Demonstrating the Benefits and Costs of ITS: Using the Enhanced Knowledge Resources for your Next ITS Project

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T3 Webinars are sponsored by ITS Professional Capacity Building Program, ITS Joint Program Office, U.S. Department of Transportation

Case Studies

- Ramp Metering – Kansas City
- Adaptive Signal Control - Nationwide

Image Source: USDOT


Image Source: USDOT

Kansas City Scout

Case Study – Kansas City Ramp Metering Implementation (2013-00852)

In April, 2010, KC SCOUT, the joint Kansas and Missouri traffic management agency for the Kansas City region, deployed the first regional application of ramp metering on seven interchanges along a 5-mile corridor of the I-435 corridor. The project was implemented because the corridor often experienced congestion during the peak commute periods, largely caused by friction and incidents due to merging at on-ramp locations. Increasing capacity or adding lanes would have been expensive and difficult given limited right of way.

KC SCOUT identified the following five objectives for the ramp metering system:

- Reduce rear end and side swipe accidents.
- Maintain or reduce travel time along the corridor even with greater traffic volume.
- Avoid ramp meter back up onto arterial streets.
- Limit motorist wait time at ramp to 1 minute or less.
- Reduce incident clearance time.

The activation of the system was supported by an intense public education campaign designed to educate drivers on the intended purpose of the system, how to safely navigate the newly implemented traffic control devices, and the enforcement activities that would accompany non-compliance. Several evaluations of the system were performed. In 2011 the initial evaluation was performed by the Kansas and Missouri Departments of Transportation six months following the activation of the meters, with a follow-up evaluation completed at the 12-month interval. Another evaluation study was performed in 2011-2012 using archived data to assess whether the initial impacts reported in the original year continue over time.

Results

Results of the initial 2011 evaluation include:

- Accidents were reduced by 64 percent along the I-435 ramp-metered corridor.
- Travel times decreased or stayed the same while increasing corridor throughput by as much as 20 percent.
- No ramp meter backed up on to city streets due to queue flushing policies.
- Motorist wait times were limited to less than 1 minute on all ramps.
- Incidents were cleared 16 to 22 minutes faster.

- Case Study section of Freeway Management Fact Sheet
- Based on Benefit 2013-00852 in the ITS Knowledge Resources

http://www.itsknowledgeresources.its.dot.gov/its/bcllupdate/FreewayMGT/

Kansas City Scout – Benefits of Ramp Metering

Table 1: Selected Benefits of Ramp Metering in Kansas City

Selected Findings
Initial findings from a ramp meter evaluation in Kansas City were consistent with findings in other cities that show ramp metering can reduce crashes by 26 to 50 percent. (2012-00795)
The Kansas City Scout program used ramp meters to improve safety on a seven mile section of I-435; before and after data indicated that ramp meters decreased crashes by 64 percent. (2012-00799)
Initial findings from a ramp meter evaluation in Kansas City show that ramp meters make it easier for drivers to merge and reduce overall travel times. (2012-00796)
The implementation of ramp metering in Kansas City increased corridor throughput by as much as 20 percent and improved incident clearance by an average of four minutes, with these benefits remaining consistent in the long term. (2013-00852)
The Kansas City Scout program used ramp meters to improve traffic flow and reduce overall peak period travel times on a seven mile section of I-435 by 1 to 4 percent. (2012-00800)

