AIM Innovation Showcase Application

Sponsor

Nominations must be submitted by an AASHTO member DOT willing to help promote the innovation. If selected, the sponsoring DOT will be asked to present the innovation at the Innovation Showcase during the AASHTO Spring Meeting.

1. Sponsoring DOT (State): Utah Department of Transportation (UDOT)

2. Name and Title: Abdul Wakil, P.E., Asset Engineer for Maintenance

Organization: Utah Department of Transportation (UDOT)

Street Address: 4501 South 2700 West

City: Taylorsville

State: Utah

Zip Code: 84129

Email: awakil@utah.gov

Phone: 385-267-9060

Innovation Description (30 points)

The term "innovation" may include processes, products, techniques, procedures, and practices.

3. Name of the innovation:

Mobile Pavement Markings Wet-Retroreflectivity Data Collection Made Safer

4. Please describe the innovation.

Mobile dry retroreflectivity testing has been around for some time now. However, mobile wet retroreflectivity testing is a recent innovation. A new mobile testing method allows for the mobile collection of wet retroreflectivity of pavement markings condition data using two moving vehicles. The vehicle in front is equipped with water sprayers to wet the pavement markings. The second vehicle, equipped with Laserlux sensors to measure retroreflectivity, follows immediately behind at the same speed and a fixed distance.

The paired vehicles can travel at a speed of 50 mph while conducting the data collection, and can complete about 250 miles of collection per day. All of this work is done in a rolling operation so no lane closure, traffic control, or highway patrol assistance is needed.

5. What is the existing baseline practice that the innovation intends to replace/improve?

Existing baseline practice for data collection of wet pavement marking retroreflectivity required the closing of two lanes and a ramp of traffic and setting up traffic control, involving two Utah Highway Patrol (UHP), two traffic control crews, and impacts to travelers. This method established work zone areas in five locations alongside Interstate 15 by right edge lines and also the yellow left edge line next to the HOV lanes. It involved crews working on the roadway with handheld measuring devices taking spot readings. This method was slow and time consuming and required the closing of lanes in various locations. Furthermore, conditions were very dangerous because crews were exposed to fast moving traffic.

6. What problems associated with the baseline practice does the innovation propose to solve?

Safety: This is a significant process improvement to address the risk to personnel safety while collecting wet retroreflectivity data. Data collection on a high volume and high speed interstate road was very dangerous. UDOT and contractor personnel were exposed to high traffic volume, poor lighting conditions, and high vehicle speeds while working on foot to collect this data. The risk of being struck and injured was very high.

Mobility: The baseline practice had a negative impact on travelers. It required the closing of two lanes of traffic in five locations of the busy interstate.

Cost: The new practice also mitigates a cost and time factor. The previous practice required the set-up and removal of traffic control, and the cost of assistance from the Utah Highway Patrol. This also increased the risk potential to these required personnel.

7. Briefly describe the history of its development.

Beck Enterprises has been conducting static wet testing in lane closures since around 2005 using mobile retroreflectometers and a rain box (old method). Over the years, Beck employees became more and more hesitant about exposing the team to the inherent dangers associated with standing in a lane closure on an interstate, especially at night. Crews had so many close calls that during the spring of 2019, the company decided that enough was enough. They started designing a process to provide the wet testing service in the same manner as mobile retroreflectivity testing.

The development process took roughly a year and a half to produce the first production mobile wet truck utilizing a platform that was relatively easy to mobilize and could also blend into traffic during data collection. The benefits of the new platform were immediately recognized.

- No boots on the ground increasing the safety factor.

- No need for traffic control or lane closure reducing the total cost of data collection.

- Dramatically greater area of data collection coverage.

- Increased efficiency of data collection reducing time on project site.

8. What resources—such as technical specifications, training materials, and user guides—have you developed to assist with the deployment effort? If appropriate, please attach or provide web links to reports, videos, photographs, diagrams, or other images illustrating the appearance or functionality of the innovation below (if electronic, please provide a separate file). Please list your attachments or web links here.

