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

Contract Number: 582-5-65591-0001

Grantee: Catalytica Energy Systems

Date Submitted: 6/10/05

Report for the **Monthly** period: May, 2005

Starting Date 10/18/04 Ending Date 10/31/05

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

Task 4 Accomplishments:

(1) Completed Task 2.4.1 activities

   a. Completed the 24 green run of Denton AD002 at the Gilbert AZ dynamometer

(2) Completed Task 2.4.5 activities

   a. Completed a written endurance and emissions performance test report on the two Denton units

   b. See report in attachment 1 for details

Task 5 Accomplishments:

(3) Completed Task 2.5.3 activities

   a. Completed the installation of the XononD units on the Denton refuse trucks

   b. See report in attachment 2 for details

Indicate which part of the Grant Activities as defined in the grant agreement, the above accomplishments are related to:

The accomplishments listed above are all part of Tasks 4 through 5 in the Grant Agreement.

Section II: Problems/Solutions

Problem(s) Identified *(Please report anticipated or unanticipated problem(s) encountered and its effect on the progress of the project)*	*(1) Unavailability of ultra low sulfur diesel fuel due to a refinery shutdown resulted in the delay of field testing* *(2) Unable to measure emissions data during the chassis dynamometer tests due to equipment malfunction.* *(3) Failure of fuel delivery components has limited the number of operational hours accumulated on the XononD units. Although the fuel delivery units were tested prior to installation on the Denton trucks, both truck have experience premature failures of either the fuel pump and/or motor. The root cause is being investigated.* *(4) Unable to achieve comparable AVL8 points for emissions testing on the chassis dynamometer due truck/dynamometer limitations.* *(5) If unable to use the dynamometer for future testing, it will not be possible to measure PM (smoke) on-vehicle.* *(6) After dynamometer testing, the refuse truck # 9858 experienced a transmission failure on the trip back to the Denton refuse station.*
Proposed Solution(s) *(Please report any possible solution(s) to the problem(s) that were considered/encountered)*	*(1) Ship low sulfur fuel in from another state until the refinery is back on line.* *(2) Have equipment serviced and verify functionality prior to testing.* *(3) Assemble a team to identify the root cause of the failure* *(4) (a) Develop alternative cycle points for chassis dynamometer operation or (b) eliminate the dynamometer testing and perform on-road emissions testing instead* *(5) Postpone smoke measurement until the end of the three month demonstration and then measure at the CESI Arizona dynamometer facility.* *(6) Have the truck transmission repaired*

Action(s) Conducted and Results *(Please describe the action(s) taken to resolve the problem(s) and its effect)*	*(1) 2,000 gallons of fuel was shipped to Denton from California. The Valero refinery is currently back on line and should be able to supply low sulfur fuel for the duration of the project* *(2) The equipment has been serviced and recalibrated.* *(3) A team has been assembled at CESI to identify the root cause and develop a solution. Any hardware modification will be first tested on the CESI delivery truck to prove the concept prior to installation on the Denton refuse vehicles* *(4) CESI currently evaluating both options* *(5) CESI currently evaluating this option* *(6) The truck is in for repairs. Estimated time back in service is 6/13.*

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) Task 2.5.4: Complete establishing "fresh" product performance baselines for NOx, CO and HC

(2) Task 2.5.4: Complete first month emissions tests for NOx, CO and HC

Troy W Kinney

Date: *6/10/05*

Authorized Project Representative's Signature

Attachment 1
Task 2.4.5: Written Endurance and Emissions Performance Test Report

Engine Information

The testing was performed on the following engine platform:

Year: 1997
Make: International
Model: DT466E
Engine S/N: 670528-137 2019672
EPA engine family: VNV466D8DARW

Endurance Results

Each unit was installed in the Giblert AZ dyno test facility for "degreening" and limited endurance testing. The units consisted of the entire XononD system which included the on-truck fuel delivery, fuel nozzle, control, monitoring, and interface hardware. Unit AD001 accumulated over 100 hours of dynamometer operation and unit AD002 accumulated 24 hours of dynamometer operation with incident. After testing, the units were disconnected, partially disassembled and packed for shipment to Denton.