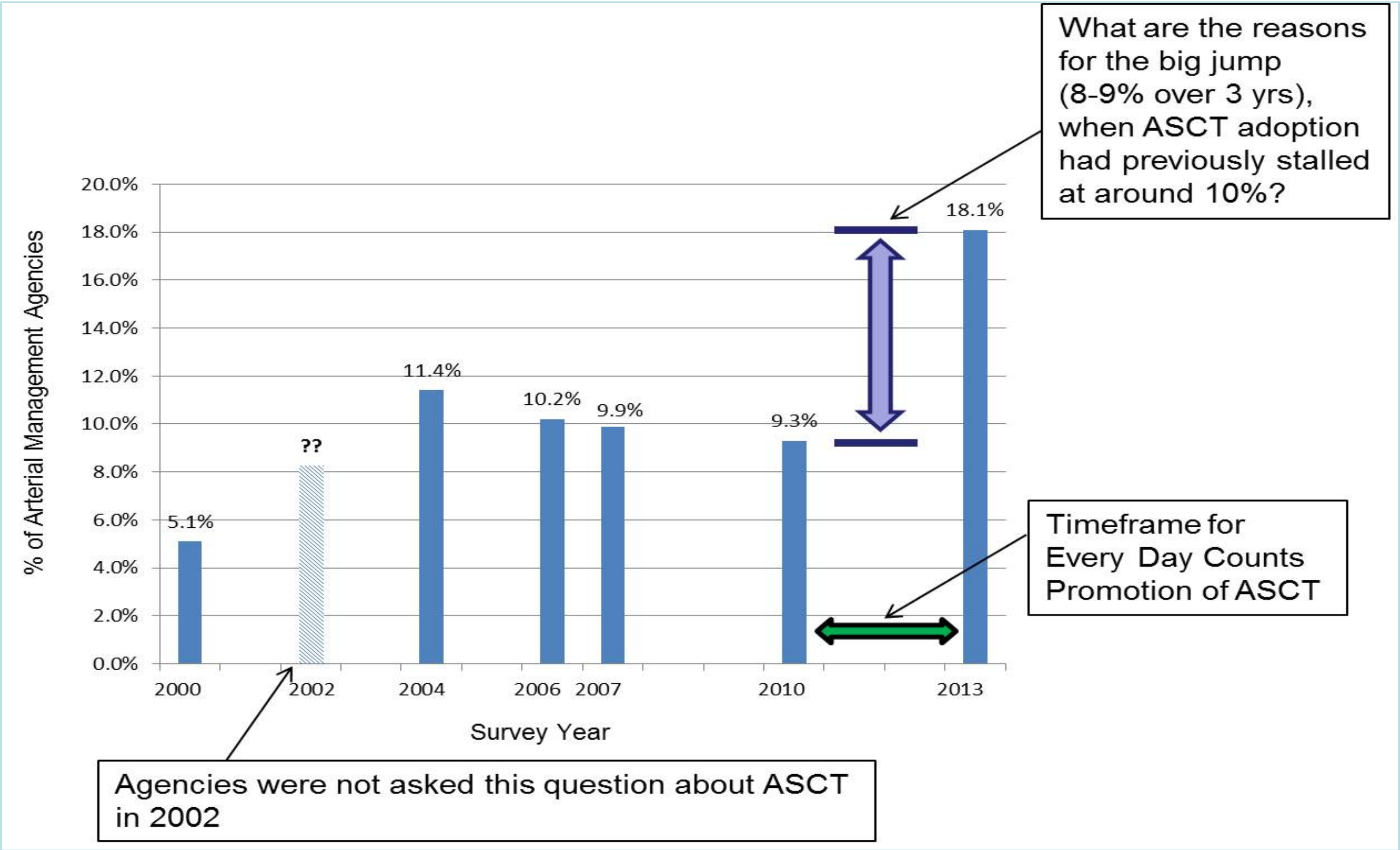
http://www.itsknowledgeresources.its.dot.gov/its/bcllupdate/FreewayMGT/

Adaptive Signal Control Technology

- How do you develop your own case study?
- Here are some things from the ITS Knowledge Resources to help:
  - Deployment Statistics
  - Benefits
  - Cost ranges
  - Interactive graphs
  - Lessons learned

Image Source: ThinkStock

2000 - 2013 Deployment Statistics



Adaptive Signal Control Benefits

Arterial Management Fact Sheet Table:

