

RESULTS SUMMARY

Researchers sought to identify equipment-related factors that cause driver fatigue in snowplow operators. Recommended cost-effective solutions to help reduce driver fatigue included installing an audio player, dimmable interior lighting and snow deflectors.

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REDUCING DRIVER FATIGUE AMONG SNOWPLOW OPERATORS

Clearing roads in the winter can be daunting and stressful. Snowplow operators are subjected to harsh driving conditions and must also deal with fatigue and drowsiness. To enhance the safety of both operators and the traveling public, state departments of transportation (DOTs) need to address the factors contributing to driver fatigue.

Need for Research

While studies have shown that environmental factors lead to driver fatigue in commercial vehicle operators, little research has been done specifically on how factors related to in-cab and external snowplow equipment cause fatigue in snowplow operators. When combined with demanding driving conditions such as limited visibility due to heavy snowfall, the onset of fatigue in drivers increases occupational hazard. Identifying cost-effective measures to decrease driver fatigue can reduce crashes and increase efficiency.

Objectives and Methodology

The goal of this project was to identify internal and external equipment factors that cause driver fatigue in snowplow operators.

The research team first conducted a literature review to gather information on vehicle equipment factors associated with driver fatigue. Using the results of that review, researchers developed a survey that was sent to 33 Clear Roads member states to gather data on snowplow operators' experiences with fatigue. A representative from each Clear Roads state assisted in recruiting snowplow operators to complete the survey.

The survey responses were then analyzed to assess any relationship between winter maintenance equipment and the development of fatigue. Based on the analysis, researchers recommended a set of cost-effective changes that could be made to the in-cab area of maintenance vehicles or to external operating equipment.

PROJECT DETAILS

Project Title: Identification and Recommendations for Correction of Equipment Factors Causing Fatigue in Snowplow Operations

Project Number: CR15-02

Project Cost: \$200,000

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Researchers identified tire chain vibrations as a source of operator fatigue. Basket chains were found to vibrate less than traditional ladder chains.

Results

More than 2,000 snowplow operators from 23 Clear Roads states responded to the survey. Nearly all the respondents (94 percent) reported feeling fatigue at some point while operating a snowplow during winter weather events. The majority of vehicle operators (59 percent) reported their shifts of 8 to 16 hours included both daytime and nighttime segments. Smaller proportions reported that they worked primarily during the day (22 percent) or primarily at night (18 percent). Survey results also indicated that more experienced operators were more prone to fatigue, and those who worked shifts lasting longer than 16 hours reported significantly higher levels of fatigue.

Based on results from the literature review and survey responses, researchers ranked the in-cab and external equipment that caused fatigue. The top four equipment-related sources of fatigue were bright interior lighting, standard windshield wipers, misplaced or insufficient auxiliary lighting, and old or uncomfortable seats. Among the nonequipment-related sources of fatigue, the most commonly reported factor was silence (lack of music or talking), followed by length of shift, lack of sleep and insufficient breaks.

Using the same ratings, researchers developed a list of recommended actions that can be implemented by state DOTs to decrease driver fatigue. The recommendations were based on a comparison of each solution's costs (equipment costs and potential risk of adversely affecting fatigue) and benefits (effectiveness in reducing operator fatigue).

Among the researchers' equipment-related recommendations, the most cost-effective called for adding:

- **A CD player or satellite radio** to deliver music or speech, preventing short-term fatigue.

- **Dimmable interior lighting** to reduce reflections on the windshield and windows, providing better visibility.
- **Dimmable warning lights** to reduce back-reflected light from the warning lights, lowering visual distraction.
- **Snow deflectors** to reduce the amount of snow blown on the windshield, providing better visibility.
- **Heated windshields** to reduce snow and ice buildup on the windshield, providing better visibility.

Nonequipment solutions recommended to mitigate operator fatigue included encouraging adequate breaks, limiting shifts to 12 consecutive hours when feasible, developing a fatigue management policy, encouraging a healthy lifestyle and designating dedicated rest locations for operators.

Benefits and Further Research

State DOTs can use the results of this study to inform equipment-purchasing decisions. Purchasing winter maintenance vehicles retrofitted with some of the recommended equipment solutions can help reduce costs. Furthermore, both the equipment-related and nonequipment-related solutions provide easy and quick corrective actions that state DOTs can implement immediately to increase the health and safety of snowplow operators.

While fatigue is believed to cause a higher rate of crashes, the number of crashes related to snowplow operator fatigue was not investigated in this research. Future research may be able to confirm that implementation of the recommended solutions does reduce fatigue-related crashes. Quantifiable results can help encourage state DOTs to create or improve their fatigue management plans, which will benefit both state employees and the traveling public.

“This research looked at ways that agencies can address various equipment-related issues to reduce the fatigue realized by snowplow drivers.”

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