

Success Story: City of Denver, Colorado

Markets Served:
Municipal waste collection
& disposal

"We anticipate an annual reduction in excess of 1,600 gallons of fuel compared to our non-hybrid fleet of similar vehicles."

*Nancy Kuhn,
Fleet Administrator, City of Denver Public
Works Fleet Maintenance Division*

New Hybrid Technology In Use

Location:

Denver, Colorado

Segment:

Commercial vehicles: refuse

Challenge:

Poor gas mileage

Solution:

HLA

Results:

25% fuel economy improvement

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Background

Eaton's Hydraulic Launch Assist™ (HLA®) technology is designed to improve both the fuel efficiency and overall operating economy of vehicles with "stop-and-go" duty cycles by capturing braking energy and then using it to help accelerate the vehicle. Eaton supplied prototype HLA systems for twelve refuse trucks built on Peterbilt chassis as part of a test and evaluation program funded by the Houston Advanced Research Center (HARC) in Texas.

While the Texas climate is ideal for hot-weather testing in near-sea level conditions, the development program also required data from a cold, high-altitude location. The City of Denver is a leader in the application of "green" technologies including bio-diesel and hybrid vehicles, so arrangements were made to

supply one of the prototype vehicles to the City of Denver.

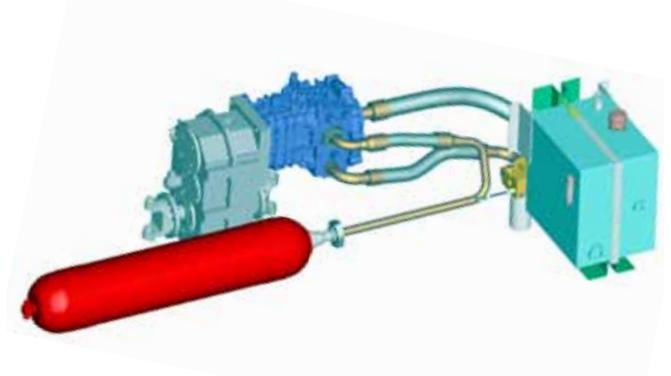
Challenge

The City has very aggressive goals for reducing emissions and moving toward sustainable energy sources like bio-diesel. Like all government entities, Denver also has a mandate to minimize both the operating and life-cycle costs of its vehicle fleet.

For its part, the Eaton hybrid development team needed real-world data on the interaction of the HLA system with the vehicles Anti-Lock Braking System (ABS) on snow and ice.

Solution

A Peterbilt Model 320 HLA hybrid-hydraulic refuse collection truck was supplied to the City of Denver in 2008 and immediately went into service. Denver's refuse



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Eaton HLA® System

- A. Transfer Case
- B. Accumulator
- C. Hybrid Control Unit
- D. Pump/Motor
- E. Reservoir

collection trucks average 8,400 miles per year with an average fuel efficiency of 2.3 miles per gallon. The trucks are operated year-round, providing extensive data on HLA system performance under severe cold, and on the integration with the truck's ABS system on snow and ice.

Results

The City estimates that the HLA-equipped truck has achieved a 25-percent fuel economy improvement. This falls in line with a goal strongly supported

by Denver Mayor John Hickenlooper's Greenprint Denver initiative.

The City also anticipates a significant improvement in brake life because the HLA system recovers and stores most of the kinetic energy usually absorbed by the brakes. This expectation is supported by the data from the trucks being used in Texas.

A non-hybrid truck typically requires brake replacement every three to four months at an average cost of \$2,000.

The integration of the HLA technology and ABS systems has performed flawlessly through a severe Colorado winter, providing one of the last confirmations required before putting the heavy-duty version of Eaton's HLA system into production. Commercial deliveries from Eaton's Spencer, Iowa, plant will begin in September 2009.

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