Table 1: Benefit/Cost Ratios for selected Traffic Control Systems

Selected Findings	Benefit/Cost Ratio
In Oakland County, Michigan a two-phase project to retime 640 traffic signals resulted in a benefit-cost ratio of 175:1 for the first phase and 55:1 for the second. (2007-00313)	175:1 Phase 1 55:1 Phase 2
The Traffic Light Synchronization program in Texas demonstrated a benefit-to-cost ratio of 62:1. (2008-00507)	62:1
Integrated Corridor Management (ICM) strategies that promote integration among freeways, arterials, and transit systems can help balance traffic flow and enhance corridor performance; simulation models indicate benefit-to-cost ratios for combined strategies range from 7:1 to 25:1. (2009-00614)	7:1 to 25:1
Adaptive signal control, transit signal priority, and intersection improvements implemented during the Atlanta Smart Corridor project produced a benefit-to-cost ratio ranging from 23.2:1 to 28.2:1. (2011-00758)	23.2:1 to 28.2:1
Installation of adaptive signal control systems in two corridors in Colorado had benefit-cost ratios ranging from 1.58 to 6.10. (2012-00807)	1.58:1 to 6.1:1
A decentralized adaptive signal control system has an expected benefit-cost ratio of almost 20:1 after five years of operation, if deployed city-wide in Pittsburgh. (2013-00822)	20:1

Adaptive Signal Control Benefits

ITS Knowledge Resources Search

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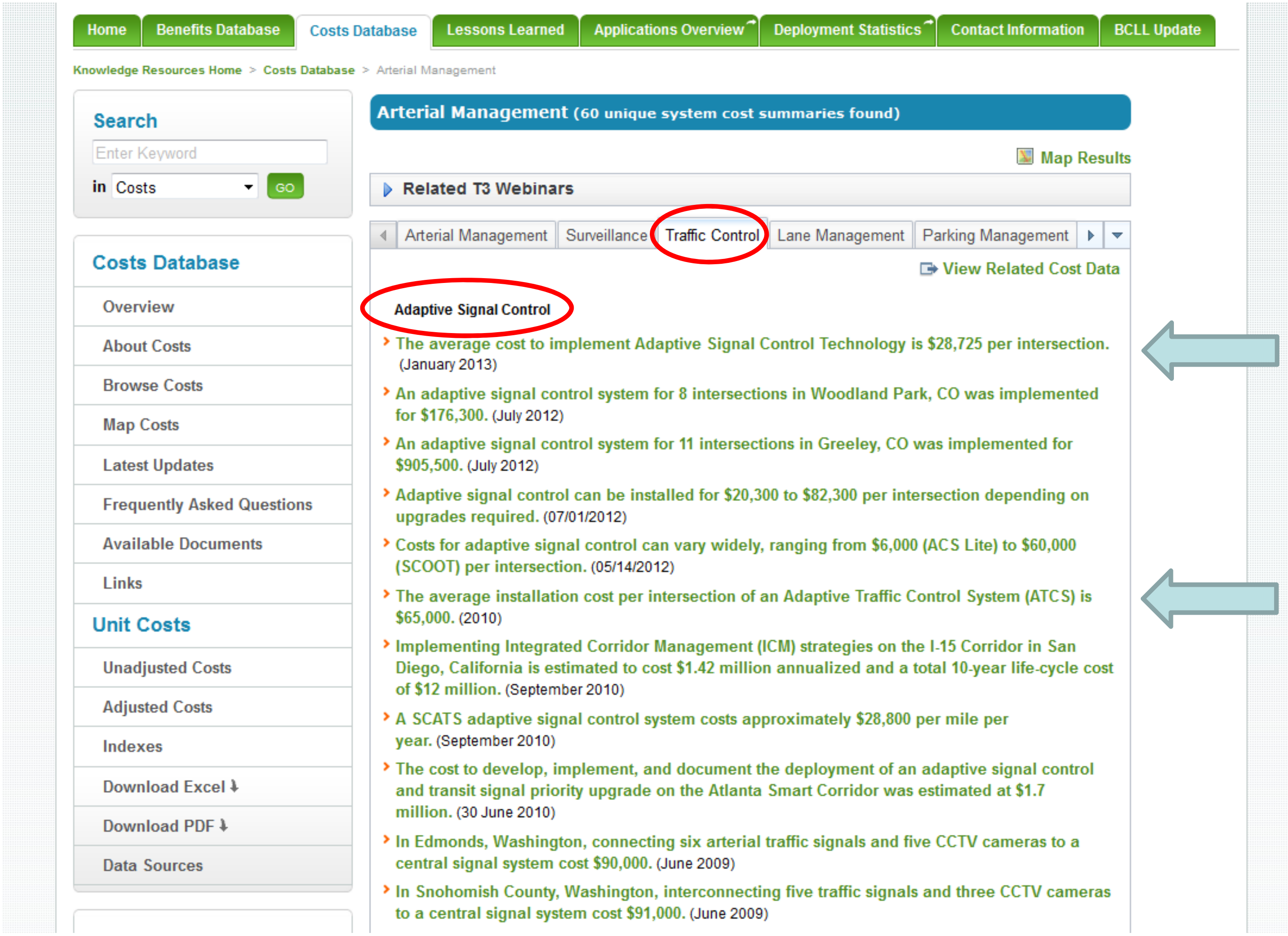
Search Results for "traffic AND signal AND control" (181 unique benefit summaries found)

