
# Fuel Economy Fleet Applications

## Notes

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Fuel Economy Case Study

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## Introduction

There are many options available for fleet managers who wish to convert their fleets to fuel efficient vehicles. The previous section provided an overview of alternative fuel options and their benefits and drawbacks. This section will provide information specific to the use of fuel economy strategies as a petroleum reduction technology.

The use of fuel economy strategies can be applied to all vehicles and any fleet application. Other alternative fuels and technologies may only apply to niche markets. Some obstacles in the use of fuel efficient vehicles and strategies are the lack of knowledge and understanding of advanced technology vehicles. There are fuel economy strategies that can be implemented by light-duty and heavy-duty fleet managers. There are also new vehicle options and tools to help fleet managers in the decision to examine fuel economy changes of their fleet.

The goal of this section is to provide the information necessary for fleet managers to determine if implementing fuel efficient strategies and fuel efficient vehicles are viable alternatives for their fleet.

## Objectives

- Explain how to implement green fleets
- Learn about incentives for converting to fuel efficient fleets
- Learn about the availability and cost of fuel efficient strategies and vehicles
- Identify the advantages of fuel economy improvements
- Understand how fuel efficient vehicles perform, compared to conventional vehicles

## Greening of Fleets

There can be challenges to starting a fuel efficient green fleet, or converting an existing fleet to use petroleum reduction technologies. According to some industry experts, a successful plan to reduce fuel consumption and carbon emissions requires a long-term vision, incremental change, support from top management, and flexibility to make changes along the way.

There are compelling reasons why fleets should be green and deliberate steps on how to implement alternative fuels.[1]

### *Why Use Green Fleets?*

- **Reduce operating costs** by improving efficiency, reducing lifecycle costs, and reducing vulnerability to volatile fuel prices.

- **Reduce greenhouse gas emissions** by implementing the use of fuel efficient strategies and vehicles, which are the primary source of greenhouse gases and urban air pollution.
- **Improve corporate image** by branding business strategies and appealing to public concerns about energy conservation and ecological sensibilities.

***How to Implement Green Fleets***

- **Get buy-in** from all management and staff levels, and be sure to communicate information about the benefits, goals, and targets frequently.
- **Create long-term objectives** and tangible goals based on best practices in the industry (such as baselines, benchmarks, and progress reports).
- **Avoid setting reduction goals in absolute numbers** for growing fleets or fleets just starting because absolute goals can impede growth.
- **Anticipate obstacles**, such as driver resistance, lag time between original equipment manufacturers' technology and market availability, and slower return on investment.
- **Move slowly** and implement change over time.
- **Improve vehicle use** with selection analysis and education of drivers.
- **Track and report progress** and share successes with employees, shareholders, and the public

## Fuel Efficient Vehicle Fleets

Fuel economy is a measure of how efficiently a vehicle uses fuel. The most common unit associated with fuel economy is miles per gallon (MPG). Improvements in fuel economy mean that a vehicle will be able to travel a larger range for a given volume of fuel. Fuel economy varies between all vehicles. New vehicles advertise vehicle fuel economy as determined by specific Environmental Protection Agency (EPA) tests. Many things can affect fuel economy, including vehicle design and operation. Vehicle manufacturers control the variables associated with improved fuel economy based on vehicle design. Consumers and fleet managers control the effects of vehicle operation on fuel economy.

Notes

The Environmental Protection Agency (EPA) sets the fuel economy and $CO_2$ emissions for all vehicles. Data for light-duty vehicles show an average engine power of 220 horsepower (hp), an average fuel efficiency of 22.5 MPG and average weight of 4,009 lbs for 2010. These figures include passenger cars, sport utility vehicles (SUVs) and light-duty trucks. The same values in 1975 were an average engine power of 137 hp, an average fuel efficiency of 13.1 MPG, and an average weight of 4,060 lbs. Thus, it is seen that while keeping the average weight similar, and increasing average power by 61%, the average fuel economy has increased by 72%. The current Corporate Average Fuel Economy (CAFE) standard for average light-duty fleet vehicles is 27.5 MPG. The Obama administration has raised this target value to 35.5 MPG by 2016 and 54.5 MPG by 2025.

Fuel economy is affected by engine and vehicle design that falls to the vehicle manufacturers and by the vehicle operator. Following are some of the key things that affect fuel economy by each. The fuel economy is measured by calculating how much fuel is consumed by the engine for a given distance. This fuel is used as the energy source to propel the vehicle down the road. There are forces on the vehicles that tend to resist motion. These forces applied to the moving vehicle consume the power generated by the engine. This is often examined by the road load equation that shows where the power is consumed.

**Engine Power = Power to Accelerate Vehicle + Power to Overcome Wind Drag + Power to Overcome Road Grade + Power to Overcome Friction + Accessory Power**

Fuel consumption for a given vehicle will increase as the necessary engine power increases. The power necessary to accelerate the vehicle is proportional to the mass or weight of the vehicle and how quickly the speed changes. The power to overcome wind drag is proportional to the size, shape, and speed of the vehicle. Power to overcome road grade is proportional to mass or weight and steepness of road grade. The power to overcome friction is proportional to the rolling resistance of the tires. Accessory power is proportional to electrical and auxiliary loading on the vehicle such as use of the air conditioning (A/C) system. Each of these areas can contribute to improvements or decreases in fuel economy.