Beck Enterprises developed the system to provide it as a service. Beck does not sell the system. Therefore, all of the technical specifications, training manuals, etc. are proprietary information.

https://sites.google.com/utah.gov/udot-i/c/20240058

AASHTO INNOVATION MANAGEMENT

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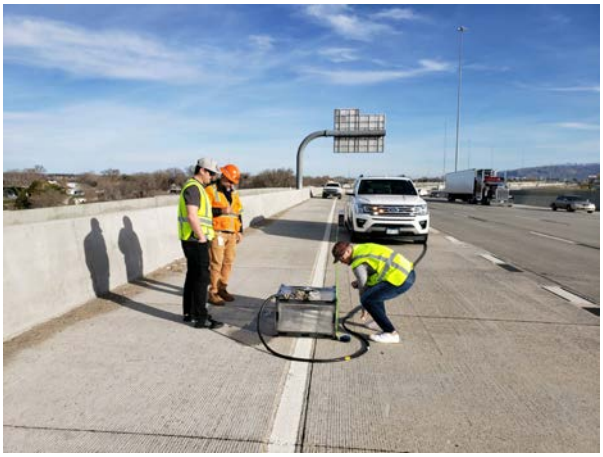	
	
	

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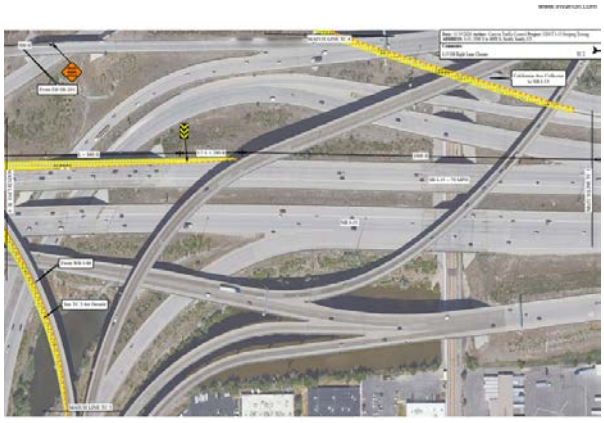
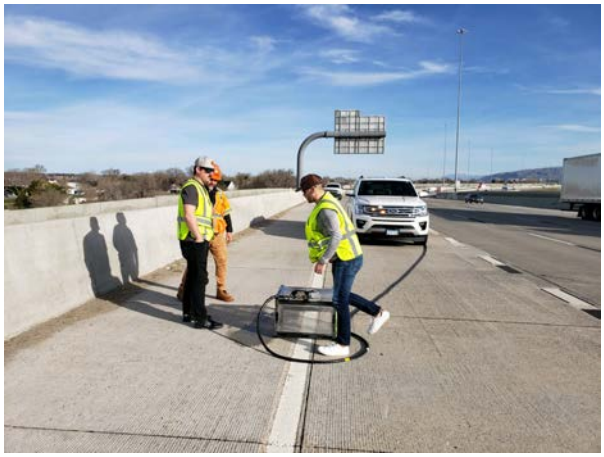
MANAGEMENT








State of Development (10 points)

Innovations must be successfully deployed in at least one State DOT. The AIM selection process will favor innovations that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use.

9. How ready is this innovation for implementation in an operational environment? Please select from the following options. Please describe.

☐ Innovation is fully functional and yet to be piloted.

■ Innovation has been piloted successfully in an operational environment.

☐ Innovation has been deployed multiple times in an operational environment.

☐ Innovation is ready for full-scale implementation.

10. What additional development is necessary to enable implementation of the innovation for routine use?

This system has been already successfully implemented in Utah, Minnesota, and Kansas.

11. Do you have knowledge of other organizations using, currently developing, or showing interest in this innovation? ■ Yes ☐ No

If so, please list organization names and contacts.

Yes, Minnesota Department of Transportation and Kansas Department of Transportation

Organization	Name	Phone	Email
Minnesota DOT	Ethan Peterson	651-234-7380	ethan.peterson@state.mn.us
Kansas DOT	Jonny Madrid	785-296-7432	jonny.madrid@ks.gov

Potential Payoff (30 points)

Payoff is defined as the combination of broad applicability and significant benefit or advantage over baseline practice.

12. Identify the top three benefits your DOT has realized from using this innovation. Describe the type and scale of benefits of using this innovation over baseline practice. Provide additional information, if available, using quantitative metrics, to describe the benefits.

