DRISI
Caltrans Division of Research,
Innovation and System Information

Research Results

Light Fleet-In Vehicle Data Acquisition System Evaluation (FIDAS)

Conducted evaluation and testing of commercial off-the-shelf components for use in light fleet vehicles to improve fleet operation using data collected with FIDAS.

Equipment

MARCH 2016

Project Title:
Fleet In-Vehicle Data Acquisition Systems for Fleet Management and Reporting (FIDAS)

Task Number: 2516

Completion Date: September 30, 2015

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WHAT WAS THE NEED?

The California Department of Transportation (Caltrans) has a fleet of about 7,100 lightweight vehicles and 2,000 heavy vehicles. Automated Vehicle Location (AVL) systems using Global Positioning System (GPS) have been used to provide better management of large vehicle fleets in both the private and public sector for decades. Recent technological advancement have lowered the cost of these systems and improved their data collection ability. With increasing availability of the automotive On-board Diagnostic (OBD) II port, the new generation of GPS/AVL systems can collect vehicle data beyond just location. Some of these systems have additional sensor (digital and/or analog) interfaces that enable customers to collect other sensor data on board the vehicle.

The Caltrans Division of Equipment (DOE) needed to assess the use of cost-effective solutions (fleet in-vehicle data acquisition systems, or FIDAS) to improve Caltrans fleet management.

WHAT WAS OUR GOAL?

The goal was to assess the current state-of the-art methods and devices for fleet tracking, perform a pilot study for a portion of the Caltrans light vehicle fleet, assess areas for potential improvements and savings, and perform a cost-benefit analysis.

WHAT DID WE DO?

Caltrans contracted the Advanced Highway Maintenance and Construction Technology (AHMCT) Research Center at the University of California Davis to assess the current state-of the-art

methods and devices for fleet tracking, perform a pilot study for a portion of the Caltrans light vehicle fleet, assess areas for potential improvements and savings, and perform a cost-benefit analysis.

AHMCT researchers worked with Caltrans DOE to perform a pilot study and determine methods to improve light vehicle fleet operation by installing in-vehicle telematics devices on two hundred Caltrans vehicles and collecting and analyzing two years of data. Researchers developed algorithms to identify waste and inefficiency in the fleet and performed cost-benefit analysis to determine the return on investment.

WHAT WAS THE OUTCOME?

Research results show that vehicle speeding and idling are the two forms of possible cost savings. Results of this study show that 13% of vehicle fuel is squandered on idling, and 2% of vehicle fuel is wasted due to speeding. Eliminating 95% of speeding and idling would result in a 12% fuel saving (9.9 gallons per vehicle per month, or approximately $39.6 per vehicle per month).

In addition, the study also found that installing the FIDAS telematics devices does not directly change driver behavior in the case of Caltrans. Research results determined that in order to accomplish fuel saving along with the deployment of a FIDAS solution, new policy on idling and speeding must be implemented, including training, coaching, and positive and negative enforcement to the drivers. Results also show that installing FIDAS telematics devices without changing driver behavior will not accomplish cost savings.

WHAT IS THE BENEFIT?

The tangible benefits that may provide direct dollar saving toward funding of the FIDAS solution are the fuel saving from reduced idling and speeding, and decreasing vehicle misuse.

The average regular gasoline price in California from December 2012 to May 2014, when this study was performed, was $3.87. Thus, a $4.00 per gallon fuel price was used for the cost-benefit analysis. In addition, the analysis also includes a $0.18/gallon/year increase in fuel prices to examine the sensitivity of the analysis.

Several Cost-Benefit fuel savings models were analyzed, along with two different deployment cost options: cellular and wireless fidelity (WiFi) data link. The analysis gave an upper and lower bound of genuine achievable savings and provided decision makers with sufficient data to make an informed decision. The analysis depended on many variables that can significantly affect the results. The fuel price alone can change the payback duration. The analysis shows that in order to break even within 5 years of investing in FIDAS telematics devices, a minimum of 12% fuel saving (at $4 per gal.) must be achieved for the cellular option, and a minimum of 8% fuel saving (at $4 per gal.) must be achieved for the WiFi data link option. Based on the idling (13% of fuel usage) and speeding data (1.2% fuel usage), Caltrans should be able to achieve 12% savings by implementing an effective speeding and idling reduction program.

