CLEAR ROADS
research for winter highway maintenance

RESEARCH BRIEF

NOVEMBER 2021

RECOMMENDATIONS FOR ADDING CAMERA SYSTEMS ON SNOWPLOWS

RESULTS SUMMARY

Taking into account the variety of available cameras, installation configurations and uses for aftermarket camera systems, researchers compiled recommendations for states wanting to initiate or expand camera use on winter maintenance vehicles.

PROJECT DETAILS

Project Title: Aftermarket Cameras in Winter Maintenance Vehicles

Project Number: CR17-03

Project Cost: $92,977

Report Date: June 2021

Project Champion:
Todd Miller
Missouri Department of Transportation
richard.t.miller@modot.mo.gov

Investigator: Mark Gallagher
SRF Consulting Group
mgallagher@srfconsulting.com

Video cameras on winter maintenance vehicles can provide a wealth of crucial information to plow operators, maintenance supervisors and the public. Cameras help operators monitor equipment operation and can provide maintenance supervisors and motorists with a near-real-time view of road conditions. However, cameras typically are not offered as a standard feature from snowplow manufacturers. Some transportation agencies have deployed aftermarket camera systems, but many have not. Winter maintenance managers who already use camera systems want to make the most of them, and those who have not need to know where to begin.

Need for Research

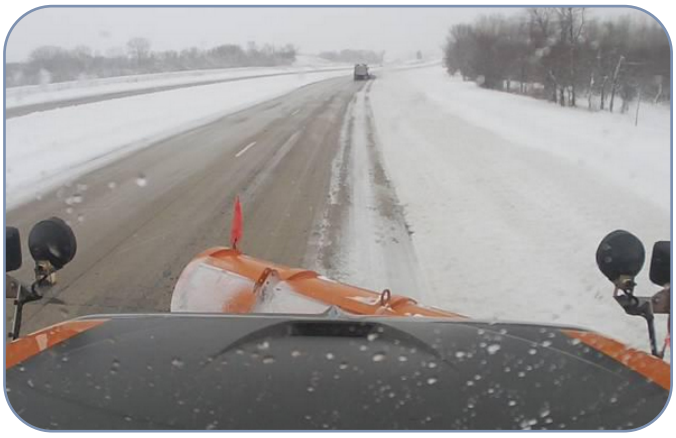
Among the agencies that have cameras on their snowplows, equipment selection, installation, usage and image quality vary. Some, for example, may capture images with a dashboard-mounted smartphone, while others have multiple truck-mounted cameras that provide front and rear views as well as equipment-specific views of the spreader, tow plow or wing plow. Some only provide displays for the snowplow operators, while others record or transmit video for management use or public viewing. Clear Roads agencies that are interested in installing aftermarket cameras on their fleets need foundational and practical information to guide their choices.

Objectives and Methodology

The goal of this project was to identify best practices for aftermarket camera systems on winter maintenance vehicles by exploring the types of cameras available, their uses, and the issues encountered with their installation or use.

Information for this effort was collected through several steps. First, a literature search examined the range of equipment, variety of uses, and best practices for vehicle-mounted cameras used by state DOTs, transit systems, emergency vehicles and law enforcement fleets. Next, researchers surveyed agency users of snowplow cameras to document camera use and configuration, how images are used, and operational issues.

CONTINUED



A forward-facing camera shows a near-real-time visual of road conditions and the position of the snowplow. (Photo courtesy of Minnesota DOT.)

Follow-up interviews were then conducted with three responding agencies to provide greater context for their survey responses. Researchers also interviewed two camera vendors to learn about product details and potential future applications.

Finally, researchers gathered information about a recent test deployment in Minnesota DOT District 4 of a lens washing system combined with a low-cost third-party camera. To understand the viability of this equipment combination, researchers interviewed District 4 staff and consulted with the equipment suppliers.

Results

The survey yielded 29 responses from 25 states. Two-thirds of responding agencies reported using cameras on their snowplows, yet few were aware of other agencies' use. Most agencies' systems included a display for the snowplow operator, as the most common purpose for the cameras was monitoring the snowplow vehicle's systems.

In choosing a camera system, responding agencies' most important selection criteria were the cameras' durability and image quality. Maintenance costs tended to be relatively low. The most common issue encountered—mostly on spreader, rear-view and wing plow cameras—was degraded image quality due to dirt and moisture on the camera lens.

From these survey results, along with the other information collected, researchers made several key recommendations for agencies using or planning to use aftermarket cameras on their snowplows. These recommendations include:

- Rear-view and tow plow cameras are recommended to allow monitoring of operations behind the plow; other equipment monitoring cameras may be deployed depending on operator needs.
- In-cab displays should be capable of showing up to four camera feeds simultaneously. Displays should be carefully positioned to avoid glare and should include brightness control for the driver.
- Live video transmission is not recommended unless a snowplow is operating in an area with high-performance cellular networks. Recording video in-cab may be an option for purposes not requiring real-time video.
- Camera washing systems for each camera are critical. Commercial camera wash systems may be used with low-cost, off-the-shelf vehicle cameras as an alternative to more expensive integrated systems. Heated lenses are also important, particularly in colder-weather states.
- Equipment operators should be involved in planning and installing camera systems. While there may initially be privacy or other concerns, getting operators' input encourages acceptance and maximizes their benefits from camera use.

Benefits

This study provides agencies with valuable information on aftermarket camera use on winter maintenance vehicles. While recommending specific equipment was not within the scope of the study, the researchers provided general recommendations to aid agencies in decision-making. Whether winter maintenance managers are considering installing cameras for the first time or expanding their current capabilities, these recommendations will maximize the value and effectiveness of whichever aftermarket system and configuration they select.

"This study opened my eyes to the possibilities—equipment, uses, feasibility and operational issues—for aftermarket cameras on our snowplows."

Project Champion Todd Miller
Missouri DOT
richard.t.miller@modot.mo.gov

Produced by CTC & Associates LLC on behalf of the Clear Roads pooled fund project #TPF-5(353), led by the Minnesota Department of Transportation.