There are many options for fleet managers to increase the fuel economy of their fleets for light-duty and heavy-duty vehicles. There are some strategies that can be implemented without significant capital costs. When starting a new fleet there are many options for fuel efficient vehicles. Conventional gasoline and diesel-fueled vehicles have advanced over the past 10 years and achieve better fuel economy. There are also options to convert fleets to hybrid electric vehicles that utilize hybridization, advanced engines, and idle reduction strategies that offer fuel economy improvements. Increases in fuel economy offer direct savings to fleets by reduction in fuel purchases and offer the incentive of reducing the carbon footprint of the fleet.

## Incentives for Implementing Fuel Efficiency

Incentives propagate the growth and purchasing power within organizations that are needed for strong commercial markets. Incentives include partnership initiatives and pooled resources, financial subsidies, and informational tools. In this section we'll discuss incentives available to fleet managers that augment efforts to implement fuel efficient strategies and vehicles in their fleets.

Recent industry surveys have confirmed that fleet managers are purchasing alternative fuel vehicles to meet specific EPAct regulations and mandates by the federal government. Unfortunately, alternative fuel and advanced technology vehicles cost more than their gasoline-fueled counterparts, and determining how to pay for these more expensive vehicles has become a growing concern for fleet managers across the country. There is financial help available and fuel efficient strategies, however, that can be implemented at almost no cost.

Despite the fluctuating economy and budget woes, there are a record number of grants and incentives for funding alternative fuel vehicles that have been made available. For example, in 2009, the U.S. Department of Energy (DOE) made nearly $300 million of American Reinvestment and Recovery Act (ARRA) funding available through the Clean Cities program. This single grant funding opportunity is responsible for putting more than 9,000 alternative-fuel and energy-efficient vehicles on the road.

### *Tax Incentives*

In the past decade there have been many federal and state tax incentives for alternative fuels and advanced technology vehicles.[2] For example, previous tax incentives were applied to hybrid electric vehicles that had improved fuel economy over their conventional counterparts. There are currently state and federal tax incentives for the purchase of electric vehicles such as the Nissan Leaf, which could be utilized in light-duty fleet applications. There are also tax incentives for heavy-duty fleets to improved fuel economy by using advanced technologies such as auxiliary power units (APUs) and other technologies to reduce fuel consumed at idle. Incentives, laws, and regulations are always changing and fleet managers should frequently check government websites for additional assistance.

***Tools to Help!***
*To find state-specific tax incentives, visit: www.afdc.energy.gov/afdc/laws/search*

Notes

In addition to an infrastructure that provides tax breaks for fuel efficient vehicles, the government has established the gas guzzler tax. This tax was created in 1978, during the height of the gasoline shortage. This tax was implemented to discourage consumers from purchasing, and manufacturers from producing, fuel inefficient vehicles. A downfall of the current gas guzzler tax is that it applies to passenger cars only. It does not apply to light-duty trucks, minivans or sport utility vehicles (SUVs), which may prove beneficial to light-duty fleet operators that require these vehicles. This tax does not apply to any passenger vehicle that has a combined MPG rating of greater than 22.5. **Figure 1** shows the tax rates for gas guzzlers as of 2010.

| Combined fuel economy of: | Amount |
|---|---|
| at least 22.5 MPG | No tax |
| at least 21.5, but less than 22.5 MPG | $1000 |
| at least 20.5, but less than 21.5 MPG | $1300 |
| at least 19.5, but less than 20.5 MPG | $1700 |
| at least 18.5, but less than 19.5 MPG | $2100 |
| at least 17.5, but less than 18.5 MPG | $2600 |
| at least 16.5, but less than 17.5 MPG | $3000 |
| at least 15.5, but less than 16.5 MPG | $3700 |
| at least 14.5, but less than 15.5 MPG | $4500 |
| at least 13.5, but less than 14.5 MPG | $5400 |
| at least 12.5, but less than 13.5 MPG | $6400 |
| less than 12.5 MPG | $7700 |

**Figure 1:** *Gas guzzler tax based on fuel economy. Source: www.epa.gov.*

### *Federal Grant Funding*

When it comes to grant opportunities, the federal government is by far the largest and most consistent source of funding. Many federal agencies offer funding opportunities, but the majority of funding for alternative fuel vehicles and transportation related projects comes from a handful of federal agencies, such as the U.S. Department of Energy (DOE), Department of Transportation (DOT), Environmental Protection Agency (EPA), and U.S. Department of Agriculture (USDA). These agencies have information on their funding opportunities available on their respective websites.

### *State Grant Funding*

Many states have developed aggressive grant funding programs during the past few years. While each state has different grant funding sources, the designated State Energy Office (SEO) is typically the largest alternative fuel vehicle grant funding source in each state. To make it easy to identify each state's SEO, the National Association of State Energy Officials (NASEO) publishes a directory of State Energy Offices online. The DOE's Alternative Fuels Data Center (AFDC) also publishes an interactive web-based map that allows users to click on

any state in the country to get information on alternative fuel vehicle incentives and funding sources.[3] There is a multitude of state-level funding programs for clean air vehicle and transportation projects, but visiting these two websites will provide the starting points for any fleet manager interested in state-level funding programs.

