



Caltrans Division of Research,
Innovation and System Information

Research



Results



Equipment

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Project Title:

Evaluating the Effectiveness of
“Smart Pedal” Systems for Vehicle
Fleets

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Evaluating the Effectiveness of “Smart Pedal” Systems for Vehicle Fleets

Evaluate the effectiveness of different “Smart Pedal” systems in reducing fuel consumption and GHG emissions.

WHAT WAS THE NEED?

California has major initiatives for reducing greenhouse gas (GHG) emissions by 40% below 1990 levels by 2030, and 80% reduction below 1990 levels by 2050. In recent years, there have been a number of “Smart Pedal” systems that emerged, both as automotive original equipment manufacturer (OEM) equipment and as third-party hardware. These “Smart Pedal” systems can be installed in vehicles with the potential to reduce fuel consumption and GHG emissions by smoothing a driver’s acceleration and deceleration patterns, with little effect on travel time or safety. This research task order will catalog and evaluate the effectiveness of different “Smart Pedal” systems in reducing fuel consumption and GHG emissions.

WHAT WAS OUR GOAL?

This research will test and evaluate the effectiveness of the SmartPedal system in reducing fuel consumption and improving fuel economy in Caltrans fleet vehicles. The system will be tested both in a controlled testing environment and realworld conditions to determine the effectiveness, benefits, issues, and potential savings offered by the system.

WHAT DID WE DO?

The research team will initially review existing “Smart Pedal” technologies and characterize the cost, installation, components, vehicle applicability, and expected effectiveness. The research team will collaborate closely with Caltrans and the technology provider to determine five (5) candidate vehicles on which to test the selected technology. Following the collaborative



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identification of five (5) demonstration vehicles, the research team will install data loggers (1 Hz data rate) to monitor vehicle operating parameters (fuel, throttle, speed, acceleration, and location). An existing baseline vehicle activity data set will then be established using drivers of these instrumented vehicles. The research team will then coordinate with Caltrans staff to facilitate the installation of the "Smart Pedal" technology by Caltrans staff on the five (5) demonstration vehicles. The research team will then conduct another similar vehicle activity dataset, this time with the use of the "Smart Pedal" technology. Finally, the research team will be able to characterize the physical impacts of the technology on vehicle operation by comparing physical operating conditions (speed, acceleration, fuel) between the datasets. The research team will utilize the before/after "Smart Pedal" data to conduct a cost/benefit analysis of the top 2% of Caltrans Fleet vehicles which would benefit from "Smart Pedal" technology installation, projecting on to a large-scale deployment in Caltrans fleet vehicles. Future phases may include a much larger pilot program, covering a larger number of vehicles in the fleet over longer periods of time.

WHAT WAS THE OUTCOME?

The average fuel economy for the baseline and the "Smart Pedal" technology data collection periods were determined from Electronic Control Unit reported fuel. An overall fuel economy savings of up to 6.3% was observed, however two of the six fuel economy differences showed small negative results, which may indicate that the effect of uncontrolled parameters may be significant.

To increase confidence in the effectiveness of the SmartPedal™ device, further testing is recommended. Two options for additional testing are a study with a much larger sample size performed under real-world conditions or a smaller study performed under more controlled conditions in which specific routes are driven

repeatedly, alternating between the baseline and the SmartPedal™ technology, and ensuring that the driver, the number of passengers, vehicle payload, traffic conditions, road conditions, accessory usage, and other parameters that could potentially affect fuel economy remain as constant as possible.

WHAT IS THE BENEFIT?

These "Smart Pedal" systems can be deployed in Caltrans fleet with the potential to reduce fuel consumption and greenhouse gas emissions by smoothing a driver's acceleration and deceleration patterns, with little effect on travel time or safety.

IMAGES



Image 1: SmartPedal™ device



Image 2: Left to right: Electronic accelerator pedal without SmartPedal™ installed, SmartPedal™ connected to accelerator pedal wire harness connection, SmartPedal™ installed inline between accelerator pedal and accelerator pedal wire harness connection.