



MDOT's Transportation Systems Management and Operations (TSMO) Program

Low-cost, high-impact solutions for safer roads, less congestion, and greater reliability

First of all, what is TSMO?

The Michigan Department of Transportation (MDOT) has developed an innovative Transportation Systems Management and Operations (TSMO) program to increase highway safety and reduce congestion simply by improving the day-to-day operations of the roads we've already built. But first of all, what is TSMO?

TSMO is an emerging term used to describe an integrated program of operational strategies that actively manage the transportation system using real-time data, analysis, and communication technologies. Some of these strategies have been in place for years at MDOT, including work zone management, road weather management, intelligent transportation systems (ITS), traveler information systems, and incident management. Other newer strategies, including Integrated Corridor Management (ICM) and Active Traffic Management (ATM), combine technologies such as traffic signal coordination, driverless vehicles, ITS, and more sophisticated data processing and analytics. MDOT's TSMO program will harmonize all of these strategies under one program to optimize the safety, efficiency, and reliability of the existing transportation system.

What are the benefits of the TSMO program?

As MDOT staff are well aware, budget limitations restrict the number of high-cost, major expansion projects that can be implemented. TSMO strategies, however, are cost-effective and quick to implement so, when integrated with MDOT's traditional means of building and maintaining our transportation system, they provide high benefit-to-cost

ratios and enhance more traditional projects. These solutions are so effective because much of modern congestion doesn't come from just having too many drivers on the road, it comes from events such as crashes, construction zones, bad weather, and special events. These events are exactly what MDOT's innovative solutions are designed to address – reducing the impacts of these events via better technology and

better collaboration between MDOT and its partners. In addition, these solutions build on MDOT's longtime services (such as clearing crashes and plowing snow) with new technologies that strengthen MDOT's services as a whole.

MDOT's TSMO program will therefore leverage existing investments by allowing Michigan to get greater capacity from existing infrastructure. For example, a Freeway Management System including cameras, detectors, and message signs was implemented along I-94 between Kalamazoo and Benton Harbor. It is estimated to provide more than \$1 million per year in travel time and secondary crash reduction benefits. That equates to an estimated benefit of \$7 for each \$1 spent over the life of the project. Similar TSMO projects, when added up across all of the MDOT's major roadways, have the potential to significantly increase the capacity, performance, and safety of Michigan's transportation system. More benefits of MDOT's TSMO strategies, along with key examples, are detailed below.

Efficient trips and commutes

- Nothing is more frustrating than driving through a green light only to see the next light ahead turn red but, with optimally timed traffic lights, Michigan traffic can flow more smoothly through intersections. For Michigan travelers, this means less time on the roads and more time for work and leisure activities. In fact, in areas of need, traffic light harmonization can reduce travel times by 8 to 20 percent. For Michigan businesses, this also provides economic gains as freight trucks can move shipments from point A to point B as quickly as possible.

More reliable trips and commutes

- MDOT has been collaborating with partners statewide to mitigate traffic backups caused by incidents through the Michigan Traffic Incident Management Effort (Mi-TIME). This program provides important training on quickly and safely clearing incidents. This training has the dual benefit of enhancing responder and motorist safety as well as reducing the number of unexpected traffic jams due to incidents, so trips that should take 20 minutes won't take an hour instead. So far, Mi-TIME has trained more than 5,600 responders.

Safer roadways, with fewer crashes, injuries, and deaths

- Technologies and best practices to safely manage construction zones help decrease the number of work zone crashes, injuries, and deaths on Michigan roadways. These innovations, such as "Do Not Pass" signs with intelligent sensors that activate the sign only during heavier traffic (used during I-94 reconstruction in Clinton Township), have been proven to reduce aggressive driving and crashes in construction zones. These strategies keep Michigan's roads safe while helping Michigan reach its Toward Zero Deaths goal.

Advancing Michigan's reputation as a leader in the auto industry

- Planet M (www.planetm.com), which promotes innovation in transportation mobility technologies across the state of Michigan, is an example of MDOT's leadership in developing and deploying connected and automated vehicle technology. MDOT is also working with key auto industry, academic, and public sector partners to advance connected and automated vehicles through initiatives such as the American Center for Mobility and the Mobility Transformation Center. MDOT strategies within the TSMO program, such as building roadside infrastructure to support connected and automated vehicles, will both augment these new technologies and strengthen Michigan's position as a destination for their development and deployment.



