

Snowplow Cameras and Automated Vehicle Locator Innovation

Overview

The purpose of the snowplow cameras is to capture real-time video and static images of the roadway in front of and behind plow trucks during winter operations. By integrating the cameras with PennDOT's existing Automated Vehicle Locator (AVL) system, the location and movement of every plow truck is tracked.



Integrating cameras, which work with the existing Geotab AVL installed in the trucks, enhances the system to provide maintenance and traffic management personnel with better situational awareness of actual road conditions during winter weather events. Video can be requested live through the system, or up to 40 hours of prior video can be requested from the digital video recorder (DVR) mounted in the truck.

Transportation Challenges Addressed

Instead of relying solely on traffic cameras that are primarily installed on interstates, the camera footage is viewed through PennDOT's existing AVL system, providing a real-time look of road conditions across the entire network during winter weather events. Use of the cameras allows PennDOT to better manage and reallocate its resources. In addition to winter operations, the cameras have proven to be a valuable resource for accident investigations as well as tort claims and have helped to resolve accident and line painting disputes.



Pilot Project Highlights

This innovation was piloted in PennDOT Engineering District 10 (Armstrong, Butler, Clarion, Indiana and Jefferson counties) and PennDOT Engineering District 11 (Allegheny, Beaver and Lawrence counties) with approximately 40 vehicles. The pilot tested the cameras' ability to transmit video in urban and rural settings during varying weather conditions. The pilot also included three paint trucks to determine whether there was any benefit in reducing line painting claim payouts. During the pilot, the team worked with the AVL vendor and camera vendor to modify the AVL platform for the best end-user experience available.

Due to the pilot's success, District 11 is expanding cameras to every district dump truck, and other pieces of equipment, including one-ton dump trucks and low-boy equipment. District 11 is also installing cameras in every Assistant Highway Maintenance Manager (AHMM) vehicle. PennDOT Engineering District 2 (Cameron, Centre, Clearfield, Clinton, Elk, Juniata, McKean, Mifflin and Potter counties) has installed the cameras for use with its line painting operations, and PennDOT Engineering District 6 (Bucks, Chester, Delaware, Montgomery and Philadelphia counties) is installing cameras on its trucks in Philadelphia County.

Lessons Learned and Best Practices

The below **challenges** were overcome for the Snowplow Camera and AVL innovation.

- **Union Discussions** – A meeting was held with union representatives and PennDOT's Employee Relations Division to discuss integrating cameras into the trucks prior to their installation. In many cases, the addition of cameras has helped prove that PennDOT and the truck operator were not liable for an accident. Several operators requested to have cameras installed on their truck for this reason.
- **Navigating the Procurement Process** – The procurement process was challenging as multiple individuals and organizations needed to be involved. The camera system vendor had to obtain IT approvals and cloud service approvals prior to procurement. The camera system also needed to be added to the AVL Vendor Contract. As a result, all equipment can now be procured through this contract.
- **Ordering the Right Equipment** – For any districts that would like to order truck cameras, they need to contact the AVL Section in PennDOT's Bureau of Operations to discuss what equipment is needed.
- **Platform Modifications** – AT&T and Sensata/Xirgo modified the platform multiple times over several years to make it more user-friendly and achieve the desired outcome for the camera integration. An additional challenge was that the camera vendor underwent multiple buyouts by other companies, resulting in changes each time that occurred.
- **Rear Cameras Lost Visibility from Salt Residue** – In order to overcome this challenge, operators need to periodically clean off the camera whenever they clean off their rear lights to ensure the camera lens is not blocked.
- **Traffic Management Center (TMC) and 511PA Integration** – The camera system could eventually be integrated into 511PA, but it has not been pursued any further at this time since there are still a limited number of cameras statewide.



Cost Information

The typical set up for a **dump truck** consists of a DVR with incorporated modem to transmit data, a forward-facing camera, a rear-mounted camera, a locking case for the DVR, an in-cab “panic button,” which allows an operator to push a button to create an event in the AVL media manager, in-cab LCD Monitor, and miscellaneous wiring harnesses. The total cost of the parts to outfit a dump truck (forward and rear-facing camera) is approximately \$800 for the hardware, plus about \$22/month for the subscription service.



The typical set up for a **paint truck** consists of the same parts as the dump truck installation, plus two additional cameras and two additional camera cables. The total cost of the parts to outfit a paint truck is approximately \$1,000, plus about \$22/month for the subscription service. The cost for a supply truck would be similar to the cost of a dump truck. The cost to install a camera system in an **AHMM vehicle** is approximately \$250, plus the \$22/month subscription service.

The installation of the camera system was done 100% in-house by district and county staff members. A typical dump truck installation takes one mechanic approximately three to four hours to complete, once familiar with the installation process. The first time doing an installation takes approximately six to seven hours.

Applicability Beyond PennDOT

This concept is also applicable to other transportation entities as well as local government organizations. Certain municipalities, such as cities and larger towns, could use the same or a similar system to integrate cameras in their plow trucks, line painting trucks, etc.



Next Steps

PennDOT’s Bureau of Operations has approved for the districts to install cameras on their **line painting trucks**. Please contact Monica Wesner, Roadway Programs Manager in the AVL Section of PennDOT’s Bureau of Operations at mowesner@pa.gov to initiate the equipment procurement process and have it integrated into PennDOT’s AVL system. Districts looking to install the cameras on **plow trucks**, must reach out to the Bureau of Operations to discuss further and obtain the necessary approvals.