NOx Emission Results

An endurance and performance test sequence for both Denton aftertreatment units (AD001 and AD002) has been completed in the Arizona Dynamometer facility. Unit AD001 was subjected to 100 hrs of durability testing during which time numerous transient FTP (Federal Test Procedure) cycles were run as well as various CBD (Central Business District) cycles. Unit AD002 was subjected to fewer run hours (24 hrs total) during which time control system parameter "tunables" were optimized. The controls tuning was determined to be necessary prior to shipping the unit to Denton since the catalysts were in a fresh condition. Thus, fewer FTP and CBD cycles were completed as indicated in Table 1. Limited fuel penalty data was gathered for unit AD002 due to the failure of the fuel flowmeter. It is reasonable to assume however that the fuel penalty for unit AD002 will be comparable to unit AD001. Table 1 below lists the ranges on the overall performance for both units for the durability tests.

Denton Unit	FTP Results		CBD Cycle Results	
	NOx Conversion (%)	Fuel Penalty (%)	NOx Conversion (%)	Fuel Penalty (%)
AD001 (100 hrs)	48.9 – 78.3	4.3 – 7.5	47.6 – 85.2	5.0 – 10.0
AD002 (24 hrs)	72.5	6.0	80.6 – 88.1	No data

Table 1: Composite performance numbers for Denton units (AD001 and AD002)

The FTP performance results shown in Table 1 (NOx conversion in particular) contain significant, but not unexpected variations in composite NOx conversion due to normal,

day to day test parameter variations. Some of those variations include: "degreening effects" on the LNT bricks, sulfur loading effects, control system effects since the system is not completely mature, other thermal effects within the system and initial NOx loading. The ranges listed however encompass the overall performance range for successive, repeating EPA cycle types. During verification testing, the integrated average NOx reduction over the course of several test cycles will determine the final verified NOx reduction level.

Attachment 2

Task 2.53 (Denton unit installation) Details

Retrofit aftertreatment devices (unit S/N AD001 & AD002) have been installed on two refuse trucks operated by the city of Denton, Texas. The installation was successfully completed in late May and the units began operation during the week of May 23. Photographs of the unit installation on the Denton vehicles are shown in Figures 1 through 4. The retrofit device installations include numerous gas temperature sensors, a backpressure sensor and other sensors necessary for control of the device. As of the end of May, no operational time had been accumulated due to the unavailability of low sulfur diesel fuel at the refuse facility.

