Efficient and Hunter-Friendly Winter Maintenance

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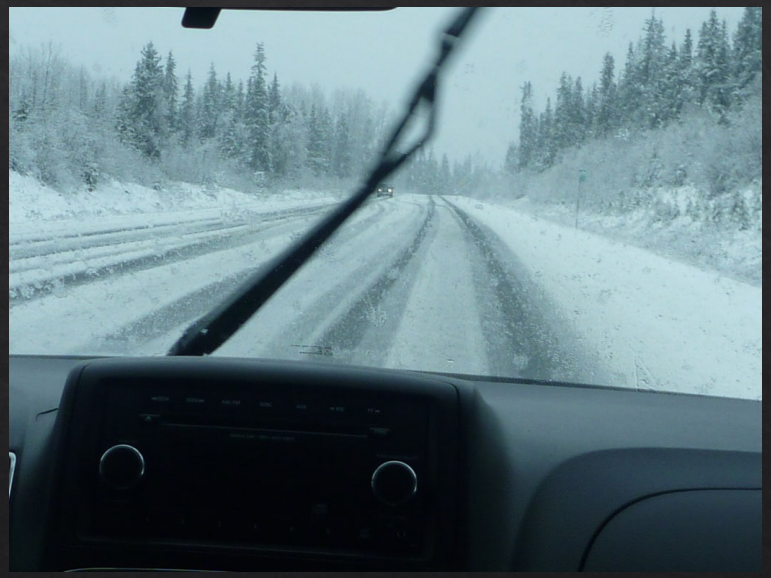
Todays Topics

- **Why we do winter maintenance -** *We need to do winter maintenance to keep people safer on the roads and keep commerce moving.*
- **Economic Incentives -** *When maintenance does not happen, crashes occur and packages that everyone needs do not get delivered.*
- **Environmental Impacts -** *But, how do we keep the roads clear and still protect the environment, including our waterways and wildlife?*
- **Budget Constraints -** *And, how do we do all of this and stay within budget?*

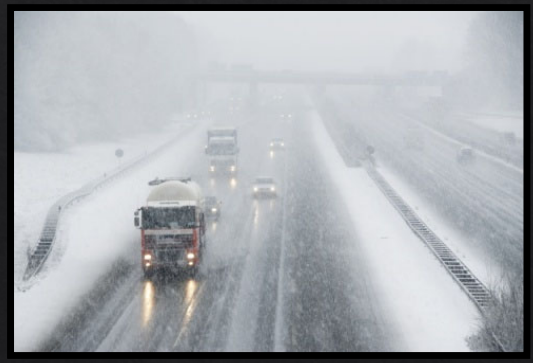
What is acceptable?



Would you (or your customers) be satisfied in either one of these situations?

Let's Remember the Reason Why

- 1,300 killed, 116,800 injured annually on snowy, slushy, or icy pavements
- 544 million vehicle hours of delay due to snow and ice annually, about a quarter of all non-recurrent delays



Why Do We Do Winter Maintenance?

- Two primary reasons, both well established by research
- Safety – Marquette University study showed proper use of road salt resulted in:
  - Crashes reduced by 88%
  - Injuries reduced by 85%
  - Accident costs reduced by 85%
- University of Waterloo Study showed proper use of road salt resulted in a 95% reduction of crashes on four-lane highways
- Related University of Waterloo study showed that chloride levels were reduced by 50% when best practices were used

Not Just Safety - Mobility

- Study by Global Insights looked at the impact of a one-day shutdown for a State due to a winter storm. They found:
  - A one-day major snowstorm can cause a state $300-$700 million in direct and indirect costs
  - The economic impact of snow-related closures far exceeds the cost of timely snow removal
  - Snow related shutdowns harm hourly workers the worst
- Other studies have shown that safe and sustainable snowfighting when applied to a winter storm pays for itself in the first 25 minutes of operations
- Plus, a high level of service is what we expect…

What the Systems Approach Reminds Us

- Every crash is a small scale, localized, environmental disaster
- Spilled fluids
  - Gasoline or diesel
  - Coolants
  - Engine oil
- Spilled cargo
  - Hazardous materials, anyone?
- Energy burden of vehicle replacement

A Goal Statement?