### *Incentives for Fuel Efficient Vehicle Production*

Just as there are incentives for the production of alternative fuels, there are incentives for the production of fuel efficient vehicles. Many of these incentives apply to continued research in the areas of hybrid electric vehicles and fuel cell technologies. An example of an available incentive is the Advanced Technology Vehicle (ATV) manufacturing incentive. This incentive is available for companies that produce fuel efficient vehicles in the U.S. It helps companies by covering up to 30% of reconfiguring or developing manufacturing facilities. These incentives help advance the research and production of fuel efficient vehicles, which will lead to increased options for future fleet managers.

## Fuel Efficient Vehicle Availability and Cost

Fuel efficient vehicles are widely available in light-duty and heavy-duty versions. Engine control continues to evolve, producing more fuel efficient gasoline and diesel vehicles. These advances are being combined with other technologies such as hybrid systems, in light-duty and heavy-duty vehicles.

The most fuel efficient light-duty cars and trucks are presented in **Figures 2** and **3**, respectively. These are the values reported by the EPA for the 2012 model year.

| EPA Class | Vehicle Description | Fuel Economy Combined |
|---|---|---|
| Two-Seaters | Honda CR-Z<br>4 cyl, 1.5 L, Automatic (AV-S7), HEV, Regular | 37 |
| Minicompacts | Scion iQ<br>4 cyl, 1.3 L, Automatic (CVT), Regular | 37 |
| Subcompacts | Mitsubishi i-MiEV<br>A-1, 66 kW DCPM, Electric Vehicle | 112‡ |
| Compacts | Chevrolet Volt<br>4 cyl, 1.4 L, Automatic (AV), Plug-in Hybrid | 60§ |
| Midsize | Nissan Leaf<br>A-1, Electric Vehicle | 99‡ |
| Large | Hyundai Sonata<br>4 cyl, 2.4 L, Manual (6), Regular<br>Hyundai Sonata<br>4 cyl, 2.4 L, Automatic (6), Regular | 28 |

**Figure 2:** *Most fuel efficient light-duty cars for 2012 model year. Source: EPA.*

| EPA Class | Vehicle Description | Fuel Economy Combined |
|---|---|---|
| Small Station Wagons | Audi A3<br>4 cyl, 2.0 L, Automatic (S6), Diesel | 34 |
| | Volkswagen Jetta SportWagen<br>4 cyl, 2.0 L, Manual (6), Diesel | 34 |
| Midsize Station Wagons | Toyota Prius v<br>4 cyl, 1.8 L, Automatic (CVT), HEV, Regular | 42 |
| Small Pickup Trucks | Toyota Tacoma 2WD<br>4 cyl, 2.7 L, Manual (5), Regular Gasoline | 22 |
| Standard Pickup Trucks | Chevrolet Silverado 15 Hybrid 2WD<br>8 cyl, 6.0 L, Automatic (CVT), Regular Gasoline<br>Chevrolet Silverado 15 Hybrid 4WD<br>8 cyl, 6.0 L, Automatic (CVT), Regular Gasoline | 21 |
| | GMC Sierra 15 Hybrid 2WD<br>8 cyl, 6.0 L, Automatic (CVT), Regular Gasoline<br>GMC Sierra 15 Hybrid 4WD<br>8 cyl, 6.0 L, Automatic (CVT), Regular Gasoline | 21 |
| Sport Utility Vehicles | Ford Escape Hybrid FWD<br>4 cyl, 2.5 L, Automatic (CVT), Regular Gasoline | 32 |
| Minivans | Mazda 5<br>4 cyl, 2.5 L, Automatic (S5), Regular Gasoline<br>Mazda 5<br>4 cyl, 2.5 L, Manual (6), Regular Gasoline | 24 |
| Passenger Vans | Chevrolet Express 1500 2WD FFV<br>8 cyl, 5.3 L, Automatic (4), Regular Gasoline<br>Chevrolet Express 1500 AWD FFV<br>8 cyl, 5.3 L, Automatic (4), Regular Gasoline | 14† |
| | Ford E150 Wagon FFV<br>8 cyl, 4.6 L, Automatic (4), Regular Gasoline | 14† |
| Special Purpose Vehicles | Azure Dynamics Transit Connect Electric Van<br>A-1, 52 kWAC, Electric<br>Azure Dynamics Transit Connect Electric Wagon<br>A-1, 52 kWAC, Electric | 62‡ |

**Figure 3:** *Most fuel efficient light-duty trucks for 2012 model year. Source: EPA.*

Heavy-duty and other commercial vehicles can also benefit from strategies to improve fuel economy. It is estimated that the largest production trucks (Class 8) have a fuel economy of about 6 MPG. The U.S. Energy Information Administration estimates this figure to rise to 6.8 MPG by 2025. Research is ongoing to combine emerging light-duty technologies into heavy-duty vehicle packages. The Northeast States Center for a Clean Air Future and the International Council on Clean Transportation found that fuel consumption

of Class 8 trucks can be reduced up to 50% by using these current and developing technologies alongside new operational measures by 2017. Even the advance to 9 MPG may seem shockingly low when compared to the light-duty sector, but with the vehicle miles traveled it is estimated this would save 8 billion gallons of diesel fuel annually. Heavy-duty hybrid electric buses and trucks that have increased fuel economy ratings are available from multiple heavy-duty vehicle manufacturers.

