

The Hidden Costs of Road Salt



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- 501(c)(3) not-for-profit since 2011
- "Creating projects to address unmet need, promote vibrant communities, and preserve the character of the Adirondacks"
- Sponsored and distributed "Review of Effects and Costs of Road De-Icing with Recommendations for Winter Road Management in the Adirondack Park."
- Sponsored 3 road salt conferences
- Road salt reduction pilot program included four highway segments, reduction of 13% from 225 lbs per lane mile to 194 lbs per lane mile



PERSONAL
VEHICLE
CORROSION



INFRASTRUCTURE
CORROSION



DOT VEHICLE
MAINTENANCE







Personal Vehicle Corrosion



Federal Highway Administration (Koch et al. 2002)

- \$23.4 billion per year nationwide
 - \$2.56 billion for corrosion resistant materials
 - \$6.45 billion in repairs and maintenance
 - \$14.46 billion in depreciation
- Cars from states that use road salt command lower resale values - as much as 20 percent less for a 10-year-old automobile, according to NACE (2002)



Personal Vehicle Corrosion



In 2002, the national annual cost of exhaust system replacements due to corrosion was \$1.68 billion (Koch et al. 2002)



How much vehicle corrosion is associated with the use of road salt?



- Bishop (1974) determined that corrosion in areas where salt was applied at 4.4 tons / km / year was twice as much as in an area with an application rate of 0.1 tons per year.
- American Public Works Association (1970) found that metal exposed to the salted highway environment corroded twice as much as metal exposed to sanded rural roads.
- Jones and Jeffery (1992) believe that it can be confidently stated that 50 % of vehicle corrosion can be attributed to the regular use of road de-icing salts.

Annual vehicle corrosion cost associated with road salt



\$11.7 billion
nationwide

Let's put that into context...



- \$11.7 billion is roughly 10% of the annual Education budget in the US in 2012
- That's more than double the annual conservation budget allocated by the 2014 Farm Bill



Infrastructure





Infrastructure Corrosion



Vitaliano (1992)

- \$2.5 Billion per year - cost to repair and rehabilitate interstate and arterial bridges in 14 snow-belt states
- \$100 Million per year - average spent by each state on maintenance and upkeep of all highway structures and facilities under their jurisdiction
- For example, in 1992 NYSDOT increased its bridge painting budget from \$10.3 million to \$33.3 million with the expressed reason being to combat corrosion

Infrastructure Corrosion - Bridges



- Koch et al. 2002
 - 15% of the 583,000 bridges in the US are structurally deficient due to corrosion of steel and concrete embedded steel reinforcement.
 - The direct cost of this corrosion is estimated at \$8.3 billion
 - \$3.8 billion to replace structurally deficient bridges over the next 10 years
 - \$4.5 billion for maintenance.

Infrastructure Corrosion - Bridges



- Transportation Research Board (1991)
 - The TRB estimated that the nation wide bridge repair costs would range from \$50 million to \$200 million per year over the projected 10 year period.
 - Future repair will be less severe due to advances in corrosion protection.
 - Future cost of newly constructed bridges.
 - epoxy coated rebar
 - waterproof membranes
 - \$75 - \$125 million in deck protection per year nation wide (Babaei and Hawkins (1987) datasource)

Infrastructure Corrosion - Bridges



- Michigan Department of Transportation (PSC 1993)
 - Utilizing the model of the TRB (1991), Public Sector Consultants (1993) calculated that bridge deck corrosion cost in the state of Michigan ranges from \$11.2 to \$25.5 million per year.
 - The range in cost depicts different options, ranging from complete replacement of damaged decks to a combination of replacement and rehabilitation.



DOT Vehicle Corrosion



Shi et. Al, 2016

- Washington State DOT Case Study
- Survey conducted to learn about DOT assets, maintenance, etc.
- Historical data

WSDOT vehicle corrosion cost associated with chloride deicers

- \$26.6 million annually
 - \$25.3 million in fleet value depreciation
 - \$142,065 in premature repair and replacement
 - Based on WSDOT estimate of 20 per cent premature repair or replacement

DOT Vehicle Corrosion



- “Average Agency” - generic Northern State, avg. fleet size
- \$14 Million - Total cost of DOT vehicle deicer corrosion risk
- The average estimated cost of equipment corrosion risks falls in six areas as follows:
 - \$12.5 million in value depreciation;
 - \$69,167 in increased downtime;
 - \$172,000 in reduced reliability;
 - \$1.1 million in reduced service life;
 - \$139,224 in increased premature repair and replacement;
 - \$30,000 in safety risks due to faulty parts.

What percent of repair costs are salt-related?

- WSDOT fleet (not including snowplows)
 - 4.3% of repair costs were corrosion-related
 - 12.9% of preventative maintenance costs were corrosion related
- WSDOT snowplows
 - 9.3% of repair costs were corrosion-related
 - 10.1% of preventative maintenance costs were corrosion related

Overview



- Personal Vehicle Corrosion
 - \$11.7 Billion per year nationwide
- Infrastructure Corrosion
 - \$100 Million per year – average spend by each state on maintenance and upkeep of all highway structures and facilities under their jurisdiction
- DOT Vehicle Corrosion
 - \$26.6 million per year in Washington State alone
 - Estimated \$14 million in generic Northern State

What about NYS?



- Current research specific to NYS is needed
- If we can show NYS how much money will be saved by reducing road salt, our initiative will be well received
- Research into bridge deck repairs in NYS Correlated with Road Salt use will begin in late 2016/early 2017
- Road Salt Working Group will collectively seek funding for a comprehensive economic analysis over the coming years