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|| DRIVING BUSINESS

GO GREEN AND SAVE GREEN℠

Wireless Fleet Management Cuts Emissions While Reducing Operating Costs

Table of Contents

Executive Summary

We all want to reduce emissions so that the air will be clean for our children and grandchildren. But going green can also save your company money. As fuel and other costs continue to rise for commercial and government fleets, this provides an opportunity to do something to improve the environment and save money at the same time.

Technology such as wireless fleet management is making it easier than ever to go green while saving green. That is because lowering vehicle emissions is closely tied to reducing fuel costs and improving operating efficiency.

However, not all wireless fleet management systems are alike. Most systems only monitor location using a global positioning system (GPS), which does not provide a complete picture of vehicle performance. Wireless fleet management systems that connect directly to the vehicle's engine computer can provide critical information, such as exact fuel consumption, mileage, speed and idle-time, which significantly enhances your fleet's ability to reduce emissions and operating costs.

Section I. Introduction

In spite of emission control devices, cars and trucks continue to release millions of tons of pollutants into the air each year. The transportation sector is currently responsible for approximately one-quarter of greenhouse gas emissions in the United States and is expected to be one of the fastest growing sources of greenhouse gas emissions in the foreseeable future (US DOT). Vehicles are now driven more than 3 trillion (3,000,000,000,000) road miles each year in the U.S., which offsets any progress achieved through improved vehicle emission controls.

Table 1 below indicates all the gases and solids released when a vehicle is burning a carbon based fuel. Carbon dioxide is widely known at current increased levels to be the main cause of greenhouse gases. For the average vehicle in compliance with EPA standards, every gallon of gasoline burned releases 20 pounds of carbon dioxide (CO_2) into the air. A vehicle not in compliance will add in excess of one additional pound of emissions for every gallon of fuel

Table 1: Pollutants Found in Vehicle Emissions (U.S. DOE)

Greenhouse and Transportation Gases	Air Toxics	Solids/Liquids
Carbon Dioxide (CO_2): A green-house gas produced by complete combustion **Carbon Monoxide (CO):** A toxic by-product of incomplete combustion. **Nitrogen Oxides (NOx):** Also a greenhouse gas, which is formed by the interaction between oxygen and nitrogen in high temperatures and pressures found in engine combustion chambers. **Sulfur Dioxide (SO_2):** Contributes to the formation of acid rain, dependent upon sulfur content of fuel.	**Hydrocarbons (HC):** Derived from unburned fuel during incomplete combustion **Volatile Organic Compounds (VOCs):** Arise from fuel evaporative emissions, these may include benzene, toluene, xylene, 1,3-butadiene, acetaldehyde, and formalde-hyde. Subsequent reaction in sunlight creates smog and other forms of air pollution	**Particulate Matter (PM):** Soot and smoke (microscopically suspended particles arising from carbon, condensed water vapor, and soluble HCs) produced by internal combustion (notably diesel) engines.

consumed. The other emissions listed either contribute to global warming or adversely affect human health, or both. Since fleets largely enable the world's economies, stopping them from driving is not feasible. However, reducing fleet miles traveled and the amount of fuel burned is entirely possible and the best way to lower fleet emissions.

In addition to reducing fuel consumption, another way to reduce fleet emissions is to make sure that vehicles comply with EPA mandated emissions control systems. In 1996, the EPA adopted the On-Board Diagnostics standard called OBD-II, which provides an electronic means to diagnose engine and emissions problems. This prompted state and federal agencies to require more stringent emissions monitoring, mostly in the form of physically checking OBD-II data through vehicle inspections.

Currently approximately 35 states have implemented a periodic (annual or biennial) smog check or emissions testing program. However, these testing facilities do not evaluate emissions between the scheduled testing cycles, leaving some vehicles to operate out of compliance for two years before the next inspection. To that end, in September 2006 the EPA brought together industry leaders and formed the Transitioning Inspections and Maintenance Workgroup. The workgroup's goal was to examine alternatives to the annual and biennial smog check methods. The workgroup concluded that the most effective alternative from a convenience and emissions reductions standpoint is "remote OBD," which is the ability to check smog status continuously, wirelessly, and anywhere.