Achieve our desired level of service in a timely manner, with an appropriate use of resources and materials, taking into account the severity of the storm conditions that we are facing…

IMPLEMENTING EXCELLENT PRACTICES

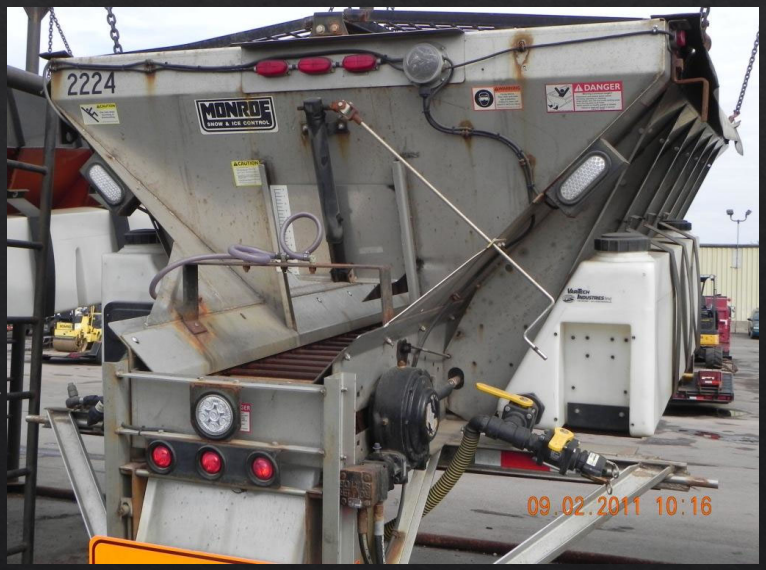
Some examples of practice that are being implemented in response to environmental regulations around the US

All salt spreading equipment must be calibrated at least annually. Records of the calibration results must be maintained for each piece of spreading equipment

- This is pretty basic, but you might be surprised by how many agencies do not do this…
- A number of guides, videos etc. out there on this
  - https://www.youtube.com/watch?v=zz3JHC9ZhsA
  - https://www.youtube.com/watch?v=ilsHIuJW-9M
- Do NOT assume it comes calibrated from the factory – experience tells us that is not the case
- Can be quite a money-saver!

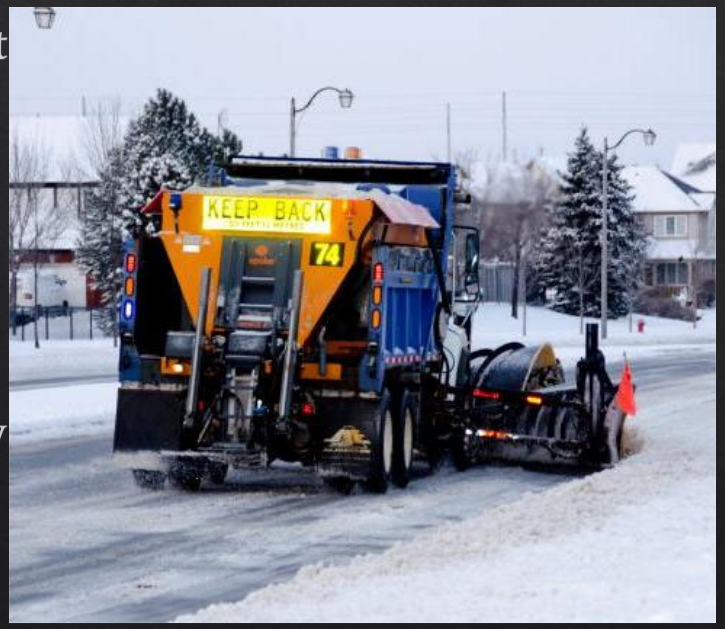
Road salt will be pre-wetted before use, either by applying liquids to the salt stockpile, or by applying liquids by way of the spreading equipment as the salt is deposited on the road

- It's better when it's wetter…
- If you decide on wetting on the truck, you will need liquid storage and transfer capability as well as equipment on the truck
- Treating the stockpile can be effective, but limits how wet you can get…



Equipment will be purchased and utilized to measure the pavement temperature

- Why – well that is where the salt works
- And the warmer it is, the less salt you need
- Is every storm the same? Of course not…
- So why should you always apply salt at the same rate…



Develop and implement a protocol to vary the salt application rate based on pavement temperature, existing weather conditions, and forecasted weather conditions

- Again, every storm is different
- So, act like it…

Salt Application Rate Guidelines							
Prewetted salt @ 12' side lane (assume 2-hr route)							
Surface Temperature	(Fahrenheit)	32-30	29-27	26-24	23-21	20-18	17-15
lbs of salt to be applied per lane mile	Heavy Frost, Mist, Light Snow	50	75	95	120	140	170
	Drizzle, Medium Snow ½" per hour	75	100	120	145	165	200
	Light Rain, Heavy Snow 1" per hour	100	140	182	250	300	350
Prewetted salt @ 12' wide lane (assume 3-hr route)							
Surface Temperature	(Fahrenheit)	32-30	29-27	26-24	23-21	20-18	17-15
lbs of salt to be applied per lane mile	Heavy Frost, Mist, Light Snow	75	115	145	180	210	255
	Drizzle, Medium Snow ½" per hour	115	150	180	220	250	300
	Light Rain, Heavy Snow 1" per hour	150	210	275	375	450	525

