US EDITION • WINTER 2013

PULSE.WAVETRONIX.COM

pulse

magazine

FUELING THE ECO-DRIVE

ITS applications offer relief at the gas pump, p. 6

Fueling the Eco-Drive

By Pete Goldin

It is not a primary goal of intelligent transportation systems, but fuel efficiency is getting renewed attention as people look to ITS applications for relief at the gas pump.

The continuously rising price of gasoline, the dependence on foreign oil, the impact of $C0_2$ on the environment and its role in climate change — these are some of the many reasons why fuel efficiency is one of the top issues in transportation, and one of the main subjects of intelligent transportation system research. Most experts agree that ITS can have a major impact on fuel efficiency, changing the way we drive and giving us the tools to make the right fuel-efficient decisions, as well as modifying our vehicles and roads to make fuel efficiency an inherent part of our transportation systems.

Almost every aspect of ITS relates to fuel efficiency in some way. Although safety is the primary objective of US government ITS research, most of the ITS applications that deliver safety benefits also help to reduce congestion and emissions, and consequently save on fuel. Even though this is not the only goal of the technology, ITS definitely delivers tangible, measurable benefits on fuel efficiency.

"Historically, many of the automotive ITS applications have been safety driven," explains Scott Belcher, president and CEO of ITS America, the leading advocate for technologies that improve the safety, security and efficiency of the nation's transportation system. "But many of the new ITS applications are all about managing congestion. Transportation managers or transportation engineers don't necessarily think in terms of fuel efficiency. They think in terms of congestion mitigation because that is a big part of what they have to do — providing better information, rerouting traffic, smoothing out traffic flow. But all those goals also reduce fuel consumption."

Good Decision Making

The greatest impact of ITS on fuel efficiency may come from informing drivers, helping them make decisions to take the most fuel efficient route or alternative routes around congestion.

"There are a variety of ITS applications that have a significant impact on fuel burn, such as traveler information," Belcher says. "A number of traveler information systems will provide you not only the most direct route but also the most fuel-efficient route."

"One of the ways ITS improves fuel efficiency is by optimizing your travel by providing information that will allow you to make decisions before you leave the house or while en route," adds Ananda Palanisamy, principal for transportation management at Citizant, a contractor working with the ITS Joint Program Office (JPO) in the US. "For example, if you are going to hit a congestion point ahead, your vehicle can display that information on your dashboard, allowing you to make a decision to take an alternative route."

In the past, much of this information was not available or at least not easily accessible to drivers. Now, with technology such as smartphones and GPS navigation, drivers have a variety of ways to be informed. For example, many map providers for onboard navigation devices publish traffic data in near real time, allowing drivers to make educated decisions to reduce fuel consumption. Vehicle manufacturers have also included features to inform drivers about maintaining an optimal speed for fuel efficiency.

In addition, research is being done with vehicle-to-infrastructure communication that will inform the driver about phase and timing of an upcoming signal.

"This technology gives suggested speeds that the driver should maintain to make a green phase, so the driver is not doing as much starting and stopping," says Steve Cook, P.E., operations and maintenance field service engineer at the Michigan Department of Transportation.

According to a report by the ITS JPO entitled *Engaging the International Community: Research on ITS Applications to Improve Environmental Performance*, "Vehicles in urban signalized traffic networks can receive advance information about imminent signal changes from the signal controller, enabling them to adjust their speeds to catch "green waves" and reduce the number of times they need to stop and idle at a red signal, and then re-accelerate to continue their trip. When the signals inform them about the amount of red time remaining, the vehicles can even switch their engines off to save idling fuel consumption, and then restart the engines immediately before the signal turns green."

A 2010 US Department of Transportation study found that alerting drivers to the status of upcoming traffic signals led to smoother decelerations to the intersection, and reduced fuel consumption and lowered emissions by up to 40 percent for passenger vehicles.

"When you combine data from the vehicle and the infrastructure, the driver has access to a range of information that allows them to make proper decisions on maximizing fuel efficiency," Palanisamy points out.

One challenge to this approach may be the drivers themselves, however. All of these ITS approaches rely on the drivers to care about fuel efficiency and make the effort. Industry experts seem to agree that the economics of high gas prices are already forcing everyone from the individual driver to the enterprise fleet to look for ways to become more fuel efficient.