Benefit Types	Please describe:
Improved Safety	Over the years, the contractor crew became more and more hesitant to expose the team to the inherent dangers associated with standing in a lane closure on the interstate, especially at night. It led to a design process to create a safer method of data collection in the same manner via mobile retroreflectivity testing. Personnel in work zones are no longer on the ground and directly exposed to high-speed traffic. Traffic control and highway patrol personnel are also unneeded. With the new mobile method, crews are inside two vehicles that blend in with moving traffic.
Improved Operation	With the previous method, UDOT had to close two lanes and a ramp of a major freeway in five locations from 7:00 a.m. to 5:00 pm. It created a huge challenge for everyone involved with this project, including travelers. UDOT also called upon the Utah Highway Patrol (UHP) to help out since it was a high volume and high-speed roadway. It used to take many employees about 9-10 hours to establish the operation and get the data collected. With the new method, it takes less than four hours, fewer personnel, and in a much safer way.
Cost Savings and more data	Eliminating the involvement of the Utah Highway Patrol and Traffic Control saves about $23,000 annually. It is $20,000 in Traffic Control cost and $3,000 in Utah Highway Patrol cost. Another notable benefit of the mobile collection is the increase in data that can be collected. Instead of testing four small spots in each of the five testing zones, UDOT is sampling the entire 1,000 foot segment on each line type through the testing zones. This yields roughly 1.9 million data points for each test section rather than one small area. This allows for a more thorough analysis of pavement markings. Finally, there is a cost reduction in personnel time, traffic control set-up and removal, and Highway Patrol time. Not

	needing to close a lane of traffic reduces negative impacts to the traveling public.

Deployability (30 points)

The AIM selection process will favor innovations that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential.

13. What challenges and/or lessons learned should other organizations be aware of before adopting this innovation?

During this first-time implementation of rolling operation data collection technology, UDOT asked our Incident Management Team (IMT) to help out for an extra measure of safety. But in the long run and moving forward, it seems that IMT involvement is no longer needed in this type of moving operation. We learned that this system requires more water so frequent water refill stops are needed. We also learned that because the collection produces many more data points, more data storage space is necessary.

14. Please provide details of cost, effort, and length of time expended to deploy the innovation in your organization.

Cost: $18,000 (Data Collection Service Cost).

Beck Enterprises does not sell this system, therefore all of the cost of this system and technical specifications, training manuals, etc are proprietary information. Service cost about $18,000 to collect this data.

Level of Effort: Several functional units within UDOT contributed to the success of this project. Two data collection vehicles (a water sprayer and laserlux vehicle) and the IMT vehicle

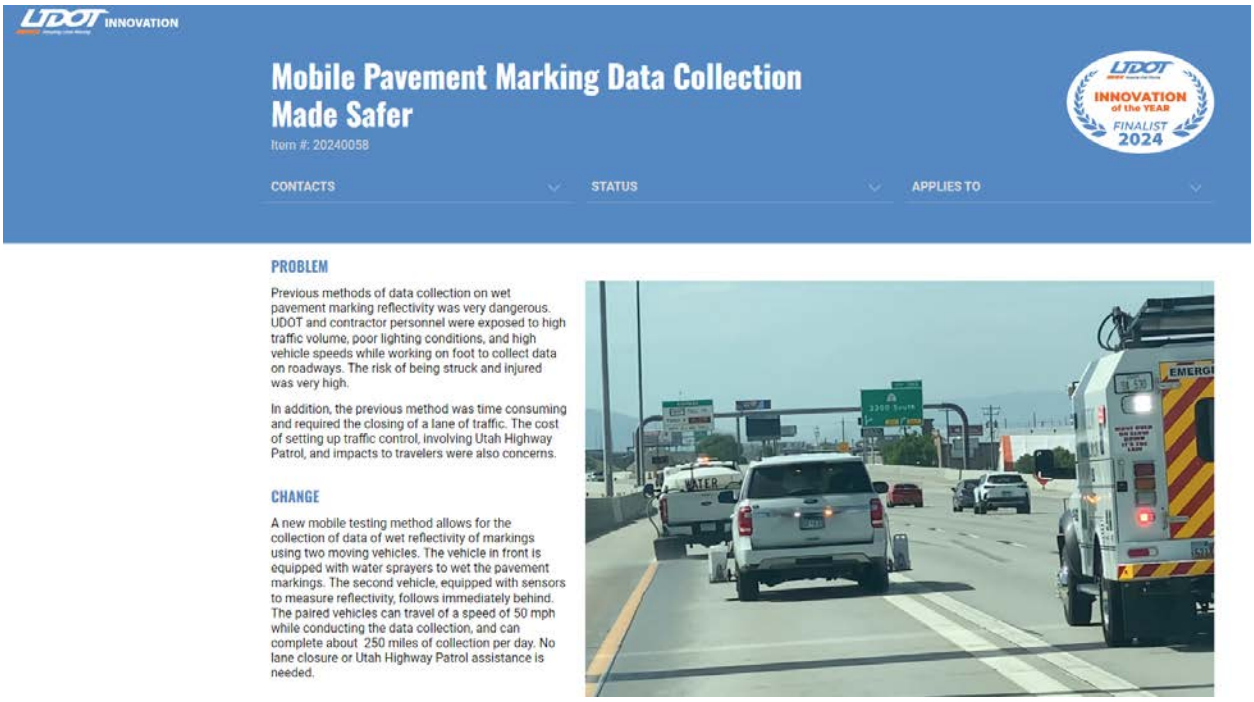
Time: About four hours to complete data collection