LEARN MORE

View the Final Report
https://dot.ca.gov/-/media/dot-media/programs/research-innovation-system-information/documents/f0016927-ca16-2516-finalreport.pdf

IMAGES

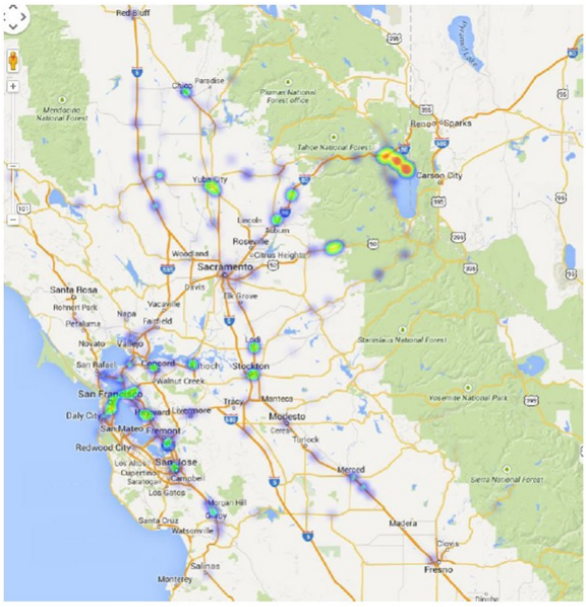


Image1: Idling location heat map for December 2012

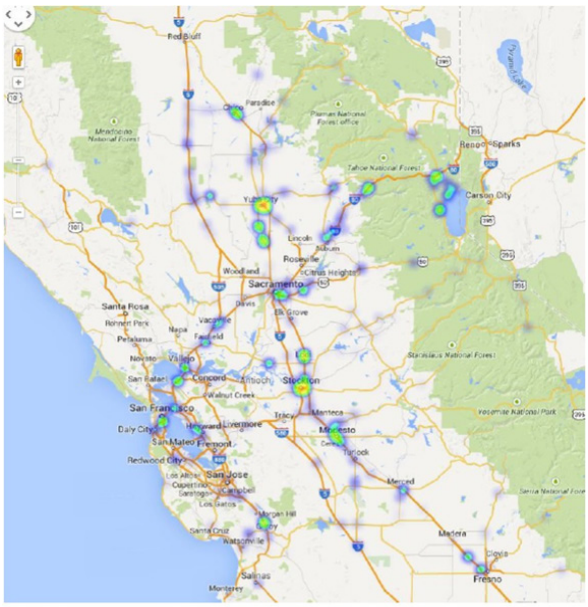


Image 2: Idling location heat map for June 2013

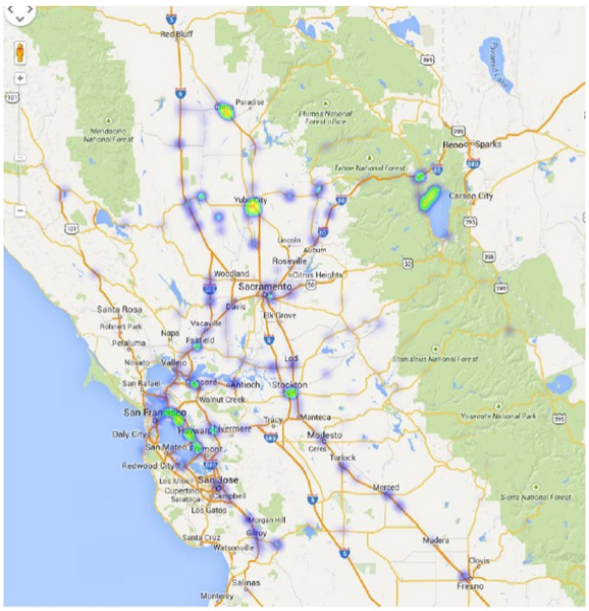


Image 3: Idling location heat map for May 2014

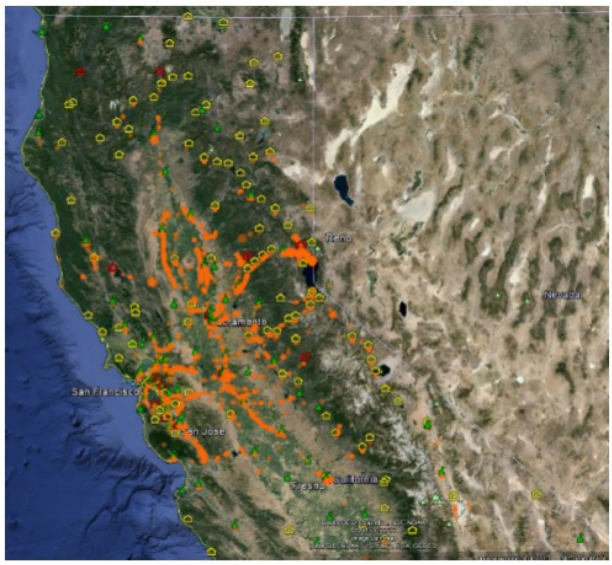
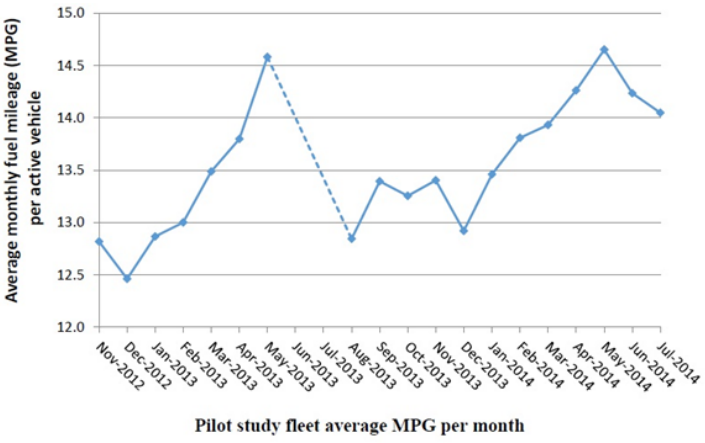


Image 4: Idling location cluster map for January 2014 for northern California, from Google Earth