"As the price of gas is going up, people are starting to pay attention, because at the end of the day it impacts their wallets," says Palanisamy. "These market economics are forcing people to look at anything that can improve the fuel efficiency of the vehicle."

> "As the price of gas is going up, people are starting to pay attention, because at the end of the day it impacts their wallets." —*ANANDA PALANISAMY, PRINCIPAL FOR TRANSPORTATION MANAGEMENT AT CITIZANT*

Driving to Distraction

With any intelligent vehicle technology that attempts to inform the driver about anything, including fuel economy, we must consider the difference between informing and distracting.

"Decisions need to be made on the interface between the vehicle and the driver," notes Cook. "How that would actually be done, so that we minimize distraction to the driver, still has to be studied."

The distraction issue becomes even more of a consideration when ITS communicates with drivers via smartphones — even though using a phone while driving is being outlawed by an increasing number of municipalities.

"There is a fine line between using a device carefully and being reckless with it," says Palanisamy. "It is a double-edged sword. A driver can use a tool, like a smartphone, for gathering more input on their driving process or they can use it for distracting purposes such as playing with Facebook while driving. It boils down to the driver's discretion. It is about operating a vehicle responsibly. But this is definitely a gray area for a lot of researchers on the product engineering side."

One solution to the distraction issue may be autonomous vehicles that automatically make fuel efficient decisions such as rerouting to avoid congestion or switching to battery mode. This may seem like futuristic technology, but with the introduction of the Google Self Driving Car, the reality of autonomous vehicles cannot be too far away.

We will see a slow transition where the driver will become less involved with the driving task," says Palanisamy. "I cannot put

a time line to it, but we have reached a point where it will be accelerated. Today, many people would not be ready to embrace that kind of technology, but the millennial generation, who are very comfortable with gadgets in their lifestyle, might be more willing to purchase a vehicle that relieves them from the driving task."

"I don't think we are that far away from having autonomous vehicles," Belcher agrees. "I am not sure that culturally in the US that is something that we will see in the near term, because of the issue of people not wanting to give up control and concerns over liability. But we are seeing the potential for greater autonomy in the commercial vehicle space, for example, where vehicles travel much closer to reduce emissions, and do not require the same amount of active driving that we have now."

Keeping Traffic Flowing

In addition to technologies that communicate with the driver to improve fuel efficiency, there are many ITS applications already in place in transportation infrastructures around the world designed to mitigate congestion, keep traffic flowing and improve fuel efficiency. For example, signal timing technologies are one of the most popular ITS approaches to fuel efficiency.

"Traffic light synchronization is an important tool to reduce emissions and fuel burn," Belcher confirms. "If you can synchronize the traffic lights — using technology to make sure that vehicles do not sit and idle when there are no vehicles coming from the other direction — the US DOT estimates you can reduce fuel burn and emissions by 15 to 20 percent."

Over the last decade many studies have proven the impacts of ITS on fuel efficiency. After presence detection, adaptive signal control, and transit signal priority were implemented on the Atlanta Smart Corridor, total fuel consumption decreased by 34 percent, as a result of reduced idling and more constant speeds along the corridor, according to a 2010 study.

Another study focusing on Georgia DOT's ITS incident management program showed reduced annual gasoline consumption by over 5.17 million gallons and decreased diesel consumption by nearly 1.66 million gallons per year.

Other ITS technologies already in place that are designed to keep traffic flowing include ramp metering, electronic tolling and weigh-in-motion programs.

"By reducing the amount of time drivers spend idling to get through the toll gate, or waiting to find change, the move to electronic tolling results in a huge reduction in fuel consumption," Belcher states. "Also most states have weigh-in-motion programs which check truck manifests and weight electronically, eliminating the requirement to stop at weigh stations. A couple years ago the CEO of HELP Inc. told me they had 50 million green lights that year, which means 50 million trucks which otherwise would have stopped to be weighed. A truck at a weigh station will typically wait for 10 to 15 minutes and in that amount of time will burn a half gallon of fuel. So their program was saving 25 million gallons of diesel fuel a year."

According to Belcher, smart parking applications are another interesting ITS technology that is having a large impact on fuel burn. "It is estimated more than 30 percent of driving time in urban areas is spent looking for parking," Belcher says. "Technology can be used to let you know in advance where parking spaces are, in parking lots or even on the street."