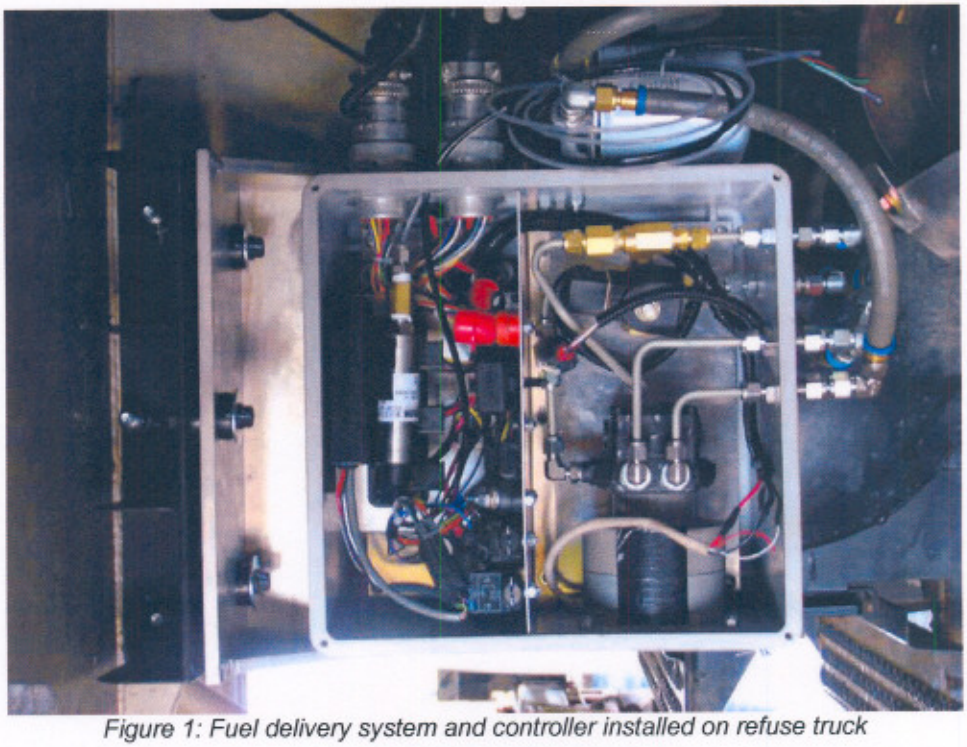

Figure 1: Fuel delivery system and controller installed on refuse truck

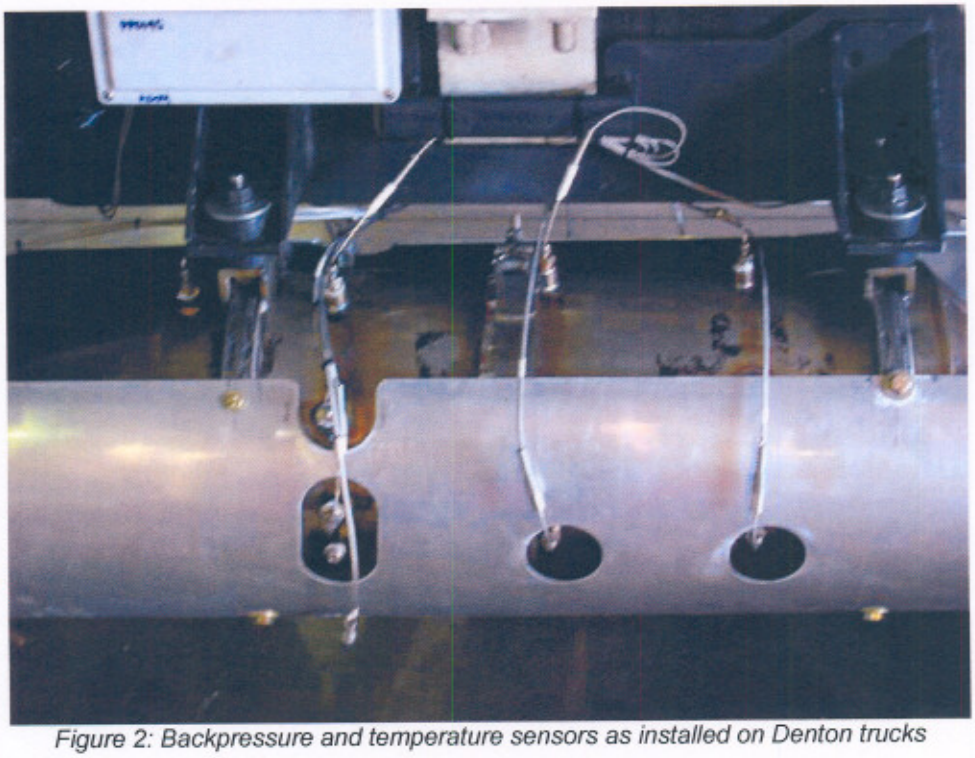

Figure 2: Backpressure and temperature sensors as installed on Denton trucks

Figure 3: Denton refuse trucks with XononD units installed