Heavy Duty & Medium Duty Drive Cycle Data Collection for Modeling Expansion

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Overview

Timeline

- **Project start date: March, 2008**
- **Project end date: September, 2011**
- **Percent complete: 31%**

Budget

- Total project funding
  - DOE share: $1,060K)
  - Partner share: $820K
- Funding received in FY08
  - $100K
- Funding for FY09
  - $320K

Barriers

- **Barriers addressed**
  - **Obtaining Voluntary Fleets for Data Collection**
  - **Obtaining Inter-Agency Cooperation for Leveraged Funding**
  - **Remote Data Download**
- **Targets**
  - **Data Collected for Three Vehicles in Each of Four Vocations in Two Data Collection Years**

Partners

- H. T. Hackney (Class-7 Combination Trucks)
- Knoxville Area Transit (Class-7 transit busses)
- Federal Motor Carrier Safety Administration (FMCSA) (wireless technologies for data download)
- Project lead: ORNL

Objectives

- Collect and analyze real-world class-7 duty cycle and performance data in order to:
  - Support PSAT Modeling (Classes 7 & 8) and Validation
  - Provide a sound basis for future DOE research and technology investment decisions for class-7 (and class-8)
  - Provide baseline data for 21CTP & SuperTruck evaluation
  - Provide realistic duty cycles to evaluate energy efficiency benefits of new and emerging energy efficiency technologies
  - Conduct special real-world-based energy efficiency studies for DOE
  - Provide a significant database of class-7 (and class-8) real-world operations experience to support research and development

Objectives

- **Primary Technical Objectives (past year)**
  - Establish MOUs with medium truck fleets representing four selected vocations
  - Seek a DOE/DOT/EPA joint effort.
  - Migrate data compilation to a wireless network and develop software for automatic daily downloads
  - Instrument and test data acquisition systems on six test vehicles
  - Initiate the collection of data on class-7 combination and transit vehicles
  - Support PSAT development efforts with HTDC data
  - Initiate class-8 special study on fuel efficiency
  - Seek real-world performance and duty cycle data collection for hybrid truck technologies
  - Seek to establish a capability for evaluation the fuel efficiency benefits of new and emerging heavy/medium truck technologies
  - Support 21CTP data and information needs

FY-2008 and FY-2009 Milestones

- Identify/finalize MTDC performance measures; March, 2008
- Complete Class-6/Class-7 vocation study and suggest vocations to address in the MTDC effort; July, 2008
- Establish MOUs with fleets representing selected vocations; December 2008
- Modify/upgrade data acquisition systems for application to MTDC, December, 2008
- Seek a DOE/DOT/EPA joint effort (before initiating FOT)
- Design/test a wireless data download system; January 2009
- Develop an automatic data downloading capability; February, 2009
- Instrument and test data acquisition systems on six test vehicles; February, 2009
- Initiate the collection of data on class-7 combination and transit vehicles; March, 2009
- Conduct MOU Signing with H. T. Hackney and KAT; April, 2009
- Complete class-8 speed/energy efficiency study; September, 2009
- Support Multi-Agency Commercial Motor Vehicle Research Information Sharing and Partnerships (on-going)

Approach and Unique Features

Collect real-world duty heavy/medium truck cycle and performance data from operating fleets and make data/information available to DOE and research partners

- Identify relevant performance measures
- Design/test a data acquisition system to collect identified performance measures
- Find fleets willing to participate without direct funding
- Instrument and "shake-down" test vehicles
- Manage data in a cost effective and secure manner (wireless download)
- Develop specialized data manipulation and analysis software (real-world-based duty-cycle generation tool – DCGenT)
- Conduct specialized studies
- Outreach to other agencies/programs for cost leveraging (DOE/DOT partnership agreement on MTDC)

Technical Accomplishments, Progress & Results

- Published HTDC Final Report
- Re-worked class-8 data acquisition systems (DASs) for MTDC application
- Achieved partnerships with H. T. Hackney and Knoxville Area Transit (KAT)
- Achieved partnership with DOT/FMCSA
- Added DASs, MGM e-Stroke (for brake actuator status [each tractor wheel end], brake application pressure) and SafeGuard Tire Pressure Monitoring system (for tire pressure, tire temperature, and tire pressure threshold detection for each tractor tire) to each H. T. Hackney test vehicle
- Initiated MTDC data collection
- Developed Software to automatically download and error-check data from each of the six instrumented vehicles
- Participated in the first DOE/OVT-DOT/FMCSA Commercial Vehicle Research information sharing meeting
- Provided duty cycle data to ANL for PSAT, Ricardo for Easy-5 runs, DOE/OVT for possible use in the SuperTruck solicitation

Future Work

- Sep09: complete Class-8 fuel efficiency vs. speed study
- Oct09: initiate fuel efficiency study for advanced technologies (tentative)
- Oct09: initiate the design of a nationwide, reduced data set, wireless data collection program (tentative)
- Feb10: complete collection of H. T. Hackney & KAT data
- Mar10: initiate 1st MTDC fuel efficiency study and generate characteristic duty cycles for class-7 combination vehicles and transit busses
- Mar10: instrument Dillard Construction bucket-trucks (3) & Clinton Highway wreckers (3)

Dillard Smith Construction Company

- Apr10: initiate data collection for Dillard Construction & Clinton Highway Wrecker trucks

CLINTON HIGHWAY
Wrecker Service

- Mar11: complete Dillard Construction & Clinton Highway Wrecker trucks data collection
- Apr11: initiate 2nd MTDC study and generate characteristic duty cycles for bucket and wrecker trucks
- Sep11: Complete MTDC study and issue final report for MTDC efforts

Summary

- The HTDC final report was issued: >700,000 miles of data, richest known source of real-world heavy truck data (290 gigabytes) – fuel consumed, engine parameters, location speed, road grade, road condition, wind velocity/direction - numerous enquiries for data
- The MTDC effort was initiated with class-7 combination vehicles & transit busses
- Wireless download capabilities were developed
- All fleet participation has been gratis
- Data has been used to support modeling, 21CTP, and studies of fuel efficiency evaluation of single wide tires, payload weight, speed, driver style. Potential to look at congestion and fuel efficiency from a network perspective. Data also has the potential to support EPA' SmartWay Program (duty cycles)
- The MTDC effort brings DOE/OVT and DOT/FMCSA together on the same project in the commercial vehicle area.