What does all this mean for commercial fleets? Reducing fuel consumption and ensuring your vehicles comply with local emissions standards are the first steps. However, you can go further to reduce emissions and operating costs. This paper will show that the actions you take to reduce emissions, including reducing vehicle usage, optimizing routing, reducing idle time and speeding, and improving maintenance, all have significant positive impacts on both the environment and on operating expenses.

Section II. The Solution – Wireless Fleet Management with Diagnostic Monitoring

In this section, we will show how wireless fleet management with diagnostic monitoring can help fleets reduce harmful emissions while lowering fuel consumption and maintenance expenses. Specifically, these six areas can significantly impact both pollution and operating costs:

1. Reduce idle time

2. Improve vehicle maintenance

3. Reduce speeding

4. Reduce unauthorized vehicle usage

5. Optimize routing

6. Continuous emissions monitoring (remote smog check)

Reduce idle time

Idling has a significant impact on miles-per-gallon (MPG), because the engine is burning fuel when the vehicle is not moving. Excessive vehicle idling also affects engine wear. Research shows that fuel usage may be reduced up to 15% if idling is significantly reduced. Heavy duty vehicles consume 0.82 gallons of fuel for every hour of idle-time, while light duty vehicles consume up to .5 gallons per hour. The US DOE estimates that more than 3 billion gallons of fuel is used in the U.S. annually just from idling, most from light and medium duty vehicles.

Fleet managers using wireless fleet management can monitor idle time by vehicle to determine which vehicles exceed a pre-set idle threshold. This information can be used in a variety of ways to reduce idle time. For example, if you are using a system that monitors engine diagnostics, you can compare idle time and the amount of fuel consumed between similarly operated vehicles. In addition, tracking MPG averages by vehicle over a given time period can show whether an individual vehicle's MPG is increasing after implementing a formal driver behavior plan to deter speeding and idling.

Improve vehicle maintenance

Knowing the health of your vehicles is critical to your business, but it is not always easy to access that information. Drivers are often reluctant to disclose a problem for fear the vehicle may be taken out of service for a day or more. Even the most obvious of notices, the "check engine" light, may not be communicated by a driver for days, weeks, or months after the initial occurrence.

Wireless diagnostic monitoring also provides access to accurate mileage information generated by the engine computer, not through GPS.

Wireless fleet management systems with diagnostic monitoring can notify managers automatically by e-mail when a vehicle registers a check engine light in the form of a specific diagnostic trouble code (DTC). This information can be provided to technicians so that they can begin their repairs immediately instead of spending time trying to diagnose the problem. For example, if the DTC indicates a failed sensor, the technicians can order the part in advance and minimize the time the vehicle is out of service.

Networkfleet, a wireless fleet management system, has collected DTCs from thousands of vehicles in fleets across the U.S. Analyzing aggregate Networkfleet data shows that 47 percent of diagnostic trouble codes for light/medium duty (OBD-II) vehicles were related to emissions issues and 24 percent were related to fuel consumption issues.

Wireless diagnostic monitoring also provides access to accurate mileage information generated by the engine computer, not through GPS. This allows for the scheduling of regular maintenance using odometer email alerts when vehicles reach predetermined maintenance intervals. These schedules ensure timely maintenance and repairs that reduce emissions while extending vehicle life.

Reduce speeding

Not only does speeding increase your insurance premiums by causing moving violations and accidents, it also has a dramatic effect on MPG. In fact, according to Fleet Owner Magazine, you will gain a 10% increase in MPG just by slowing from 70 MPH to 60 MPH. Edmunds.com reports a 12% increase in MPG by slowing from 75 to 65. If you are able to effect a reduction of 10 MPH across your fleet, you will realize approximately a 10% reduction in your total fuel cost. This is the equivalent of purchasing all of your fuel at a reduction of $.40 per gallon.

