Lifecycle Cost Analysis for Class 8 Snowplow Trucks at Utah DOT

TRB Session 818: Critical Issues in Snow Removal Equipment and Operations

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Client Overview

• Total fleet of more than 5,000 units
• Replacement value of 200 million dollars
• 500 Class 8 snow plow trucks
  – 2009 average age of 8.4 years
  – 2015 average age of 10.3
• Light duty fleet provided by General Services
Plow Fleet Budget History*}

*Chart provided by UDOT
Plow Truck Repair Trends

*Chart provided by UDOT*
Project Objective

• Six tasks, three key questions:
  1. When should UDOT replace its Class 8 snowplow trucks?
  2. What year-by-year funding is needed to achieve the target class age over 3, 4 or 5 years?
  3. How should UDOT address the units with cracked frames (or likely to develop such problems)?
Frame Cracking*

*Picture provided by UDOT
Cracked Frame – Side View*

*Picture provided by UDOT
Work Plan

• Literature review
• Develop lifecycle model
• Identify year-by-year funding needs
• Recommend strategy for units with current or potential frame cracking
Key Recommendations

• Identified 9 years of age as the target for replacing UDOT Class 8 snowplows
• Add a points-based equipment condition evaluation system to age as replacement criteria
• Recommend a 5 year funding plan for achieving a target fleet age of 4.5 years
• Prioritize the replacement of trucks that have existing frame cracking issues
Lifecycle Model

• Consists of three curves:
  1. PM and repairs costs
  2. Capital costs
  3. Total Asset Cost curve (combination of above)
Unit Costs - PM and Repair

Years 11-17 contain projected values due to low record count

\[ y = 404.86x + 2312.2 \]

\[ R^2 = 0.9842 \]
Cost per Mile by Snowplow Truck Age

Ownership Costly | Target | O & M Costly

Cost per Mile

PM and Repair Cost per Mile | Capital CstMi | Total CstMi

Truck Age

January 13, 2016
Funding Comparison

• Based on Lifecycle Model recommendation of 9 years as target replacement age
• Assumes that corresponding fleet target age would be an average of 4.5 years
• Provided a year-by-year analysis of funding required to achieve goal in 3, 4 or 5 years
• Determined a 5-year target to be optimal
NOTE: Due to model design (built on months, not years), fleet ‘average age’ appears on graph as 4 years but actual value is 4.5
Frame Repairs Options

• Average residual value estimated < $8K
• Frame replacement
  – $47K per unit
  – Need to operate additional 7 years to recover costs
• Frame reinforcement
  – $10-15K per unit
  – Lasts only 2 years
  – OEMs do not recommend, increasing safety concerns
• No information to support any change in residual estimates with either approach
Other Comments

- Evolving emission regulations are changing equipment cost and service profiles
- Corrosion damage remains a significant, ongoing concern
- Existing fleet data includes a significant volume of unsegregated corrosion repairs
Other Comments (continued)

• Unclear as to whether changes in specifications or maintenance practices will alter cost and depreciation patterns

• Completing a snowplow route study to evaluate snowplow fleet size needs

• Revisit the equipment replacement criteria as additional data becomes available
Current Status

• Implementing the following recommendations
  – Segregating corrosion-related repair costs
  – Designing and implementing annual vehicle condition assessment system

• Legislature has stalled additional equipment funding authority
Thank You!

Provide questions / comments to:
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