- The Texas Traffic Light Synchronization Program reduced delay by 23 percent by updating traffic signal control equipment and optimizing signal timing on a previously coordinated arterial.
  Benefit - (October 2005)
- A simulation study of five intersections in Oakland, Michigan indicated that adaptive signal control resulted in lower travel times than optimized fixed-time signal control.
  Benefit - (8-12 November 1999)
- A simulation study found that adaptive signal control reduced delay by 18 to 20 percent when compared to fixed-timed signal control.
  Benefit - (13-17 January 2002)
- The Traffic Light Synchronization program in Texas demonstrated a benefit-to-cost ratio of 62:1
  Benefit - (7-10 August 2005)
- In the City of Fort Collins, Colorado, the installation of an Advanced Traffic Management System reduced travel times up to 36 percent.
  Benefit - (24 June 2008)
- Installing new traffic signals in Japan reduced crash frequency by 75 to 78 percent and upgrading existing traffic signals reduced accidents up to 65 percent.

http://www.itscosts.its.dot.gov/its/benecost.nsf/SingleCostTax?OpenForm&Query=Arterial%20Management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Arterial Management (60 unique system cost summaries found)

Map Results

Related T3 Webinars

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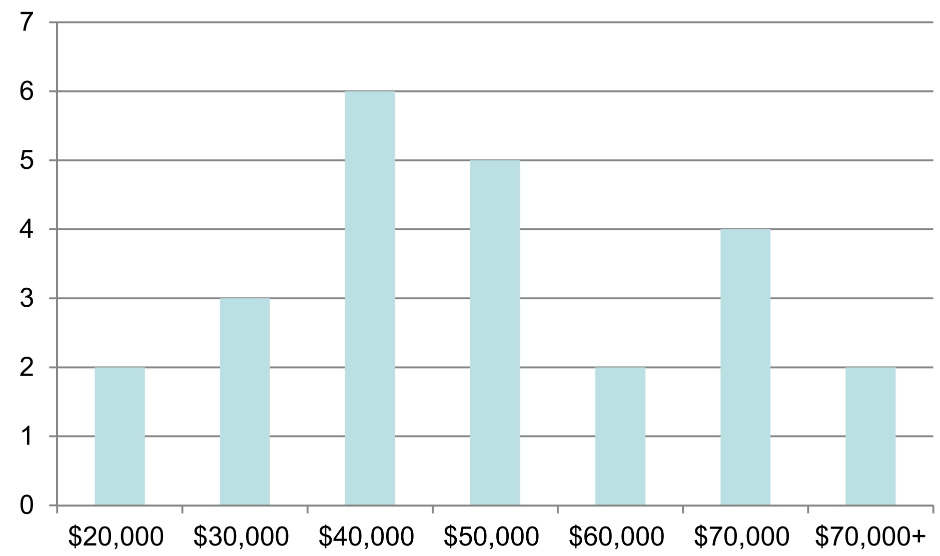
Adaptive Signal Control

