

## 0-7009: Implementation of Automatic Traffic Signals Performance Measures

### Background

The availability of high-resolution traffic signal data along with analysis tools has enabled agencies to troubleshoot problems before they escalate into bigger issues and to maintain and update signal timings in a proactive manner. This methodology is achieved by using tools called automated traffic signal performance measures (ATSPMs) or signal performance metrics (SPMs). Currently, signal maintenance and operational issues are reactively identified through public feedback, and significant lag could occur between problem occurrence, troubleshooting, and implementation of a corrective measure, causing public dissatisfaction.

ATSPM work was initially started by researchers at Purdue University in conjunction with the Indiana Department of Transportation. A team led by the Utah Department of Transportation (UDOT) in cooperation with Purdue University and funded by the Federal Highway Administration, American Association of State Highway and Transportation Officials, other state agencies, and traffic controller manufacturers developed the first version of open-source ATSPM software.

The scope of this project was to develop draft specifications of an ATSPM system for statewide deployment. These draft specifications will be used to develop formal specifications for the Texas Department of Transportation (TxDOT) to procure and deploy an ATSPM system. This project also aimed to develop guidelines for local agencies about making decisions to deploy and operate an ATSPM system. These draft

specifications and guidelines will facilitate the statewide deployment of ATSPMs and significantly improve the TxDOT districts' ability to operate in a more efficient manner.

### What the Researchers Did

Researchers conducted a thorough review of the history of signal performance measures and the evolution of ATSPMs. The review included the open-source software developed by UDOT and other vendors like Iteris and Miovision, and vendor-based SPMs like Centrac. Review included:

- Modifications/enhancements made to the ATSPMs by other state departments of transportation like the Georgia Department of Transportation.
- The architectures of these various platforms and the needs and constraints of each system.
- Performance measures and their definitions.

Researchers received input from the project panel and TxDOT district engineers in the following manner:

- Consulted with the project panel for guidance on the needs and constraints of the agency.

#### Research Performed by:

Texas A&M Transportation Institute

#### Research Supervisor:

Srinivasa R. Sunkari, TTI

#### Researchers:

Nadeem Chaudhary, TTI

#### Project Completed:

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- Reached out to all 25 districts individually to assess their awareness of ATSPMs, their interest in implementing the system, availability of resources, and other constraints.
- The project director coordinated a webinar with all districts to get their collective feedback regarding the proposed statewide ATSPM deployment.

Based on the feedback from the various districts, researchers developed the minimum capabilities of the proposed statewide deployment system as well as detailed functional and technical requirements. These products were then presented to the project panel at a pilot workshop, which also served as a closeout meeting.

### What They Found

Based on the review of the literature and deployment experiences, researchers recommended the following eight stages for the statewide deployment of ATSPMs:

1. Select the desired performance measures.
2. Determine the implementation scale.
3. Conduct a system requirement gap assessment.
4. Procure resources.
5. Configure the system.
6. Verify the system.
7. Apply performance measures.
8. Integrate the ATSPM into agency practice.

The researchers recommended using the architecture developed by UDOT for the deployment of an ATSPM system in Texas.

Researchers also provided guidelines to the individual TxDOT districts to facilitate the deployment of ATSPMs. These ranged from identifying a champion to developing an architecture that ties the proposed ATSPM system to the statewide deployment and includes any vendor-based ATSPM system deployed within the district.

Finally, researchers recommended TxDOT districts investigate the use of platforms that use connected vehicle data using vehicle trajectories to develop signal analytics in the absence of resources to deploy a typical ATSPM.

### What This Means

The draft specifications submitted in the project, which include the minimum capabilities and functional and technical requirements, will facilitate a statewide deployment of an ATSPM system. Such a system will support the agency goal of focusing on the customer by optimizing system performance in a proactive manner. This is accomplished by delivering the right projects to minimize congestion and improve the reliability of the transportation network. Specifically, it will mean that traffic signal engineers and technicians will be able to operate their signal system in a more efficient manner, troubleshoot maintenance in a timely fashion, and make decisions based on knowledge of overall system performance.

### For More Information

**Project Manager:**

Wade Odell, TxDOT, (512) 416-4737

**Research Supervisor:**

Srinivasa Sunkari, TTI, (979) 317-2845

**Project Monitoring Committee Members:**

America Garza, Barbara Russell, Jeremy Dearing, Jianming Ma, Juan Marfil, Kelli Williams, Mathew McCarty, Robert Guydosh, and Steve Chiu

Research and Technology Implementation Office  
Texas Department of Transportation  
125 E. 11th Street  
Austin, TX 78701-2483

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