Better, easier-to-use traveler information and road weather management

- When a big storm hits, MDOT will help travelers get to work or school safely with reliable snow removal and accurate, easy-to-use traveler information through the MDOT Mi Drive website (www.michigan.gov/drive), which gives users up-to-the-minute information on travel times, snowplow status, construction activity, and crashes across the state.

Fewer wasted gallons of gas, enhancing livability and sustainability

- With more efficient and reliable trips, Michigan travelers won't have to waste gas idling in congestion. These gas and emissions reductions will help protect natural habitats and outdoor destinations across the state, as well as meet state and national air quality standards.

Better, faster, cheaper, safer and smarter results

- When combined with traditional means of building and maintaining the transportation network, these solutions allow MDOT to more cost-effectively reduce congestion and increase safety, and provide Michigan residents with noticeable benefits now, not 10 years from now.



What are some specific TSMO strategies for Michigan, and how do they build upon existing initiatives?

Many states, including Michigan, have been conducting some TSMO activities for years in a primarily ad hoc fashion, without any comprehensive planning. A comprehensive TSMO program that is integrated with MDOT's long-range planning is critical to unlocking the next level of safety, mobility, and reliability benefits that new technology and Michigan's existing infrastructure can offer the traveling public. Because TSMO activities are not currently planned comprehensively or included in statewide long-range planning, MDOT is limited in its ability to effectively plan and budget for the resources needed to best operate Michigan's existing infrastructure.

A comprehensive TSMO program will allow MDOT to streamline current activities and leverage new technologies to take full advantage of the state's existing infrastructure. Some examples of specific, current projects that will be enhanced by the TSMO program are detailed below.

Integrated Corridor Management (ICM)

ICM strategies employ advanced transportation technologies and inter-agency coordination to reduce congestion by shifting traffic to alternate routes when crashes or events cause traffic jams. Traveler information in the form of roadside message signs and in-vehicle navigation systems, along with improved arterial signal timing, are among the tools used to implement ICM. As part of the TSMO program, ICM will allow Michigan to more effectively use all of its existing infrastructure to reduce congestion during such events.

- In 2012, MDOT (in partnership with the Southeast Michigan Council of Governments (SEMCOG); Oakland, Macomb, and Wayne counties; and the City of Detroit) received funding for ICM implementations on three distinct corridors: I-75 in Oakland County, I-75 in Wayne County, and I-696 in Macomb County. A comprehensive TSMO program would allow MDOT to strategically plan and budget for such projects across the state and to fully capture performance measures and lessons learned from these early deployments for use in longer-term plans.

Active Traffic Management (ATM)

ATM includes a range of TSMO strategies that quickly adapt the transportation system at the time when congestion strikes. These strategies include converting shoulders into travel lanes during rush hour and variable advisory speed limit signs that can adjust to help drivers avoid abrupt changes in speed.

- MDOT is implementing ATM along US-23 outside Ann Arbor (known as the US-23 Flex Route), which is estimated to provide 33 percent cost savings compared to capital expansion-only alternatives delivering equal capacity improvements. A TSMO program will help MDOT fully capture the cost savings opportunities offered by such projects.

Road Weather Information Systems (RWIS)

MDOT is striving to have an advanced RWIS that will consolidate all road weather information into one system to ensure that our roads are plowed on time and that Michigan travelers are getting accurate road weather information.

- The TSMO program will formalize and extend the benefits of MDOT's work to create an advanced RWIS that seamlessly integrates with maintenance decision support systems and advanced traffic management systems.

Traffic Signal Operations

Traffic signals need to be re-optimized periodically to harmonize traffic flow and MDOT's TSMO program will enhance MDOT's efforts to get Michigan travelers through intersections as efficiently as possible via the application of arterial signal operations strategies. These strategies include advanced models for signal timing as well as signals that can adapt to current traffic conditions, so cars don't have to sit at a red light while no vehicles are trying to cross the street.

- Michigan's arterial signals have been sporadically and incrementally modernized to optimize traffic flow. The TSMO program will help MDOT and its partner agencies systematically and strategically deliver these benefits to Michigan travelers.

Connected and Automated Vehicles

Connected and automated vehicles will revolutionize the way we get around, increasing the efficiency and safety of our roadways. Michigan has been at the forefront of testing and developing this technology.

- The TSMO program will help Michigan best capture the economic development opportunities offered by connected and automated vehicles. Connected vehicle technology is being installed on infrastructure in both MDOT's Metro and University regions. These installations will help spur the development of these technologies in Michigan and support the automakers' on-board safety systems of the future.



**For more information on MDOT's
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