- The average cost to implement Adaptive Signal Control Technology is $28,725 per intersection. (January 2013)
- An adaptive signal control system for 8 intersections in Woodland Park, CO was implemented for $176,300. (July 2012)
- An adaptive signal control system for 11 intersections in Greeley, CO was implemented for $905,500. (July 2012)
- Adaptive signal control can be installed for $20,300 to $82,300 per intersection depending on upgrades required. (07/01/2012)
- Costs for adaptive signal control can vary widely, ranging from $6,000 (ACS Lite) to $60,000 (SCOOT) per intersection. (05/14/2012)
- The average installation cost per intersection of an Adaptive Traffic Control System (ATCS) is $65,000. (2010)
- Implementing Integrated Corridor Management (ICM) strategies on the I-15 Corridor in San Diego, California is estimated to cost $1.42 million annualized and a total 10-year life-cycle cost of $12 million. (September 2010)
- A SCATS adaptive signal control system costs approximately $28,800 per mile per year. (September 2010)
- The cost to develop, implement, and document the deployment of an adaptive signal control and transit signal priority upgrade on the Atlanta Smart Corridor was estimated at $1.7 million. (30 June 2010)
- In Edmonds, Washington, connecting six arterial traffic signals and five CCTV cameras to a central signal system cost $90,000. (June 2009)
- In Snohomish County, Washington, interconnecting five traffic signals and three CCTV cameras to a central signal system cost $91,000. (June 2009)

Distribution of ASCT Installation Costs per Intersection

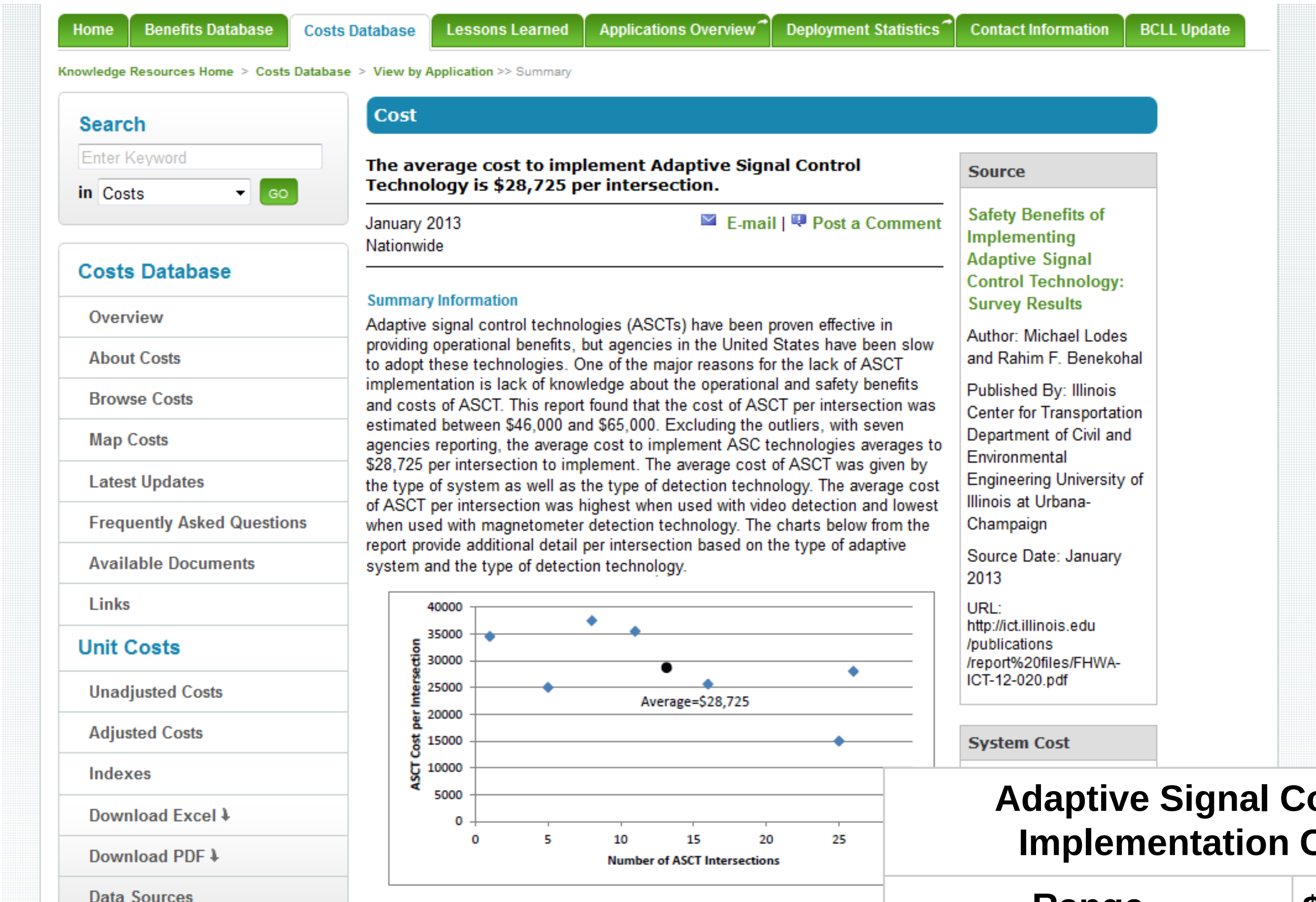
http://www.itscosts.its.dot.gov/ITS/benecost.nsf/ID/5A53F0D1919AA5EE8525798300819B6E?OpenDocument&Query=CApp