Fuel efficient vehicles and strategies directly affect operating costs of fleets. Fuel efficient vehicle purchase prices may be higher than conventional vehicles. Fleet managers should examine the payback period due to lower fuel consumption and operating costs of these vehicles. The new 2013 fuel economy labels offer annual fuel cost estimates.

The following fuel efficient strategies require little-to-no monetary investment. The buy-in of these strategies really only requires the time to implement these practices in everyday operation. An example of a single fuel saving strategy alone would be to calculate the cost savings due to the practice of proper tire inflation. If the maximum benefit from this practice is 3.3% and a fleet pickup travels 30,000 miles a year at 12 MPG, this would increase the fuel economy to 12.4 MPG. This may not seem like much, but this would equate to $300 in savings per year per vehicle. As the vehicle fuel miles traveled increases, the added benefit of these simple practices becomes more valuable.

## Fuel Efficient Vehicle Advantages

As with all alternative fuels and other petroleum reduction technologies, there are advantages and things to consider when implementing fuel efficient fleets.

### *Advantages*

- Immediate savings from implementing practices
- New fuel efficient vehicles typically have lower operating costs
- Reduces emissions and carbon footprint
- Reduces U.S. dependence on foreign oil

### *Things to Consider*

- New vehicles may have a higher capital cost but 2013 window stickers may help to better examine payback periods
- Some practices such as load reductions on not possible for heavy-duty long haul applications
- Fleet operators may require monitoring to ensure that fuel efficient practices are utilized

## Fuel Economy Strategies

Beyond purchasing new fuel efficient vehicles, there are fuel economy strategies for fleet managers to consider. Many of these strategies require little-to-no investment to implement. The following is a list of safe and effective techniques a driver may use to improve their gas mileage:

- **Slow Down** – Fuel consumption increases rapidly at speeds above 60 mph. The EPA estimates a 15% savings for passenger vehicles reducing their speed from 65 mph to 55 mph.

- **Coasting** – When moving downhill or approaching a stoplight, there is no reason to accelerate. The momentum of the vehicle will keep it moving, and this fuel may be saved. Rapid starts and stops, often called "jack rabbit" starts and stops, use fuel and cost money at the gas pump. Gentle acceleration and braking can save more than $1 per gallon, according to the EPA.

- **Cruise Control** (see **Figure 4**) – It is easy to lose sight of how much pressure a driver is applying to the gas pedal. Cruise control helps maintain a steady speed. Setting the speed typically 5 to 10 mph slower than the speed limit can greatly reduce the amount of fuel consumption on interstate travel. Using cruise control on 10,000 of the miles driven in a year could save you nearly $200 and save more than 60 gallons of fuel, according to the Department of Transportation (assuming $3 a gallon for fuel, 20 MPG, and 15,000 miles driven annually). As the price of fuel increases, savings will be proportionally greater.

- **Tire Pressure** - The U.S. Department of Energy estimates that one can improve gas mileage by up to 3.3% by keeping the tires inflated to the proper pressure. Underinflated tires can lower gas mileage by 0.3% for every 1 psi drop in pressure of all four tires. Properly inflated tires are safer and last longer.

- **Weight** (see **Figure 5**) – Every ounce of weight can make a small difference in the fuel economy of a vehicle. It is recommended to empty a vehicle's trunk or backseat of any nonessential items before driving. This does NOT include removing things like the jack or spare tire. Certain items, like emergency winter blankets, ice chests, and extra clothing have the tendency to stay in the vehicle all year round, while they are only truly useful in select seasons. Ford Motor Company reports that fuel economy drops approximately 1% for every 25 pounds of additional cargo.


**Figure 4:** *Cruise control button and controls. Source: www.fueleconomy.gov.*

**Figure 5:** *Extra weight that can decrease vehicle fuel economy. Source: www.fueleconomy.gov.*

- **Air Conditioning** – A/C can reduce mileage significantly, by as much as 20%. When driving at slower speeds (less than 40 mph), such as driving in urban areas, open windows are better. At higher speeds (over 40 mph), open windows use more fuel than the air conditioner, so close the windows and turn on the A/C. This is the most common form of accessory power utilized by the consumer that be modified to help save fuel.

- **Rerouting** – In some cases it can use less fuel and take less time to find an alternative route than the most direct one. If the direct route involves a great deal of traffic or steep road grades, a longer route can actually prove to be more efficient. Climbing a steep incline will use more fuel than climbing a longer, more gradual incline. Idling in traffic consumes fuel even though no miles are traveled. The fuel economy of a vehicle sitting still in traffic is 0 MPG.