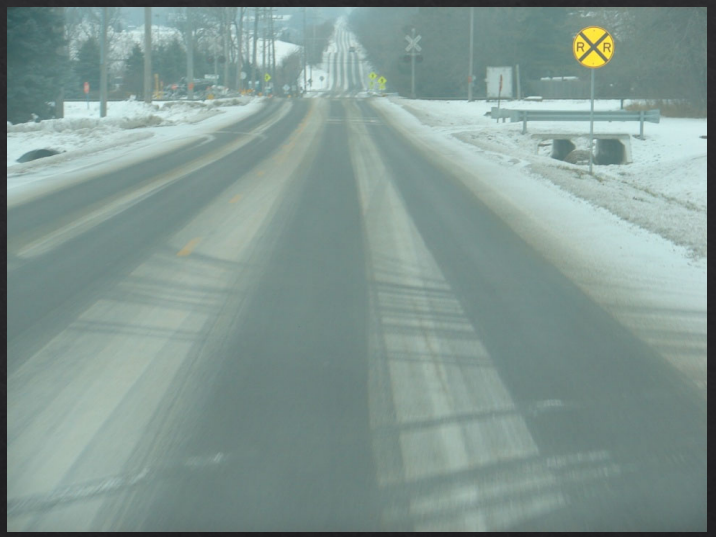
Salt quantity used and storm conditions will be tracked during each storm and recorded

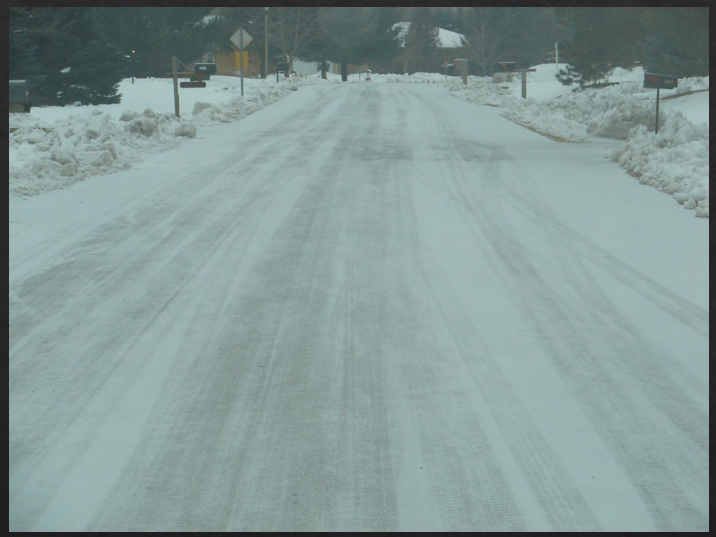
- If you don't measure it, you cannot manage it
- And these are meant to be **Management** Practices…

A plan must be developed for implementation of anti-icing, with milestones. The plan should consider increased use of liquids (e.g., carbohydrate products)

- You are going to be anti-icing, so develop a plan to:
  - Learn what it is (it may not be what you think…)
  - Learn how to do it
  - Learn what you will need in terms of equipment as well as operational approaches
- While salt brine is a good starting point, it does not have to be an ending point – the additives that are available today can give you substantial flexibility in your operational actions

Treated vs. Untreated





Know your Expectations

Employees involved in winter maintenance operations must undergo annual training in best practices in the use of road salt in such operations (including the practice of plowing first, and applying salt only after snow has been cleared)