Frequency	Costs per intersection (US $)
2	$20,000
3	$30,000
6	$40,000
5	$50,000
2	$60,000
4	$70,000
2	more than $70,000



Cost ID: 2012-00249

http://www.itscosts.its.dot.gov/ITS/benecost.nsf/ID/34ACAD7692BB577585257B20006C7649?OpenDocument&Query=CApp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Cost

The average cost to implement Adaptive Signal Control Technology is $28,725 per intersection.

January 2013
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Summary Information

Adaptive signal control technologies (ASCTs) have been proven effective in providing operational benefits, but agencies in the United States have been slow to adopt these technologies. One of the major reasons for the lack of ASCT implementation is lack of knowledge about the operational and safety benefits and costs of ASCT. This report found that the cost of ASCT per intersection was estimated between $46,000 and $65,000. Excluding the outliers, with seven agencies reporting, the average cost to implement ASC technologies averages to $28,725 per intersection to implement. The average cost of ASCT was given by the type of system as well as the type of detection technology. The average cost of ASCT per intersection was highest when used with video detection and lowest when used with magnetometer detection technology. The charts below from the report provide additional detail per intersection based on the type of adaptive system and the type of detection technology.

Source

Safety Benefits of Implementing Adaptive Signal Control Technology: Survey Results

Author: Michael Lodes and Rahim F. Benekohal

Published By: Illinois Center for Transportation Department of Civil and Environmental Engineering University of Illinois at Urbana-Champaign

Source Date: January 2013

URL: http://ict.illinois.edu/publications/report%20files/FHWA-ICT-12-020.pdf

System Cost

Adaptive Signal Control Technology – Implementation Costs - Nationwide	
Range	$15,000 - $37,500 per intersection
Average	$28,725 per intersection