- **Maintenance** – A properly maintained vehicle will always achieve higher fuel efficiency than one that is poorly maintained. Certain vehicle components, like spark plugs, air filters, and fuel filters, are recommended to be replaced regularly due to the direct impact they have upon the vehicle's fuel economy. Ford Motor Company explains that fuel economy drops approximately 25% if the vehicle is not properly maintained.

- **Transmission** –If a transmission is equipped with overdrive, it is recommended to use whenever possible. Overdrive causes the least amount of friction and less friction means less energy waste.

- **Motor Oil** - A vehicle can improve its gas mileage by 1% to 2% by using the manufacturer's recommended grade of motor oil. Always use energy-conserving motor oil to be sure it contains friction-reducing additives.

## Fuel Economy Label

The EPA has unveiled a new label for consumers to help them choose the most fuel efficient car for their driving habits (see **Figure 6**). This new label includes more than the MPG and will be standard for 2013 vehicle sales. Details such as predicted annual fuel costs and average fuel savings will appear alongside a greenhouse gas rating (a scale from 1-10, 10 being the least emissions and 1 being the most), and a smog rating.

The EPA is calling this new labeling program "the most dramatic overhaul to fuel economy labels since the program began more than 30 years ago." Not only has the label changed, but the way that consumers will use the information has as well. Also, the new labels direct buyers to the government website, fueleconomy.gov. This website has information about the labeling program and vehicle rankings, and tips on how to increase fuel economy through driving habits.

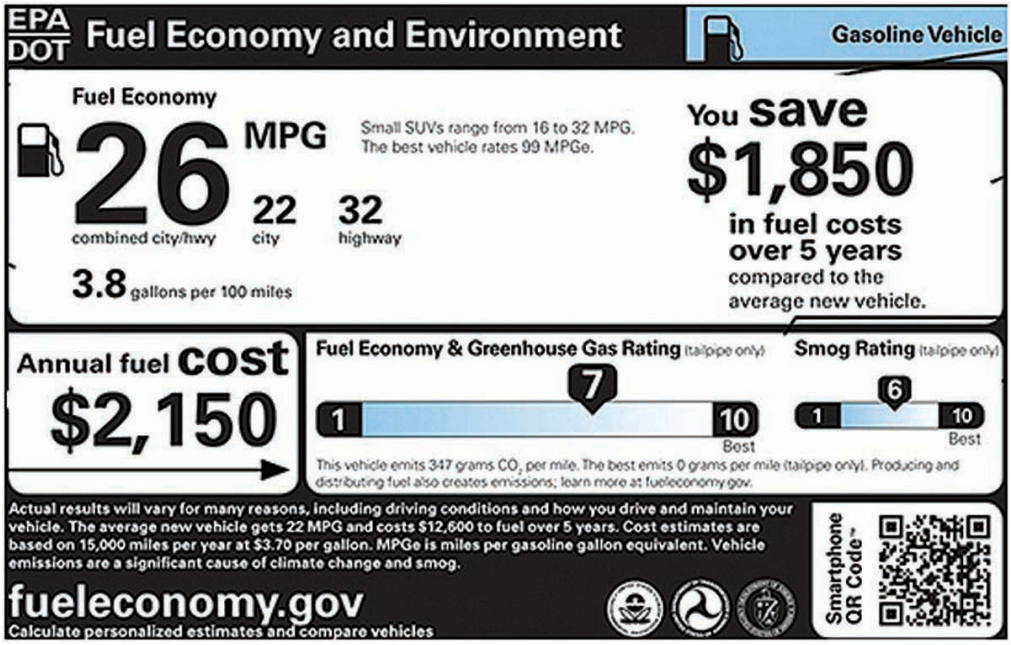



**Figure 6:** *New EPA window label for consumers. Source: EPA.*

## Fuel Efficient Vehicle Performance

Performance is a key consideration when implementing fuel efficient vehicles and strategies as a petroleum reduction technology in fleet applications. These vehicles and strategies should not require sacrifice in operating performance. There are often negative connotations or viewpoints on fuel efficient vehicles such as hybrids. However, fuel efficient vehicles of today offer similar or better performance than conventional vehicles. Fuel economy in itself is often

a performance issue utilized in the decision making process of consumers and fleet managers. As discussed earlier, fuel economy improvements have occurred simultaneously with increases in engine power. Smaller vehicles and engines often use downsized engines that are modified with turbo charging to provide for increased fuel economy with similar or better vehicle performance.

## Summary

This lesson develops an understanding of fuel efficient vehicles and strategies as option for fleet managers and explained how to green fleets by purchasing fuel efficient vehicles and implementing fuel saving practices. Fuel efficient vehicles offer similar performance with reduced fuel consumption, compared to conventional counterparts. There are many options for light-duty and heavy-duty fuel efficient vehicles. There are also low cost practices that can be implemented by fleet managers to see fuel economy improvements on existing fleets. Not only do fuel economy improvements reduce fuel budget costs but it also reduces the carbon footprint of environmentally conscious fleets.

### Test Your Knowledge

1) **True or False:** Fuel economy savings can only be accomplished by the purchase of new fleet vehicles?

