UTC Project Information

Project Title	MPC-544 – Lifecycle Assessment Using Snowplow Trucks' Automatic Vehicle Location Data
University	University of Utah
Principal Investigator	Xiaoyue Cathy Liu
PI Contact Information	Assistant Professor University of Utah Phone: (801) 587-8858 Email: cathy.liu@utah.edu ORCID: 0000-0002-5162-891X
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Total Project Cost	$65,000
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Start and End Dates	November 15, 2017 to July 31, 2022
Brief Description of Research Project	Utah Department of Transportation's (UDOT) vision is Keeping Utah Moving. The agency's ability to deliver its core mission is supported by having an optimal age fleet to ensure the delivery of its winter maintenance program at the targeted levels of service. Class 8 snowplow trucks are the primary tool for clearing snow and delivering the winter maintenance program. The state legislature has allocated an additional $6 million per year to help bring the average age of the fleet from 11+ years old, down to the 4.5 year old target. It is important to document and follow the impact of this $6 million dollar per year infusion of funds into the Class 8 truck replacement cycle. UDOT needs to ensure they are on target and demonstrates full value of the program through transparent evaluation and measurement of the impacts of the funding. The primary objective of this research is to evaluate and measure the impacts of the allocated fund through the snowplow trucks performance assessment during their lifecycle. The secondary objective is to explore the possibility of using the Verizon's real-time automatic vehicle location (AVL) data that UDOT equipped all the snowplow trucks with to update the lifecycle model. Such high-resolution data can help us re-examine the replacement criteria of snowplow trucks such as age, mileage and condition score, to determine whether the replacement decision is made properly.

Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	The results suggest a shorter replacement cycle than what is currently implemented, and provide additional guidance on the procurement, maintenance, and prioritized selection of Class 8 snowplow trucks. The ranking of the exogenous features can provide a better understanding of what cause the lowering of performance and can help transportation agencies refine their trucks replacement strategy effectively at the micro-level. In addition to feature importance analysis, we apply RF to visualize the change of truck performance with the increase of service year by varying work intensities and working environments. The results suggest a reasonable range of average annual working mileage based on replacement year for preventing quick deterioration of their performance.
Impacts/Benefits of Implementation (actual, not anticipated)	Predicting truck performance and identifying factors that lead to performance depreciation are paramount. First of all, a number of trucks may still maintain decent performance at "optimal" replacement year determined by the model. As a result, replacing all trucks completely could be a significant waste of resources. Additionally, a better understanding of the performance can assist agencies in refining their replacement strategy and systematically determine the service continuity/termination at the micro-level. As a result, if truck performance can be monitored and predicted with high resolution and high accuracy, they can be replaced in time and help cut down maintenance expense.
Web Links • Reports • Project Website	• MPC Final Report – Lifecycle Assessment Using Snowplow Trucks' Automatic Vehicle Location Data