

Multi-Fleet Demonstration of Hydraulic Regenerative Braking Technology in Refuse Truck Applications.

Recipient Organization: New York State Energy Research and Development Authority

Partners: Maryland Energy Administration
Maryland Department of the Environment
New Jersey Board of Public Utilities
Shorepower Technologies, LLC
New West Technologies, LLC
Bosch Rexroth Corp
City of New York Department of Sanitation
City of Baltimore, Department of Public Works, Bureau of Solid Waste

1. Project Objective:

This project demonstrates the use of an innovative technology called hydraulic regenerative braking (HRB) in a heavy-duty vehicle application. In particular, the project involves the development of HRB system specifications, installation of the prototype HRB systems on refuse trucks, and in-use fleet demonstration in refuse truck fleets in New York City and Baltimore.

2. Background:

HRB technology significantly reduces fuel consumption, emissions, and brake maintenance while at the same time improves vehicle performance. The project involves a long-term field demonstration of HRB technology in two refuse truck fleet applications with data collection on real-world performance, efficiency, emissions, maintenance, and cost in accordance with standardized testing procedures. During braking, this technology recuperates a vehicle's kinetic energy that is otherwise lost as heat generated by friction brakes. This is accomplished by integrating a hydraulic pump/motor along with hydraulic accumulators into the vehicle's driveline. The recovered energy is stored in the accumulators as compressed gas and later used for assistance in propelling the vehicle. This technology is most effective in urban "stop and go" applications of heavy-duty vehicles.

3. Patents: None.

4. Publications/Presentations:

- "Advancing Hydraulic Hybrids," Diesel Progress North American Edition, July 2007.
- "Data Collection Key in Hydraulic Hybrid Refuse Truck Test Program," Diesel Progress North American Edition, July 2007.
- "Data Collection and Development of New York City Refuse Truck Duty Cycle," SAE paper # 2007-01-4118, presented at the SAE Powertrain & Fluid System Conference, October 2007.

5. Progress in Past Quarter and Current Status:

During this billing period, the project team completed the following according to the approved Scope of Work:

Task 1: Project Management

DSNY Fleet Demonstration

- Developed NASEO progress report.
- Held regular bi-weekly project team conference calls to discuss progress and address any issues.
- Held monthly project team conference calls with DSNY.
- Held a meeting between Rexroth and ALF in Charleston, South Carolina.

Baltimore Fleet Test

- None.

Task 2: HRB System and Installation Design Specifications

DSNY Fleet Demonstration

- Continued discussions with ALF's engineering, design and manufacturing groups to discuss HRB integration into existing vehicle systems.
- Continued engineering discussions with Heil to integrate the HRB system and refuse body hydraulics systems.
- Continued HRB system modeling and packaging.
- Continued simulations and modeling using duty cycle data.

Baltimore Fleet Test

- Completed duty cycle analysis of baseline truck data.

Task 3: HRB System Installation and Instrumentation

DSNY Fleet Demonstration

- Development of the design specifications and plans for installing hydraulic hybrid system on the American LaFrance Condor 830L refuse truck chassis:
 - Accumulator mounting has been detailed and is currently in purchasing process.
 - Accumulators have been selected and are on order.
 - Pump and gearbox positions have been finalized.
 - Driveline components have been selected.
- Completed simulations and modeling using duty cycle data.

Baltimore Fleet Test

- Completed route and operational data collection on the Freightliner truck. The instrumented vehicle was moved to several different routes, including urban and suburban extremes before the datalogging instrumentation was removed from the vehicle.
- Initiated development of Baltimore refuse fleet duty cycle.

Task 4: Preliminary Tests

- None.

Task 5: Field Test and Data Collection

- None.

6. Plans for Next Quarter:

During the next reporting period, staff will complete the following activities:

Task 1

- Develop quarterly progress report.
- Hold bi-weekly conference calls to discuss project progress.

Task 2

- Develop a short version of the driving cycle(s) for use in chassis dynamometer testing.
- Continue development of the design specifications and plans for installing hydraulic hybrid system on the ALF Condor 830L refuse truck platform whose design and operation is currently being qualified with DSNY.
- Continue hydraulic hybrid system hardware and control development.

Task 3

- Complete development of Baltimore refuse fleet duty cycle.

Task 4

- Finalize the pre-trial test protocol for DSNY.
- Identify providers of portable emissions measurement systems (PEMS) for collecting in-use emission data.

Task 5

- None.