2) **True or False:** The new 2013 EPA window stick helps buyers understand the operating fuel costs and fuel savings of new vehicles.

3) The Corporate Average Fuel Economy standard was recently raised by President Obama to _____ MPG by the year 2025.

4) **True or False:** Hybrid electric vehicles offer improved vehicle fuel economy and are available for light-duty and heavy-duty fleets.

Answers: 1) False — there are many practices that can be applied to existing fleets to improve fuel economy; 2) True; 3) 54.5; 4) True.

## Resources

***U.S. Environmental Protection Agency's SmartWay Program***

The DOE Clean Fleets Partnership initiative will complement the U.S. Environmental Protection Agency's (EPA) SmartWay program. The SmartWay brand signifies a partnership among government, business, and consumers to protect our environment, reduce fuel consumption, and improve our air quality for future generations. Fleets can become recognized in their community, in their industry, and on the road by purchasing U.S. EPA Designated SmartWay tractors and trailers for their fleets. These tractors and trailers are outfitted at the point of sale with equipment that significantly reduces fuel use and emissions.

***Learn more about EPA SmartWay:***
*http://www.epa.gov/smartwaylogistics/index.htm*

As a SmartWay partner, fleets may qualify to label the exterior of their tractor or trailer as a SmartWay tractor or SmartWay trailer—marks of a cleaner, more flue-efficient transportation—when they add fuel-saving components to their equipment.

Only the most progressive and committed carriers earn the privilege of labeling their vehicles with the SmartWay brand—setting them ahead of the pack and delivering a competitive advantage. SmartWay financing tools are also available to make the SmartWay tractors and trailers accessible to even the smallest carriers. SmartWay tractor and trailer programs can save fuel and money, improve a company's public image, and attract new business.

Whatever your company's involvement in freight transport, with SmartWay transport partnership, fleets can save fuel, money, and the environment. They provide the tools and resources; you bring the commitment to reducing your costs and saving energy. Truck and rail carriers can save up to $4,000 per truck per year with SmartWay Transport. Logistics companies can join SmartWay Transport and give their clients benefits they can bank on, and truck stops can better serve their customers and their communities.

- **Alternative Fuels Data Center – Fuel Economy** (http://www.afdc.energy.gov/afdc/vehicles/fuel_economy.html) – Offers publications about the benefits of increased fuel economy, strategies to improve fuel economy, and additional resources.
- **Auto Alliance** (http://www.autoalliance.org/) – Provides information about consumer fuel economy and techniques to reduce fuel consumption.
- **Clean Cities 2012 Vehicle Buyer's Guide** (http://www.afdc.energy.gov/afdc/pdfs/51785.pdf) – Offers model-specific information about vehicles that utilize alternative fuels.
- **Comparing Fuel Economy** (http://fueleconomy.gov/feg/savemoney.shtml) – Allows users to calculate their fuel economy and compare the results with other vehicles.
- **Environmental Protection Agency – Fuel Economy** (http://epa.gov/fueleconomy/data.htm) – Includes fuel economy test procedures and results; also provides specific vehicle test results.
- **Federal Trade Commission** (http://www.ftc.gov/bcp/edu/pubs/consumer/alerts/alt064.shtm) – Contains tips to help consumers save money through the utilization of specific fuel economy practices.
- **Fuel Economy** (http://www.fueleconomy.gov/) – Presents official information pertaining to fuel economy ratings and fuel savings methods.
- **U.S. Department of Energy (DOE) – Clean Cities Program** (http://www1.eere.energy.gov/cleancities/) – Addresses the nation's energy security by supporting local actions and groups to reduce overall petroleum consumption in transportation.
- **U.S. Department of Energy (DOE)** (http://energy.gov/) – Agency that helps ensure America's security and prosperity by addressing energy related problems with emerging technologies.
- **U.S. DOE Vehicle Technologies Program** (http://www1.eere.energy.gov/vehiclesandfuels/) – Develops more efficient transportation technologies that help reduce domestic dependence on foreign petroleum.

## Footnotes

[1] Environmental Defense Fund, "Greening Fleets, A Roadmap to Lower Cost and Cleaner Corporate Fleets," http://business.edf.org/sites/business.edf.org/files/greening-fleets.pdf

[2] U.S. Department of Energy, Alternative Fuels Data Center, *All Incentives and Laws Sorted by Type,* http://www.afdc.energy.gov/afdc/laws/matrix/tech

[3] U.S. Department of Energy, Alternative Fuels Data Center. *State Incentives and Laws.* www.afdc.energy.gov/afdc/laws/state

