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Properly Timed Traffic Signals

In 2005 the National Transportations Operations Coalitions (NTOC) [1] released a report on national traffic signals that concluded "[p]roper traffic signal timing on major arterials is the low-hanging fruit in the battle against congestion." According to the Institute of Transportation Engineers (ITE),[2] the benefits of investing in signal timing—in terms of fuel consumption, auto emissions, noise pollution, and travel time—are about 40 times the cost (NTOC 2005). Properly timing traffic signals is a relatively inexpensive investment that, according to the research of the above organizations, will produce immediate benefits. Spending a few dollars can produce big benefits; studies show that the benefits of investing in signal timing improvements outweigh the costs by 40:1. Yet most urban governments are dropping the ball. According to the first-ever National Traffic Signal Report Card, released in April by ITE, 68% of the 378 responding traffic agencies said they have no documented management plan for traffic signal operations, 71% don't have adequate staff to monitor traffic conditions, and 57% don't conduct routine (every three years) reviews of traffic signals. Overall, the Report Card gives traffic agencies a grade of D- with regard to traffic signal management.

The Report Card also estimates what it would take to run high-caliber traffic signal systems, with up-to-date computer hardware, regular timing updates, and proper maintenance. Their national total is $965 million a year, which is less than one percent of the $104 billion in federal, state, and local funds spent on highways in 2000" (NTOC 2005). According to an analysis by Andrew J. Meese, AICP, the Principal Transportation Planner for the Metropolitan Washington Council of Governments, optimizing the traffic lights costs about $3,000 per signal and estimates a savings of $10 in time and fuel for each $1 spent fixing the signals. With optimization comes half a ton a day of nitrous oxide emissions out of the air (Meese 2005).

To date, traffic signal retiming programs have resulted in travel time and delay reductions of 5 to 20 percent, and in fuel savings of 10 to 15 percent nationwide (NTOC 2005). Plus, by reducing congestion, properly timed signals cut vehicle emissions and can postpone or sometimes even eliminate the need to construct additional road capacity.

collective interests of stakeholders at state, local, and regional levels who have a wi
operations, planning, and public safety.

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A variety of factors contribute to poorly timed traffic signals, including equipment malfunction, insufficient staffing of traffic professionals, and out-of-date traffic analysis. Primarily, however, insufficient resources and agency attention are to blame, according to Philip J. Tarnoff, director of the Center for Advanced Transportation Technologies at the University of Maryland. "The poor state of the Nation's traffic signal timing reflects our failure to provide adequate resources," Tarnoff says (quoted in Halkias and Schauer 2004). "This failure is apparent from the fact that 35 percent of the Nation's signals have not been retimed in more than 10 years, and nearly 10 percent of the agencies in the United States are operating outdated electromechanical equipment" (Halkias and Schauer 2004).

What Local Governments Are Doing

While were unable to find any activity on the part of state governments to improve traffic signal timing, we did find that a number of local governments have taken steps in this area.

San Jose

San Jose retimed 409 signals on city streets between 2003 and 2005. Engineers were hoping for up to a 20 percent reduction in travel time and the number of red lights drivers regularly hit. They got a much 45 percent decline, much more than they expected. **(**Richards 2005).

Los Angeles

In an article produced in November 2006, ABC news-Los Angeles reported:

> In November 2006, the city of Los Angeles launched Operation Bottleneck, a system of real-time traffic adjustments performed at the Automated Traffic Surveillance and Control Center (ATSAC) to address 35 of the busiest intersections throughout the city. The system is expected to reduce commuter wait time at the intersections by an average of 22 seconds and to improve travel time by 35%.

Syracuse

In an article in *Public Roads,* John Halkias and Michael Schauer (2004) reported that:

> In the city of Syracuse, NY, where traffic signals are owned by the city and the New York State Department of Transportation, each agency historically chose the type of equipment it deemed most appropriate for its system, and communication among adjacent signals was nonexistent. Several years ago, however, the city implemented the Signal Interconnect Project, which involved implementing a computerized traffic signal system (Halkias and Schauer 2004).
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> Through the project, Syracuse optimized and interconnected the signals at 145 intersections in the central business district, University Hill area, and key arterials, with the goals of reducing vehicle delays and stop times at traffic signals and improving air quality in downtown Syracuse and Onondaga County. After the traffic signal system had

been operating for more than 3 years, the New York State Department of Transportation conducted an evaluation, which recently revealed the extent of the project's benefits, including:

- 15.7-percent reduction in stops
- 18.8-percent reduction in delays
- 16.7-percent decrease in travel times
- 13.8-percent drop in fuel consumption
- 13-percent reduction in vehicle emissions and noise pollution (Halkias and Schauer 2004).

Counties in Michigan

Halkias and Schauer (2004) also reported the following on the Oakland County, MI program:

> In 2002, the Road Commission for Oakland County—in cooperation with the Michigan Department of Transportation, the Southeast Michigan Council of Governments, Wayne County, the Road Commission of Macomb County, and the cities of Ferndale, Pontiac, and Royal Oak—began a program to retime traffic signals. The program included developing and implementing traffic signal timing and coordination plans for nearly 900 signals. The commission now is in Phase III, with 640 signals retimed during the first two phases. Already, the program boasts impressive benefits:
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> Phase I Benefits:
> - Benefit/cost ratio of 175 to 1 due to reduction in delays
> - 2.5-percent reduction of carbon monoxide (CO)
> - 3.5-percent reduction of nitrous oxides (NOx)
> - 4.2-percent reduction of hydrocarbons (HC)
>
> Phase II Benefits:
> - Benefit/cost ratio of 55 to 1 due to reduction in delays
> - 1.7-percent reduction of CO
> - 1.9-percent reduction of NOx (cite source here)

Types of Lights

According to the NOTC (2005) there are a few options to change traffic lights to better reduce pollution/traffic woes. Each option involves different costs. The timed lights are the cheapest but need to be updated frequently to ensure maximize efficiency.

creates a magnetic field surrounding the wires. When a vehicle approaches the line, the magnetic field alters and a mechanism in the traffic light is set off.

Camera sensors

Perched on top of signals, the sensors detect motion at the intersection approach opposite the signal. The cameras are usually low resolution and can not pick up license plate numbers and the like.

Computer technologies

Some roads have detectors far ahead of a traffic signal that counts how many vehicles are approaching a light, when a certain number is reaching the signal ahead changes.

Stop Signs

According to the NTOC (2005), removing stop signs would eliminate idling but, a city's Police, Engineering, and Public Works Departments need to evaluate an intersection, follow State and Federal guidelines and ensure uniformity in traffic control before doing so. The NTOC suggests four items must be examined for each intersection: vehicle and pedestrian volumes, traffic speeds, visibility (sight distance), and accident history.

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