Reducing speeding lowers fuel consumption, which also translates into lower emissions by reducing the amount of fuel burned. Companies using wireless engine monitoring systems can check exact vehicle speed and receive alerts when drivers exceed a particular speed, such as 65 miles-per-hour. Fleet managers can also view reports to determine who, when and where speeding occurred to counsel drivers and change their behavior. To manage speeding, companies may want to prepare a formal driver behavior plan that sets goals for average speed or number of speeding incidents accepted. Drivers with the best track record can be recognized and rewarded.

Reduce unauthorized vehicle usage

Many companies allow their workers to take vehicles home at night, but have policies against using company vehicles for personal driving. Even businesses where the vehicle does not go home at night can have problems with employees using vehicles in an unauthorized fashion during business hours.

Any unauthorized or unnecessary vehicle use can contribute to vehicle wear and tear, which can cause higher emissions and costs. Fleet managers using wireless fleet management can verify daily route and stop locations as well as check on odd hours of usage, such as weekends. Fleet managers can also use the system to monitor vehicle movement into and/or out of a user-defined geographic area. By analyzing driving patterns, locations and routes, the system can help reduce unnecessary vehicle use, reduce fuel costs and lower emissions.

The reality is, if you reduce unauthorized driving, you reduce your fleet's fuel usage. This does more than save you money. For every gallon of fuel you don't burn, it saves more than 20 pounds of greenhouse gases, like carbon dioxide and methane, from being released into the air.

By analyzing driving patterns and historical location history, managers can choose routes that optimize workers' schedules.

Optimize routing

For many businesses, each day brings new challenges. Work orders change, new priorities arise, field personnel finish early or fall behind, while high value customers call wanting immediate service. Knowing where your fleet is at any given moment is crucial to addressing those business issues that arise during the workday. Improving routing, even if only by a small percentage, can have a significant positive impact on fuel usage.

By analyzing driving patterns and historical location history, managers can choose routes that optimize workers' schedules. This means they can perform more jobs each day, making them more productive and increasing revenues. At the same time, wireless fleet management systems let dispatchers view vehicles on a map so that they can choose the closest vehicle to a particular customer site. This reduces miles driven, optimizing vehicle usage and efficiency of overall operations.

Continuous emissions monitoring

Most fleet owners are required to check emissions status once a year or every two years. However, by continuously monitoring emissions using a diagnostics-based wireless fleet management system, fleets can significantly reduce harmful emissions and lower maintenance costs. Rather than wait for a yearly or biennial smog check, fleets can identify polluting vehicles faster and fix problems early. For example, a wireless fleet management system that monitors the OBD-II can send an alert to the fleet manager when an emissions sensor or pollution control device is not operating properly, or when vehicle emissions are out of compliance.

Continuous emissions monitoring also helps to increase fuel economy. A non-compliant vehicle has an average loss in fuel economy of up to four MPG. In California, some fleets are allowed to continuously, wirelessly monitor their emissions, thus eliminating trips to testing facilities. This increases productivity, reduces travel time to inspection facilities, and lowers fuel consumption and emissions.

Section III. Benefits of Going Green – Fleet Examples

Small Fleet

Joe's Communications Company is a specialist in business communications services. They sell business communications systems, including long distance, voicemail, IVR, etc. In addition to these products, they also install and maintain the systems they sell. They have 15 fleet vehicles used for sales and maintenance. Those vehicles are all light duty vans and SUVs. The fleet averages 300 miles/week/vehicle with an average MPG of 14.