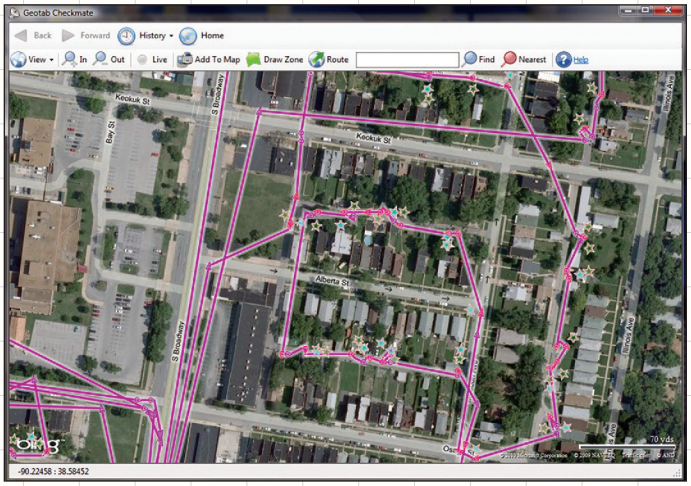
## Notes

# CASE STUDY

**Location:** St. Louis, MO
**Company:** City of St. Louis
**Study:** Fuel Economy

The City of St. Louis has long been interested in saving money though the use of alternative fuels and fuel economy planning. But it wasn't until 2007 when Chris Amos, commissioner of equipment services for the City of St. Louis found a cost-effective way to save money and began installing passive telematics devices into the company's fleet vehicles. The fuel savings of these devices has been remarkable, with each device paying for itself within the first 18 months of its usage. The estimated fuel savings over the life of the vehicles is typically around $7,000-8,000 over the cost of the equipment. While the equipment itself does not improve fuel economy, it allows for an understanding of vehicle operation so that fuel economy practices such as rerouting can be implemented.

Telematics are a combination of computer and communications equipment that provide data on the location of each vehicle and the status of the onboard systems. This allows department heads to monitor compliance with safety and fuel efficiency guidelines and establish efficient vehicle routes. The identification of more efficient routes and the reduction in vehicle idling and improved driver safety results in a significant decrease in fuel use and results in significant savings on fuel and maintenance costs.




*Telematics let complete vehicle routes be recorded and monitored so that management decisions can be used to improve fuel economy. Photo courtesy of Chris Amos.*

## Decision Points

Starting in the mid-1990s, the City of St. Louis began looking for options to save on the price of fuel. Driven by the belief that the 1990 Clean Air Act would mandate fuel reduction and the use of alternative fuels, Amos began looking for the most cost-effective options. The challenge in seeking such an option was determining the ability of an alternative fuel vehicle to pay for itself over its lifetime when compared to a conventional vehicle. This was especially difficult given that the City's vehicles operate as short-range vehicles; alternative fuels tend to reach a pay-off point when increased fuel efficiency is increased by increased highway driving efficiency. "If we could find an alternative fuel that would just break even and pay for itself, we would use that option," Amos said.

St. Louis experimented with numerous types of alternative fuels. Biodiesel was attempted and rejected because of the increase in costs, as well as the lack of tax subsidies. Ethanol (E85) ran into similar concerns. Compressed Natural Gas (CNG) "performed well and came close to breaking even during the high gas prices of the late 2000s, but gas prices started dropping again and the gap was too large," Amos reported. Fuel savings were realized when hybrid vehicles were utilized, but the high cost of the vehicles negated the savings and the vehicles did not project to pay off over their lifetime.

Telematics first showed up on Amos' radar in 1998, but it wasn't cost effective at that time. The telematics systems at that time were all active systems, meaning that there was a constant cellular signal being sent from the vehicle to the data collection point. This system provided up-to-the minute information, but also included the cost of the cellular service to transmit the signal, something that would not be financially feasible for the purposes of the St. Louis fleet, which was more interested in tracking fuel efficiency than in knowing where each vehicle was at every moment.

It wasn't until 2007 that Amos was able to identify a company providing a passive telematics system, one which does not require a constant cellular signal, but rather collects data on an onboard device which is then downloaded once the vehicle is returned to its home garage. This process made the technology more cost-efficient than active systems. St. Louis tested the technology in four vehicles in 2007.

The 2007 test demonstrated significant fuel and maintenance cost savings, and the City began exploring wide-scale implementation of the technology in their vehicles. Installation of the units began in 2008 and 2009 in several departments and has remained ongoing as each department head must sign off on the device's installation within their fleet.

## Fleet Facts

The City of St. Louis operates 2,440 vehicles, a number that includes 800 vehicles that are currently off-road. The city's fleet is overseen by the Equipment Services Division, which is responsible for maintenance and vehicle replacement for fleet vehicles. ESD operates four garages and 15 fueling sites. The ESD is responsible for the purchase and maintenance of the city's vehicles, but fuel cost and day-to-day operation of the vehicles is under the control of the managers of the departments where the fleet vehicles are assigned.

### QUICK FACTS

**Alternative Fuel Practice:** Fuel Economy (Telematics)

**Number of Fleet Vehicles:** 2,440

**Vehicle Instrumented with Telematics:** 313

**Estimated Vehicle Life:** 10 years

**Estimated Lifetime Savings per Vehicle:** $7,000-8,000

## Infrastructure

Telematic devices record how each vehicle and its systems are used. They can measure the amount of time a vehicle spends idling, the distance traveled, the amount of time a vehicle is at rest, and vehicle speed. These devices include a GPS system to track where the vehicle has gone and how much fuel it expends by traveling those routes, allowing for the identification of more fuel efficient routes to common destinations.

