.624	0.431
Composite	0.163	3.615	4.993	0.751	0.420
Standard	1.3	15.5	5.0	0.25	---

**Section II: Problems/Solutions**

<p><b>Problem(s) Identified</b></p> <p><i>(Please report anticipated or unanticipated problem(s) encountered and its effect on the progress of the project)</i></p>	<p>The PM emissions of the vehicle exceed standards for the vehicle/engine model year (see above). According to the Detroit Diesel dealer, the fuel and air management systems are performing correctly and the engine compression is within specification. The only remaining service action is to replace the cylinder liners, pistons rings, and valve guide seals. This activity is estimated to cost approximately \$15 ,000 and then the engine requires nearly 1000 hours of run-in for the rings and cylinder liners to set and seal properly which is probably required to achieve acceptable PM emissions. Neither time or funding is available for this repair.</p>
<p><b>Proposed Solution(s)</b></p> <p><i>(Please report any possible solution(s) to the problem(s) that were considered/encountered)</i></p>	<p>Extengine requests TECQ approval of 1 of the following 3 alternative solutions shown below:</p> <ol style="list-style-type: none"> <li>1) Accept the engine as-is for testing as a "worst case" example of the effect of Extengine fuel on a high PM vehicle.</li> <li>2) Replace the engine with another available engine (suggested engines are an urban bus 2000-2002 MY DD50 engine (8.5L displacement rather than 12.7L displacement of DD60). The DD50 is 3 years old, has been tested for another project at Olson-Ecologic and meets applicable standards.</li> <li>3) Supplement TCEQ funding to permit complete overhaul and break-in of the DD60 engine.</li> </ol>
<p><b>Action(s) Conducted and Results</b></p> <p><i>(Please describe the action(s) taken to resolve the problem(s) and its effect)</i></p>	<p>Components replaced on DD60 to correct PM emissions: turbocharger, all fuel injectors, ECU, wire harness, fuel filters, oil filters. Compression has been verified as within specification and engine power has been verified as within specification. The engine does not have a visible smoke plume at steady speed conditions.</p> <p>The DD60 has been removed from the engine dynamometer pending TCEQ decision regarding possible alternatives</p>

**Section III. Goals and Issues for Succeeding Period:** *(Please provide a brief description of the goal(s) you hope to realize in the coming period and identify any notable challenges that can be foreseen)*

- 1) Resolve issue over PM baseline emissions of DD60 emissions. This requires guidance and decision from TECQ.
- 2) Blend Extengine candidate fuel and deliver to Olson-Ecologic labs.

  
Authorized Project Representative's Signature

Date: July 15, 2005

**NOTE:** *Please attach any additional information that you feel should be a part of your report or that may be required to meet the deliverable requirements for tasks completed during this reporting period.*

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**ISO 9001:2000 Registered**

July 14, 2005

Mr. Richard Carlson  
 COO  
 Extengine Transport Systems, LLC  
 By e-mail transmission

Re: Emission testing of your DDC-60 Diesel Engine

Dear Mr. Carlson:

This letter summarizes the results of your DDC-60 diesel engine emission testing.

The emission tests were done in accordance with the EPA, FTP official transient test cycle for on-road engines as defined in the applicable CFR.

One cold start (including the 20 minutes cold test cycle, 20 minute soak and 20 minute hot cycle) was followed by two additional hot cycles.

The test results are as follows:

-----Grams per hp-hr-----							
Test Number	Condition	THC	CO	NO <sub>x</sub>	CO <sub>2</sub>	PM	BSFC Fuel 1b/bhp/hr
Ext DDC 20A	Cold-Start	0.217	4.020	5.867	651.45	0.624	0.4305
Ext DDC 20A	Hot-Start	0.183	3.303	4.871	640.02	0.862	0.4166
Ext DDC 21	Hot-Start	0.123	3.821	4.993	648.82	0.774	0.4198
Ext DDC 22	Hot-Start	0.156	3.519	4.677	647.70	0.681	0.4156
3 Test average (hot starts)		0.154	3.548	4.847	645.51	0.772	0.4173

Detailed data sheets are available.

Sincerely,



Donel R. Olson  
 President

**1370 South Acacia Avenue, Fullerton, California 92831**  
 Tel (714) 774-3385 Fax (714) 774-4036  
[www.ecologiclabs.com](http://www.ecologiclabs.com)