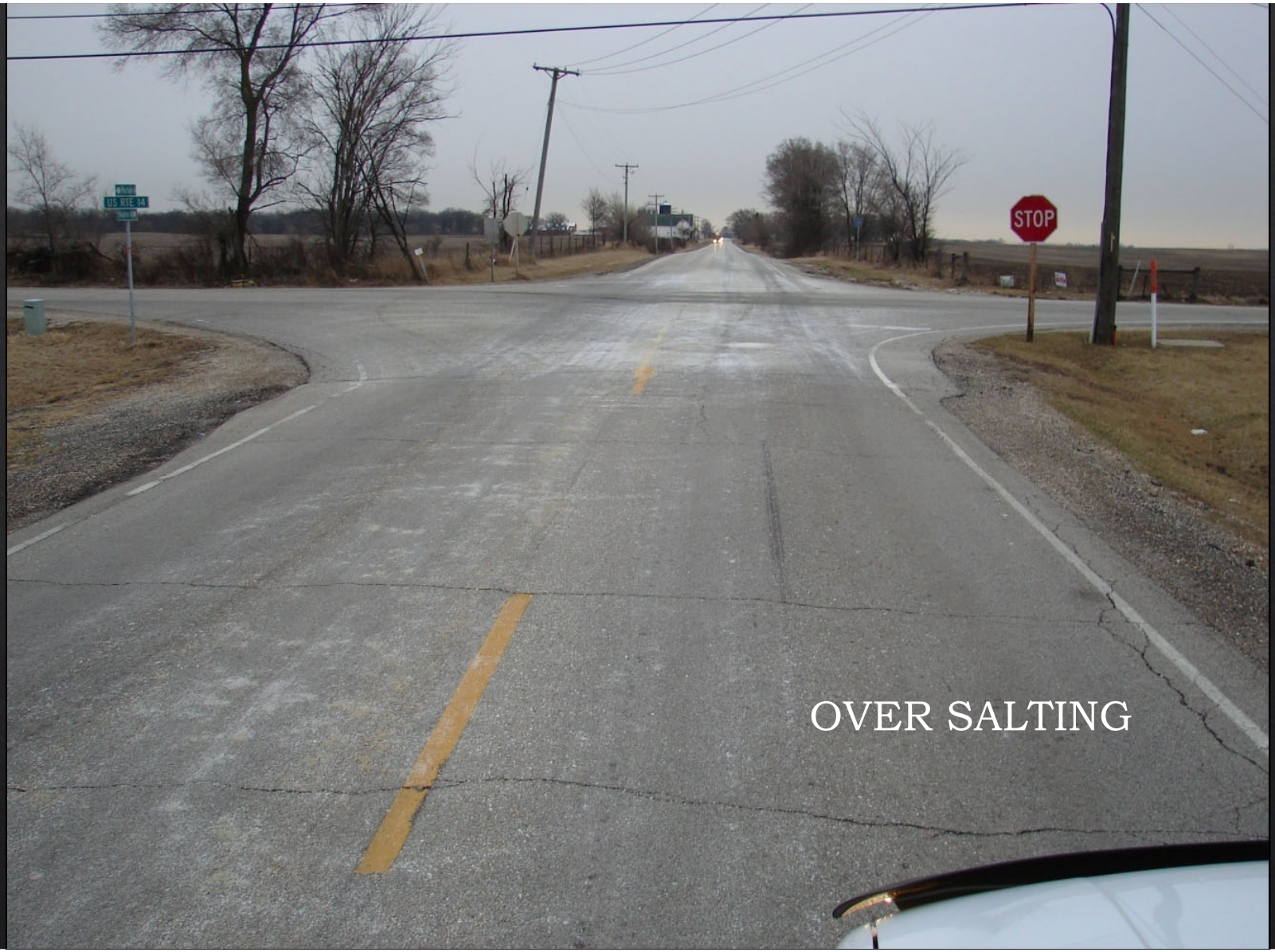
- Your folk have to know not just **WHAT** to do, but also **WHY** to do it that way
- The point about plowing first is a direct shot at so-called "chemical plowing" where instead of plowing snow off the road you melt it off with salt – do **NOT** do this…

Equipment to measure the pavement temperature will be installed on the winter maintenance fleet for a sufficient number of vehicles to provide sufficient information to adjust application rates for the most efficient levels.

- A plan to equip the winter maintenance fleet must be developed, and must be completely implemented by the end of the initial TLWQS period (this is part of the BMP)
- How many vehicles is a "sufficient number?" Great question!!!
- Increasingly agencies are putting these devices on every truck
- But note why they are being put on trucks "to adjust application rates…" – if you add the monitors but cannot demonstrate you are "adjusting" your rates…

By the end of the initial TLWQS period, a method must be developed to determine whether each truck in fleet applied salt at the recommended rate, why any variations occurred, and ensure that a variation occurs only when strictly necessary

- That variable application rate stuff – you are going to have to show you did it, you tracked it, and you closed the loop…
- DON'T BE PETE…


STOP
US RTE 34
OVER SALTING

Conclusions

- There are techniques available that allow us to achieve our goals without negatively impacting the environment
- These techniques are operationally tested, and work. If you choose not to implement them, why not?
- Some of the techniques are pretty basic (e.g. calibration) - and should be implemented as soon as possible