

SMARTDRIVE

Fuel Efficiency Study: Commercial Transportation

The SmartDrive Commercial Transportation Fleet Fuel Efficiency Study looks at the impact of eco-driving techniques on fuel consumption in long- and short-haul trucking fleets. The study evaluated 695 Class 8 tractor-trailers, heavy-duty trucks and drivers in a broad range of locations to assess fuel use and determine the effect of fuel-efficiency training combined with in-vehicle, instant driver feedback on improving fuel economy.

The study results show that 80% of fuel waste involves acceleration, deceleration, speeding and turning. Furthermore, the study found that by following eco-driving best practices, drivers could improve fuel economy on average up to 22%. That average reduction in fuel consumption could save fleet operators as much as \$12,553 per vehicle in fuel cost annually.

Eco-Driving Practices Reduce Fuel Consumption

The term eco-driving describes driving practices that optimize fuel use and minimize environmentally harmful emissions, and is being promoted by the U.S. EPA, DOT and industry organizations.

Commercial Transportation Eco-Driving Best Practices



Accelerate and Decelerate Smoothly: Controlled, even starts and stops make more efficient use of power and require less fuel



Reduce Excess Idling: Turning off the engine while parked reduces fuel consumption, improving overall MPG



Avoid Hard Turning: Anticipating turns and smooth deceleration into and acceleration out of turns improves fuel efficiency



Maintain Consistent Speed: Operating within posted speed limits and anticipating traffic flow helps maintain a consistent speed and optimizes fuel efficiency

Eco-Driving Directly Impacts Costs and Emissions

By changing driving habits to improve smooth driving performance, lower speeds and reduce unnecessary idling, fleets committed to eco-driving can:

- Realize significant improvement in fuel mileage and reduce operating expenses
- Reduce hydrocarbon, carbon monoxide, carbon dioxide and nitrogen oxide emissions (and help meet emissions mandates)



SmartDrive Systems

SmartDrive delivers innovative solutions that make it easy for fleet managers to improve driver safety and reduce operating cost. SmartDrive records comprehensive video-based data from the road, then thoroughly reviews and scores critical events and recommends action for fleet managers to quickly respond and deliver sustainable savings – all through an easy-to-use managed service.

The company has compiled the world's largest storehouse – more than 34 million events – of real-time, risky-driving incidents. SmartDrive is based in San Diego, CA, and employs over 375 people worldwide.

For more information, please visit

www.smartdrive.net

SMARTDRIVE
**COMMERCIAL
TRANSPORTATION
FUEL EFFICIENCY
STUDY**



Overview

In May 2011, SmartDrive began ongoing fuel economy studies across different types of fleets. This paper focuses on the commercial transportation sector, evaluating the fuel consumption and driving performance of 695 Class 8 vehicles and drivers over a period of several months.

What was measured:

The study looked at key fuel use indicators and driving maneuvers:

- **Actual fuel use:** as measured in miles per gallon from the Engine Control Unit (ECU)
- **Idling time:** how much time was spent with the engine running while no movement was recorded for greater than five minutes
- **Acceleration:** the incidence, frequency and severity of quick starts and sudden acceleration during travel as measured by accelerometer and ECU
- **Braking:** hard braking defined by speed from the ECU, duration of deceleration and G-force effect measured by the accelerometer
- **Turning:** hard turning/cornering measured by speed from the ECU and G-force from the accelerometer
- **Speeding:** excessive speeds above posted limits and/or typical traffic flow for road segments, as measured by GPS and ECU

How driving performance was measured:

The SmartDrive Safety and Operations solution consists of in-vehicle systems for collecting data and providing real-time feedback to the driver, plus data review, analysis and recommendations. The in-cab hardware includes a variety of sensors and recorders, including:

- **Multi-axis accelerometer (G-force) sensor** detects inefficient vehicle maneuvers
- **High-sensitivity GPS receiver** for real-time tracking of location, time, speed, and direction
- **ECU connection** to access a broad range of data on engine performance, including speed, odometer, fuel level, fuel consumption and additional vehicle information
- **LED multi-light bar** for real-time driver feedback

The multi-stage study process:

- **Establishing baseline metrics:** data collection of driving performance for all vehicles in the study during a control period
 - **Determining fuel efficient operating standards** for idling, braking, acceleration and cornering based on vehicle type and typical operation
 - **Analyzing data to identify type and severity** of maneuvers during control period
 - **Providing driver training on eco-driving** best practices and the SmartDrive in-vehicle Instant Driver Feedback (IDF) system
 - **Analyzing data after training** and after the IDF lights were activated; comparing the treatment period results to the control period
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About the SmartDrive Instant Driver Feedback system:

The SmartDrive IDF system uses data from SmartDrive’s sensors and the vehicle’s engine computer to record hard acceleration, hard braking, hard turning, idling and speeding. Proprietary algorithms determine these maneuvers, which trigger LED lights on the in-cab device. This immediate feedback helps drivers understand the impact of their driving as it happens and make immediate adjustments as needed.