After installing Networkfleet wireless fleet management, Joe's recognized the following benefits related to fuel usage and the environment:

- A 7.5% reduction in total miles driven due to improved dispatching and routing of closest vehicles, and reduced unauthorized vehicle usage
- A decrease in average fleet speed of 2 miles per hour
- The ability to track emissions failures and remedy them quickly
- A decrease in idle time of 15 minutes per day per vehicle

These benefits had the following financial and environmental effects:

Environmental Effects	
Decreased Fuel Usage	3,022 Gallons/Year
Decreased Annual Emissions	
Carbon Dioxide	54,482 pounds
Methane	1,634 pounds
Nitrous Oxides	1,647
Carbon Monoxide	10,197 pounds
Hydrocarbons	605 pounds
Total Emissions Reductions Annually	68,566 pounds

Note – the company realized several other benefits, including a decrease in total hours worked by employees, an increase in the number of sales calls and installations performed by employees, an increase in revenue per job, and a decrease in insurance premiums.

Medium Fleet

Fred's Building Supply is the leading supplier of building materials and construction services to professional home builders and contractors in the Yuma, AZ region. Fred's has 62 fleet vehicles: 21 are light duty trucks used by sales and management to make sales calls and visit contractors on site; 41 are heavy duty delivery vehicles used to deliver products ordered by homebuilders and contractors. On average, this mixed fleet travels 375 miles/week/vehicle with an average MPG of 10.

After installing Networkfleet, Fred's recognized the following benefits related to fuel usage and the environment:

- A 6% reduction in total miles driven due to improved dispatching and routing of closest vehicles, and reduced unauthorized vehicle usage
- A decrease in average fleet speed of 2 miles per hour
- An average decrease of 20 minutes per day per vehicle in idle time
- The ability to track emissions failures and remedy them quickly

These benefits had the following financial and environmental effects:

Financial and Environmental Effects

Decreased Fuel Usage	**17,062 Gallons/Year**
Decreased Annual Emissions	
Carbon Dioxide	**279,306 pounds**
Methane	**8,379 pounds**
Nitrous Oxides	**6,756 pounds**
Carbon Monoxide	**42,226 pounds**
Hydrocarbons	**2,247 pounds**
Total Emissions Reductions Annually	**339,094 pounds**

Note – the company realized several other benefits, including a decrease in total hours worked by employees, an increase in the number of sales calls and installations performed by employees, an increase in revenue per job, and a decrease in insurance premiums.

Large Fleet

Southeast Montana A&M is a four year university designed to provide technical education to students interested in ranching and farming. SEM A&M has 379 university owned vehicles. The fleet is a mix of vehicle types performing every sort of duty, including student van pool, construction, delivery, patrol, etc. On average, this mixed fleet travels 275 miles/week/vehicle with an average MPG of 13.

After installing Networkfleet, Southeast Western recognized the following benefits related to fuel usage and the environment:

- A 5% reduction in total miles driven due to improved dispatching and routing of closest vehicles, and reduced unauthorized vehicle usage
- A decrease in average fleet speed of 2 miles per hour
- An average decrease of 15 minutes per day per vehicle in idle time
- The ability to track emissions failures and remedy them quickly

These benefits had the following financial and environmental effects:

Financial and Environmental Effects

Decreased Fuel Usage	**58,155 Gallons/Year**
Decreased Annual Emissions	
Carbon Dioxide	**1,052,757 pounds**
Methane	**31,583 pounds**
Nitrous Oxides	**40, 588 pounds**
Carbon Monoxide	**241,873 pounds**
Hydrocarbons	**13,282 pounds**
Total Emissions Reductions Annually	**1,380,083 pounds**

Note – the company realized several other benefits, including a decrease in total hours worked by employees, an increase in the number of services performed by employees, a decrease in insurance premiums, and a decrease in maintenance costs.

In each of these cases, reducing the total fleet miles traveled resulted in lowering the amount of fuel burned and significantly reduced fleet emissions. At the same time, these actions improved the efficiency of the fleet and reduced operating costs. By using a wireless fleet management system with diagnostic monitoring, your fleet can easily achieve similar or even higher results.

Section IV. Networkfleet Wireless Fleet Management System

Networkfleet is a wireless fleet management system that combines GPS location tracking with diagnostic monitoring to reduce operating costs for commercial fleets. Networkfleet collects and wirelessly transmits emissions information directly from a vehicle's on-board diagnostic (OBD-II) system. Fleet managers and vehicle owners log in to a secure web site to view fleet diagnostic and location data including emissions. The also receive email notifications regarding vehicle and emissions status.