**City of St. Louis Fleet Vehicle Types:**

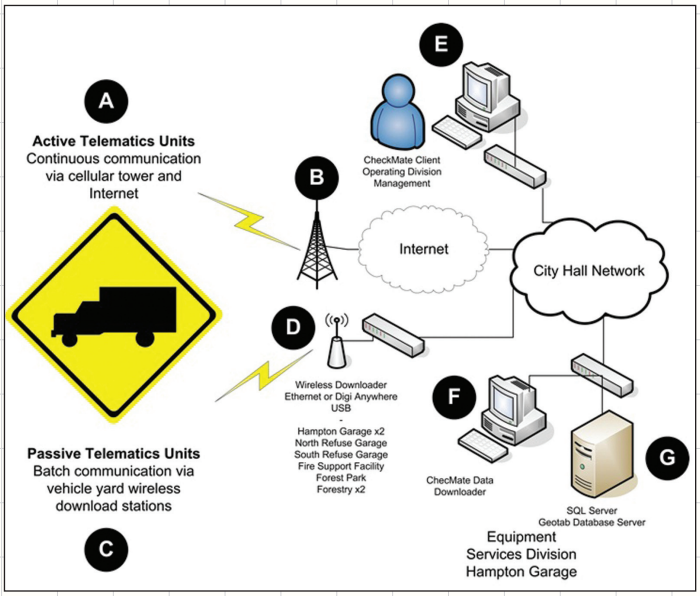
- Tow Trucks
- Refuse Trucks
- Street Sweepers
- Dump Trucks
- Flusher/Brine Distribution Trucks
- Roll-off Container Trucks
- Service Trucks
- Cargo Vans
- Aerial Trucks
- Tree-trimming Trucks

When the systems first came into use, there were only two ways to acquire the data; through a cellular signal sent by each individual device, or by downloading the information manually from each vehicle. Both options presented problems to the cost-conscious fleet manager. Cellular service for each vehicle has the potential to be prohibitively expensive, especially in cases where the fleet manager does not need real-time location data. Manual downloading could have a similar problem; as fleets grow larger, it takes more time and man-hours to manually download the information.

The system St. Louis uses is a cost-efficient middle ground. With the exception of the City's tow service, none of the telematics devices installed have an active cellular signal. Nor does the system require that each system be downloaded manually. Rather, each vehicle's data is downloaded via a short-range Wi-Fi connection located at vehicle yards, fuel islands, or maintenance shops. Downloading the data does not require a large commitment of man-hours, nor does it require a special trip.

## Costs

As of September 2011, 313 telematics units had been installed in St. Louis fleet vehicles. An additional 15 units have been purchased for installation. As of the same date, Amos had identified another 116 good and 56 possible candidates for installation. As of September, the total cost for the telematics systems was approximately $358,000. This cost includes the passive telematics system employed by most of the fleet, and the active systems used by the City towing fleet, which uses the active system so vehicles can be efficiently dispatched using real-time location data.




*Schematic of the telematics network. Photo courtesy of Chris Amos.*

The average cost of each unit is $700 for both passive or active units and $57 per hour for installation of the devices. Data download stations cost $1,845 per unit in addition to electrical and network connection costs. The active devices cost an additional $36 per month per vehicle. The cost includes $2,000 per year for server software support.

Amos reports that each unit provides, in conjunction with fuel economy and worker safety policies, a 7-8% savings in fuel consumption. Maintenance costs are also reduced significantly due to the concurrent reduction in vehicle idling, decreasing the wear-and-tear on an engine. Amos stated that the telematics units pay for themselves in fuel and cost savings within the first 18 months of their installation. He estimates that, when considering the typical 10-year lifetime of a vehicle, that each unit ultimately saves $7,000-8,000 over the lifetime of the vehicle. With a fleet as large as that of the City of St. Louis, the total savings could be in the hundreds of thousands of dollars.


*St. Louis has even installed telematics on its hybrid tree trimming truck. Photo courtesy of Chris Amos.*

## Maintenance and Satisfaction

Of the St. Louis departments that have installed telematics devices, there has been universal satisfaction with the technology among the department managers. Every department that has implemented the technology has seen a significant decrease in fuel costs. There have been some technical glitches, including a recent firmware update that required that each installed device be rewired. Overall, Amos expresses a great deal of personal satisfaction with the technology overall. The results have been a decrease in fuel and maintenance costs, and increase in driver safety and efficiency, and the development of more fuel and time efficient routes for common destinations.

## Summary

The City of St. Louis developed a fuel economy plan that strived to achieve increased fuel efficiency and a decrease in fuel and maintenance cost. This plan was supplemented and enforced with the installation of passive telematics technology. The technology provided St. Louis with the means and ability to enforce the fuel economy plan. The result of these actions created cost savings that project to far exceed the initial cost of installing the devices. The results have included:

- Route changes for refuse pick-up, street sweepers, and snow plows
- Vehicle use monitored
- 7-8% decrease in fuel consumption
- Vehicle unit payback within 18 months

From the early 1990s, Amos sought ways to decrease conventional fuel usage. St. Louis tried numerous alternative fuels, hybrid vehicles, and the implementation of a fuel economy plan. Starting in 2007, passive telematic technology provided the solution.

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