Combinations of color LEDs are used to prompt drivers and rate their eco-driving performance in real time. Green indicates good performance, amber indicates moderately inefficient or risky driving, and red indicates more severe, wasteful driving. With this immediate feedback drivers are able to manage their own performance improvement.

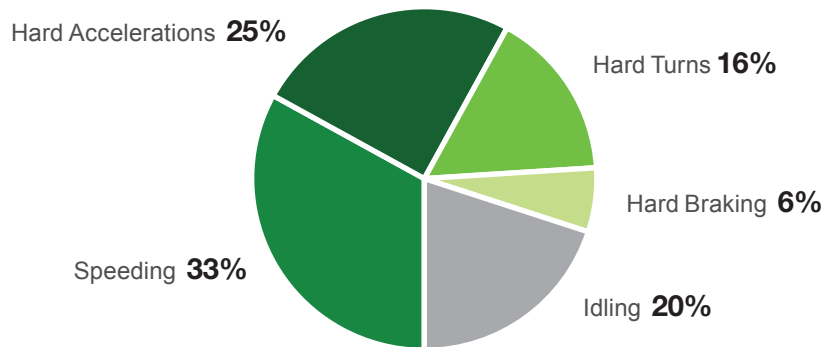
Findings

Stage One: Control Period

The first stage of the study focused on insight – gaining a benchmark view of how the vehicles were being driven and the impact of that driving performance on fuel economy. The study group included heavy-duty trucks and tractor-trailers manufactured by Ford, Freightliner, International, Kenworth, Peterbuilt, Sterling and Volvo.

The baseline findings reveal the following fuel-saving opportunities for Class 8 vehicles:

80% of fuel waste can be improved by softer driving



Incidence of fuel-wasting driving maneuvers: During the control period, the SmartDrive system recorded the frequency of inefficient driving maneuvers



4.0

Hard Accelerations per hour



2.7

Hard Braking Events per hour



0.9

Hard Turns per hour

Stage Two: Training and Instant Driver Feedback (IDF)

Once the baseline was obtained, the study moved into stage two, which initiated the Instant Driver Feedback. Performance rankings were then forwarded to fleet managers, providing them with visibility and recommendations for training drivers to improve performance.

Fuel use before and after training and instant driver feedback

Control Period (before training and IDF) Established an average MPG of 5.92	Baseline MPG 5.92	Gallons 12,127 Annual Cost \$48,629
Within two months , with training and IDF, fuel economy rose to an average of 6.73 MPG; a 14% increase from baseline	MPG up 14% 6.73	Gallons 10,667 Annual Cost \$42,777 Annual Savings \$5,853
The top 25% performing drivers improved fuel economy to 7.98 MPG, an average of 22%, within the first two months Improvement calculated on baseline of top 25% drivers	MPG up 22% 7.98	Gallons 8,996 Annual Cost \$36,076 Annual Savings \$12,553

Average Weekly Mileage: 1,381
 Average Annual Miles Driven: 71,792 (estimated based on average weekly mileage from control period)
 Annual cost based on national diesel fuel cost of \$4.01 from AAA 8/3 to 8/9, 2011

Conclusions and Recommendations for Commercial Trucking Fleets

- The greatest opportunity in fuel efficiency comes from the way a vehicle is operated, particularly hard driving maneuvers.** Identifying inefficient driving habits and reinforcing best practices leads directly to improved performance and reduced operating costs.
- Providing drivers with immediate feedback in the vehicle allows them to make quick corrections and learn over time how to most efficiently operate their vehicle.** Substantial week-to-week improvements indicate that drivers are adopting and adhering to eco-driving techniques that improve fuel efficiency.
- For quick results, deliver additional training with constructive guidance to the drivers that show the highest number of inefficient driving events.** The combination of real-time feedback and focused training drives significant and immediate impact on overall fleet fuel consumption. In this study, by the end of the second month of the treatment period, the top 25% of drivers with the greatest improvement in fuel economy reduced fuel use by an average of 22%, resulting in an annual average fuel savings of \$12,553 per vehicle.