With its patented technology, Networkfleet takes a comprehensive approach to helping fleets decrease fuel usage and the amount of resulting emissions. This approach involves three distinct focus areas: diagnostics, emissions system status, and location related information.

Diagnostics: Because of Networkfleet's ability to read real-time diagnostics from the vehicle, fleet managers can continuously monitor speed and idle time for all vehicles. This allows them to counsel drivers and reduce speed and idle time, which reduces emissions.

Example: Networkfleet Idle Time Report

Report Overview

Vehicle Group	MASTER FLEET
Number of Vehicles in Group	102
Number of Vehicles Shown	37
Percentage of Group Shown	36%
Average Idle Time - %	23%
Average Idle Time - Hours	1.5
Total Idle Time - Hours	54.8
Total Operating Hours	244.8
Average Speed	40
Total Miles Driven	7,709
Average Miles Driven per Day	3,854
Report Run Date/Time	06/03/08 11:14 AM
Report Time Period	06/02/08 12:00 AM - 06/04/08 12:00 AM

Export Data — Export this report data to a Microsoft Excel spreadsheet.

Schedule Report — Schedule this Report.

Printer Friendly — View this report in a printable format.

Select a vehicle group, time period and amount of time spent idling in either percentage or hours

View detailed information about vehicles in this group including distance traveled and a breakdown of idle and driving time

Idle Time Report

Vehicle Label	VIN	Year Make Model	Starting Mileage	Ending Mileage	Distance Traveled (Miles)	% of the Time Vehicle Was Idling	Idle Hours	Drive Hours	Total Operating Hours	Max Speed Range	Average MPH	Vehicle Begin Date	Vehicle End Date
961	1FBSS31S51HA37671	2001 FORD ECONOLINE E350	312262	312515	253	30%	2.6	6.1	8.7	70.0-80.0	42	06/02/08 04:34 AM	06/03/08 04:38 AM

Emissions System Status: Networkfleet checks the emissions status continuously. If a vehicle has an emissions problem, the fleet manager is notified almost immediately so that the problem can be fixed. In California, fleets can enroll in the Continuous Testing Program, which is used in place of a physical smog check. Continuous, wireless smog checks have a significant emissions advantage over biennial checks.

Location Information: By using historical location reports and other data, fleets using Networkfleet can route vehicles more efficiently and reduce miles driven. These efficiency improvements can also reduce the size of the fleet and eliminate older, higher emission-producing vehicles. In addition, by tracking vehicles use after hours, fleets can reduce unauthorized or unnecessary vehicle use. The net result is less total miles traveled, which provides a significant reduction in harmful emissions.

Example: Networkfleet Odd Hours Report

Networkfleet's comprehensive approach to emissions reduction can revolutionize the manner in which fleets operate. Networkfleet's continuous emissions monitoring, combined with the system's ability to reduce fuel usage, lower idle time, reduce vehicle speed and miles traveled, is already having a significant impact on reducing harmful emissions.

With its patented technology, Networkfleet takes a comprehensive approach to helping fleets decrease fuel usage and the amount of resulting emissions.

Networkfleet with continuous emissions monitoring:

- Reduces emissions by providing fleet managers with instantaneous awareness of vehicle emission control system failures

- Performs a complete EPA-mandated emissions control system check every four hours of vehicle run-time

- Immediately emails a fleet manager when an emissions control device malfunctions so action can be taken to fix the problem

- Helps reduce idle time by monitoring excess engine idling

- Helps improve fuel efficiency by identifying unnecessary vehicle use and poor driving habits

- Provides reports on the fleet vehicles that are failing the EPA emissions control system check

For more information, or to schedule a ROI analysis for your fleet, please contact Networkfleet at 866.227.7323 or visit www.networkfleet.com.

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