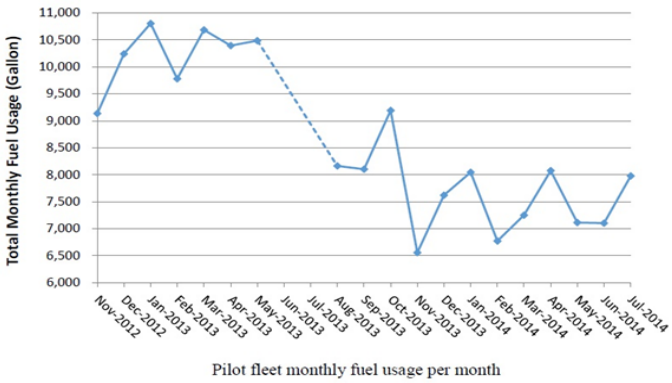
Idling location cluster map for January 2014 for southern California, from Google Earth

Image 5: Idling location cluster map for January 2014 for southern California, from Google Earth



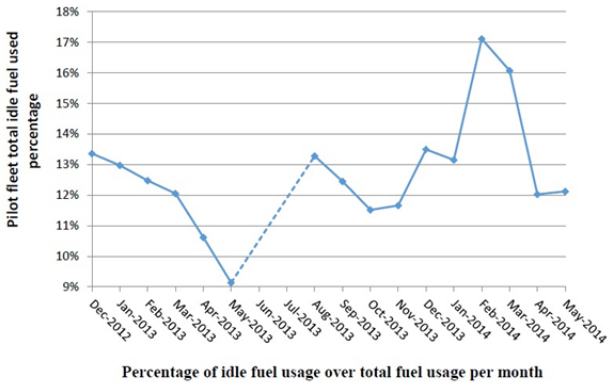
Pilot study fleet average MPG per month

Image 6: Pilot study fleet average MPG per month



Pilot fleet monthly fuel usage per month

Image 7: Pilot fleet monthly fuel usage per month



Percentage of idle fuel usage over total fuel usage per month

Image 8: Percentage of idle fuel usage over total fuel usage per month