



Study of the Impact of a Telematics System on Safe and Fuel-Efficient Driving in Trucks

Transportation and logistics companies increasingly rely on modern technologies and in-vehicle tools (also known as telematics systems) to optimize their truck fleet operations. Telematics is technology that combines telecommunications (i.e., the transmission of data from on-board vehicle sensors) and global positioning system (GPS) information (i.e., time and location) to monitor driver and vehicle performance. These technologies are sometimes combined with specialized driver interventions in the forms of feedback, training, and/or incentive programs that can improve truck fleet management and reinforce safe and fuel-efficient driving behavior. Driver behavior is by far the largest single contributor to improving fuel efficiency. There can be as much as a 35-percent difference in fuel consumption between a good driver and a poor driver. Therefore, improving fuel efficiency by encouraging improved driving habits is one of the most promising measures to reduce fleet operation costs. Because fuel costs account for a significant portion of overall motor carrier operating costs, technologies that reduce fuel consumption and encourage responsible driving behavior have tremendous potential.

PURPOSE

This study examined the relationship between safe driving and fuel consumption in heavy-duty truck operations. Commercial motor vehicles (CMVs) are vital in moving the Nation's freight and they make up about 4 percent of the vehicles on the road, but they account for more than 20 percent of all fuel consumed in the United States. The subject of this study—Class 8 trucks (i.e., trucks with gross vehicle weight rating of 33,001 lbs. or over)—generally have the highest annual fuel use, and their energy demand accounts for approximately 65 percent of the total fuel consumed by all truck classes. Fuel is

the number one non-labor operating expense for truck fleets, and the estimated annual fuel cost of Class 8 trucks can range from 28–38 percent of the operating costs. Thus, reductions in fuel consumption will improve fleet profitability. The question is: “Can improved fuel economy be associated with safer driving?”

PROCESS

Researchers conducted a 10-month field evaluation that included installing telematics technologies in 46 Class 8 trucks in combination with staged driver intervention (i.e., feedback, coaching, and rewards).

The truck drivers naturally fell into two distinct groups: drivers of day cabs and drivers of sleeper cabs. Data were collected separately for each group, and driver performance was monitored through several on-board vehicle sensors: an accelerometer which senses sudden or harsh braking or swerving and “jack-rabbit starts,” and other sensors that measure fuel economy, engine speed (revolutions per minute), and vehicle speed (miles/hour). The two groups were subdivided into a pilot group and a control group, resulting in four total combinations: pilot day cabs, control day cabs, pilot sleeper cabs, and control sleeper cabs. While all four groups were monitored for driver performance, driver intervention was only applied to the pilot groups.

The project was conducted in the following stages, described below (see Figure 1 for approximate dates):

- **Stage 1.** Baseline data collection.
- **Stage 2.** Pilot driver awareness/information.

- **2A**—Pilot driver aware of being monitored.
- **2B**—Pilot driver provided with vehicle-specific information on speed, revolutions per minute (RPM), and fuel consumption on a weekly basis.
- **Stage 3.** Pilot drivers were made aware that their behavior was being monitored with feedback provided through in-cab display for speeding and unsafe events.
- **Stage 4.** Pilot drivers were rated, and pilot drivers with below-threshold ratings were provided with coaching.
- **Stage 5.** Stage 4 plus incentives.
- **No intervention.** All interventions ceased (not called a stage), but data collection continued.

STUDY FINDINGS

Key findings resulting from monitoring driving performance with a telematics system and providing feedback, coaching, and incentives for improved driving performance from November –October 2011 are shown in Table 1.

Table 1. Change in driver performance from Stage 1 to Stage 5.

Driver Group	Change in unsafe events (sudden acceleration, hard braking, sudden lane change)	Change in distances driven at speeds > 65 miles per hour	Change in distances driven at engine speeds > 1,500 revolutions per minute
Day Cab	-56% to -63%	-33%	+27%
Sleeper Cab	-55 to -60%%	-42%	-48%

As a result of the various interventions, fuel economy improved by 5 and 9 percent, respectively, for the sleeper cab and the day cab groups. Overall, the study appears to show a correlation between fuel economy and safe driving. Trends on fuel economy exhibited a rise as trends on unsafe events exhibited a decline, with the data on both parameters originating from the same set of drivers. This means that safer driving may be said to conserve fuel. Since safe driving is said to conserve fuel, and conserving fuel reduces emissions, then safe driving can also be said to reduce emissions.

RECOMMENDATIONS

Key recommendations are as follows:

- Vendors should be encouraged to develop and market telematics technologies that monitor key fuel and safety performance variables. Telematics systems must be able to generate daily updates on driver performance, as well as summary statistics on the fleet. The data must be easy to access, immediately available for use, and customizable for various audiences.
- Fleet managers should be exposed to safety/fuel-efficiency training prior to providing feedback or coaching drivers on safety and fuel economy.
- Additional research is recommended to further investigate the study findings over a longer period (36–60 months) in order to allow for collection of crash data (which are more definitive measures of safe driving). Because this study was limited in scope, the study team was not able to collect sufficient crash data and instead examined unsafe events.
- It is recommended that a similar study be conducted with motorcoach drivers.

For more information, please visit:

<http://www.fmcsa.dot.gov/safety/research-and-analysis/publications?keywords=&title=&author=&year=&to=&page=0>