Minnesota LTAP
University of Minnesota

Local Operational Research Assistance (OPERA) Program

Traffic Signal Preemption for Snowplows

Time-sensitive snow plowing operations can be hampered when snowplows must stop and wait for red traffic signals.

Emergency vehicles have used vehicle preemption for more than 25 years to change red traffic signals to green, which allows them to get through signalized intersections more quickly. But Minnesota law prohibits the use of high-priority vehicle preemption equipment by other vehicles. Low-level preemption devices typically used on mass transit vehicles tend to be more subtle and less effective.

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OPERA Funding
$10,000

Relative priority preemption technology

The City of St. Cloud received a $10,000 grant through the Local OPERA Program to evaluate a new level of traffic-signal preemption developed for snowplows and other similar equipment called relative priority preemption (RPP). Relative priority preemption is similar to high-level preemption in that it will force a traffic signal to display green except when emergency vehicles need it.

To test the system, four snowplows at the St. Cloud central maintenance facility were equipped with combination GPS and video cameras to capture both video and location details of the snowplows on their routes. Before the study began, the city navigated an extensive state permission process for a traffic signal override device to be used with the snowplows.

Snowplows were equipped with dashcams to capture video and location data during the study.

Significant improvement in snowplow travel times

After obtaining state approval, the City of St. Cloud conducted an evaluation of the RPP system with the preemption system activated for a group of plows during selected plowing runs. Baseline data were captured during winter snow events along a two-mile traffic signal corridor equipped with the relative priority equipment. Travel times from each snowplow operating together as a platoon were compared with and without the relative priority system.

More information about the Local OPERA Program is at mnltap.umn.edu/opera

Sample of GPS dash camera playback with date and timestamp. The preemption received indicator light has also been circled.

This study is significant because it shows the effectiveness of RPP technology for snowplows when used by a local road agency. In addition, the system provides many more safety and operational benefits.

The city collected five years of data and completed analysis of the data in early 2020 with the help of the St. Cloud State University Statistics Department. The team's work may be the most extensive analysis ever conducted of snowplow relative priority preemption in terms of the amount of data captured and the length of the study. But most important, the project team determined that travel times for snowplows improved by 22 percent using relative priority preemption technology.

This study is significant because it shows the effectiveness of RPP technology for snowplows when used by a local road agency. In addition, the system provides many more safety and operational benefits that are difficult to quantify, such as reducing the number of unplowed snow windrows blocking cross traffic at intersections and more quickly clearing the way for emergency vehicles during snowstorms.

Recommendations

- Relative priority preemption (RPP) units must replace outdated high- and low-priority optical traffic control devices.
- State and local statutes need to be updated to allow for RPP in maintenance equipment.
- RPP devices must be regulated to protect the public and government agencies. Training and certification should be required.

About OPERA

The Local OPERA Program encourages maintenance employees from all cities and counties to get involved in operational, "hands-on" research. OPERA helps to develop innovations in the construction and maintenance operations of local government transportation organizations and share those ideas statewide.

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