Adaptive Signal Control Interactive Graphs

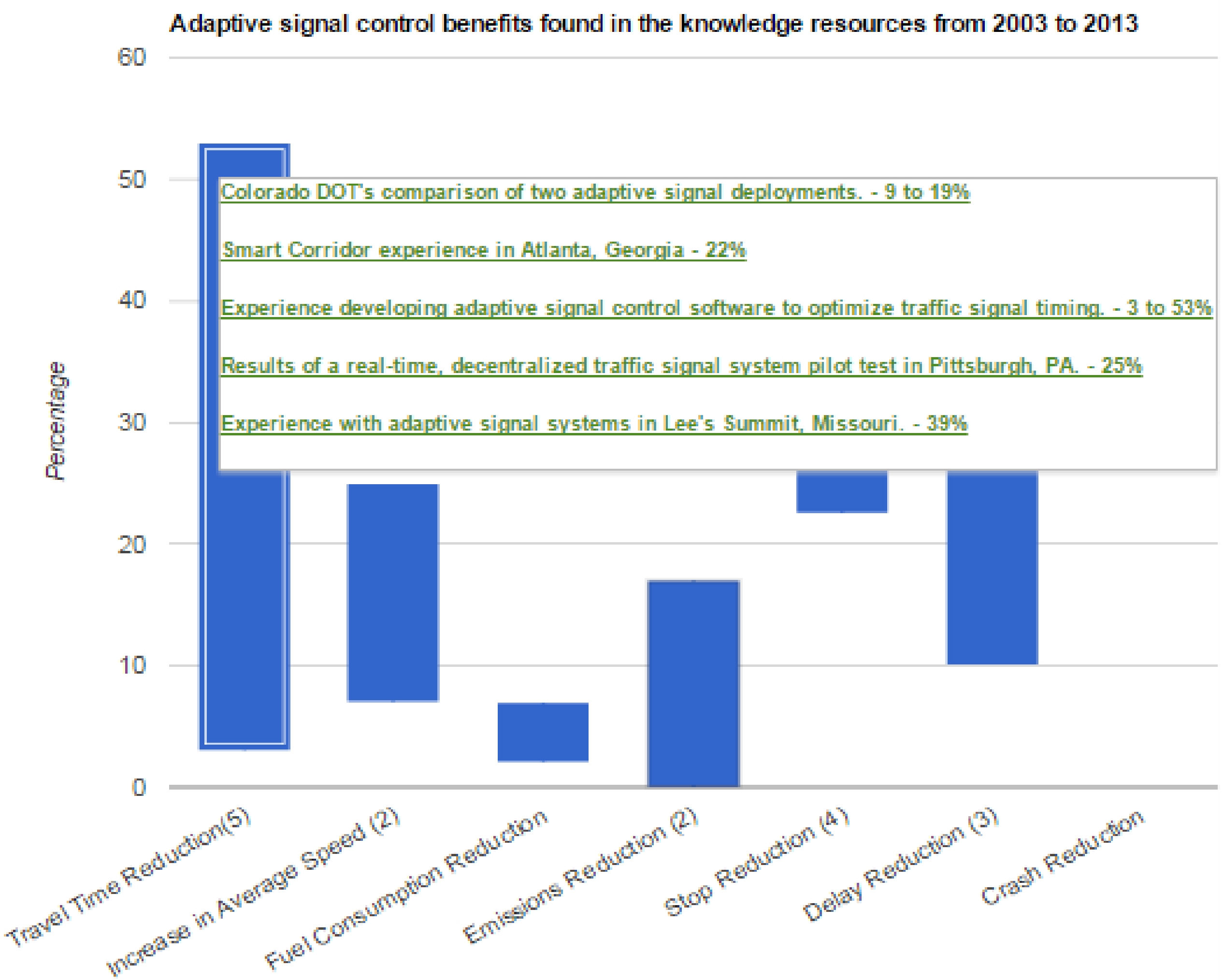

Figure 2: Adaptive Signal Control benefits found in the knowledge resource database from 2003 to 2013 (Source: ITS Knowledge Resources).

Adaptive Signal Control Lessons Learned

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Submit Your Data

Please share any documentation that you may have regarding benefits and costs of ITS.

Lesson

Use Model Systems Engineering (SE) Documents for Deployment of Adaptive Signal Control Technology Systems

Systems Engineering guidance developed through lessons learned in national deployments of Adaptive Signal Control Technology systems

August 2012
Nationwide, United States

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Background (Hide)

The "Model Systems Engineering Documents for Adaptive Signal Control Technology Systems" guide, sponsored by the Federal Highway Administration and finalized in August of 2012, is intended to provide guidance for professionals involved in developing SE documents covering the evaluation, selection and implementation of Adaptive Signal Control Technology (ASCT)systems.

Lesson Learned

The purpose of this document is to guide the user through the process of developing SE documents for assessment and selection of adaptive signal control technology (ASCT) systems. This document is the result of best practices observed through many case studies and provides a structure within which you can examine your current operation (or the operation you expect to have within the near future), assess whether or not adaptive control is likely to address your issues, and then decide what type of adaptive control will be right for you. Templates are also provided for the development of the SE documents that are appropriate for your situation. There are instructions on how to select appropriate answers to questions, how to select statements from the examples that are provided, and what additional information you need to gather and include in the documents. This may lead you to prepare a set of requirements and a specification against which vendors may propose a solution; or it may lead you to identify one system that is particularly suitable for your needs. It may also lead you to the realization that you are not yet prepared or capable of operating an ASCT system.

Source

Model Systems Engineering Documents for Adaptive Signal Control Technology Systems - Guidance Document

Author: Fehon, K., et. al.

Published By: U.S. DOT Federal Highway Administration

Source Date: August 2012

Other Reference Number: Report No. FHWA-HOP-11-027

URL: http://ops.fhwa.dot.gov/publications/fhwahop11027/

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