> "We achieve the maximum benefit when we get these two technologies [vehicle and infrastructure] to talk to each other." —*ANANDA PALANISAMY*

Outlook for the Future

In terms of transportation, the future is always hard to predict. On the negative side, there are political considerations, funding limitations and cultural hurdles; while on the positive side, new technologies are emerging all the time.

For example, the electric vehicle (EV) could become mainstream, having a massive impact on fuel economy and the future of transportation. In the EV environment, ITS still plays a major role, helping to make EVs easier to use, and consequently helping drive the adoption of electric vehicles.

"Telematics are going to be key to the success of EVs," Belcher predicts. "As we grapple with range issues, we are going to see ITS technology providing drivers with information about the status of their charge, where they can find the next charging station, whether there is time to charge — all of that is being done off the telematics backbone, which is all ITS."

But even in today's world of gasoline powered vehicles, there is vast potential for ITS to impact fuel efficiency in the near future. Much of this success will depend on the progress of the partnership between automakers, governments and ITS technology companies to develop, test and deploy connected vehicle technology.

"There are two categories of technology: vehicle and infrastructure," Palanisamy concludes. "We achieve the maximum benefit when we get these two technologies to talk to each other. That is happening now with the connected vehicle program, and over a period of time you will see a lot more positive impact on the fuel efficiency side as more and more of these cooperations mature."

Palanisamy acknowledges that many of these technologies may not be affordable at this time, even if they are mass produced. "But they may become cheaper down the line," he says. "Then more technologies will become even more affordable and can be deployed more broadly to reduce fuel consumption and meet other ITS goals." ■

Pete Goldin is a freelance journalist specializing in transportation and technology. He has written for magazines such as ITS International, World Highways, Parking World and the ITS Daily News at the ITS World Congress. Mr. Goldin can be reached at petegoldin@gmail.com.

Time, Distance, and Money Wasted

City drivers spend an average of two weeks per year in traffic jams across the US. This amount of extra congestion costs an additional 785 million hours in time delays.

According to the 2010 Urban Mobility Report, 3.9 billion gallons of fuel were wasted in the US. That's about the same amount that flows through the Alaska Pipeline over 130 days.

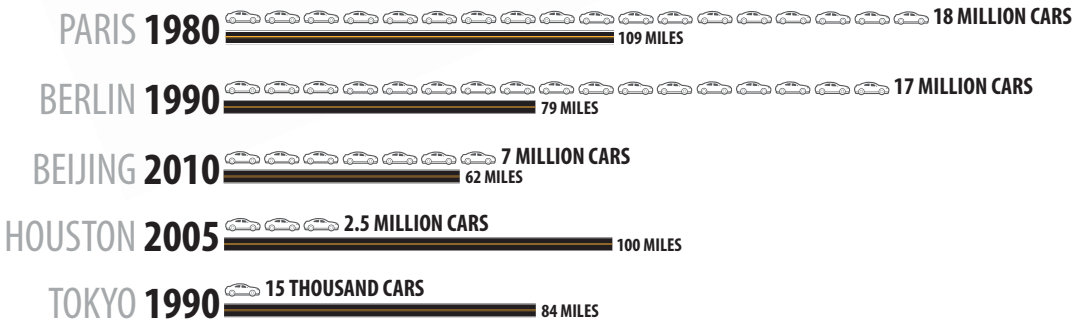
For all cities, the average one-way length of a commute is 12.8 miles, taking about 33 minutes.

47% of people who have been surveyed claim they've been forced to cancel a planned trip in the last month alone due to anticipated traffic.

10 Most Congested Cities in America

Rank	City	Yearly Delay	Cost Per Driver
1	CHICAGO	70 HOURS	$1738
2	WASHINGTON DC	68 HOURS	$1555
3	LOS ANGELES	63 HOURS	$1464
4	HOUSTON	58 HOURS	$1332
5	SAN FRANCISCO	49 HOURS	$1112
6	BOSTON	48 HOURS	$1112
7	DALLAS	48 HOURS	$1077
8	SEATTLE	44 HOURS	$1056
9	ATLANTA	44 HOURS	$1046
10	NEW YORK	42 HOURS	$999

Worst Traffic Jams in History



Pain Index: Worst Commuter Cities Worldwide

SCORED ON 10 ISSUES:

- Commuting time
- Time stuck in traffic
- Price of gas is too high
- Traffic has gotten worse
- Start-stop traffic is a problem
- Driving causes stress
- Driving causes anger
- Traffic affects work
- Movement has stopped
- Canceled trips due to traffic