15. To what extent might implementation of this innovation require the involvement of third parties, including vendors, contractors, and consultants? If so, please describe. List the type of expertise required for implementation.

Data collection is done by the vendor, Beck Enterprises, that developed this system. This implementation brought an improvement to our existing data collection operation. We had the data collection process analyzed by researchers at the University of Utah and they compared it with data from the old method. They found it was acceptable. State DOTs and consultants will analyze the

collected data. This is a joint effort to improve the collection process with this new and innovative data collection method.

https://sites.google.com/utah.gov/udot-i/c/20240058



UDOT INNOVATION

Mobile Pavement Marking Data Collection Made Safer

Item #: 20240058

INNOVATION of the YEAR FINALIST 2024

CONTACTS | STATUS | APPLIES TO

PROBLEM

Previous methods of data collection on wet pavement marking reflectivity was very dangerous. UDOT and contractor personnel were exposed to high traffic volume, poor lighting conditions, and high vehicle speeds while working on foot to collect data on roadways. The risk of being struck and injured was very high.

In addition, the previous method was time consuming and required the closing of a lane of traffic. The cost of setting up traffic control, involving Utah Highway Patrol, and impacts to travelers were also concerns.

CHANGE

A new mobile testing method allows for the collection of data of wet reflectivity of markings using two moving vehicles. The vehicle in front is equipped with water sprayers to wet the pavement markings. The second vehicle, equipped with sensors to measure reflectivity, follows immediately behind. The paired vehicles can travel of a speed of 50 mph while conducting the data collection, and can complete about 250 miles of collection per day. No lane closure or Utah Highway Patrol assistance is needed.

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RESULT

The most significant benefit of this collection method is the improvement in safety. UDOT and contractors are able to work inside vehicles and are no longer exposed to the hazards of being on the ground next to high speed traffic.

Another notable benefit of the mobile collection is the increase in data that can be collected. Instead of testing four small spots in each of the five testing zones, UDOT is sampling the entire 1,000 foot segment on each line type through the testing zones. This yields roughly 1.9 million data points for each test section rather than one small area. This allows for a more thorough analysis of pavement markings.

Finally, there is a cost reduction in personnel time, traffic control set-up and removal, and Highway Patrol time. Not needing to close a lane of traffic reduces negative impacts to the traveling public.

LINKS

- Mobile Data Collection_video 1
- Mobile Data Collection_video 2
- Mobile Data Collection_video 3

IMPACT

BETTER MOBILITY

- VIsible markings help drivers stay in their lane
- More testing helps UDOT prioritize re-painting
- No lane closure required

GOOD HEALTH

- Keeps workers inside vehicle and away from fast moving traffic
- Important to keep markings visible even when wet

CONNECTED COMMUNITIES

- Safe road help keep Utah moving

STRONG ECONOMY

- Data collection helps determine the correct time for re-stripping
- Mobile collection cost less than stationary site testing

EFFICIENCIES*

- Cost Avoidance: Eliminated Traffic Control and Highway Patrol involvement of $23,000 annually, resulting in $460,000 avoided over 20 years

**Benefits are estimated net of initial and ongoing expenses. Savings are averaged over the expected benefit life of the innovation. See details.*