The Evolution of Salt Brine

Innovations from Vermont

Presentation Content

1. **Winter in Vermont**
   Understand some of our winter maintenance challenges.

2. **Salt Brine Functionality**
   Learn why brine is one of the most valuable tools for winter maintenance.

3. **Technology**
   Innovations in brine management and application over the past decade.

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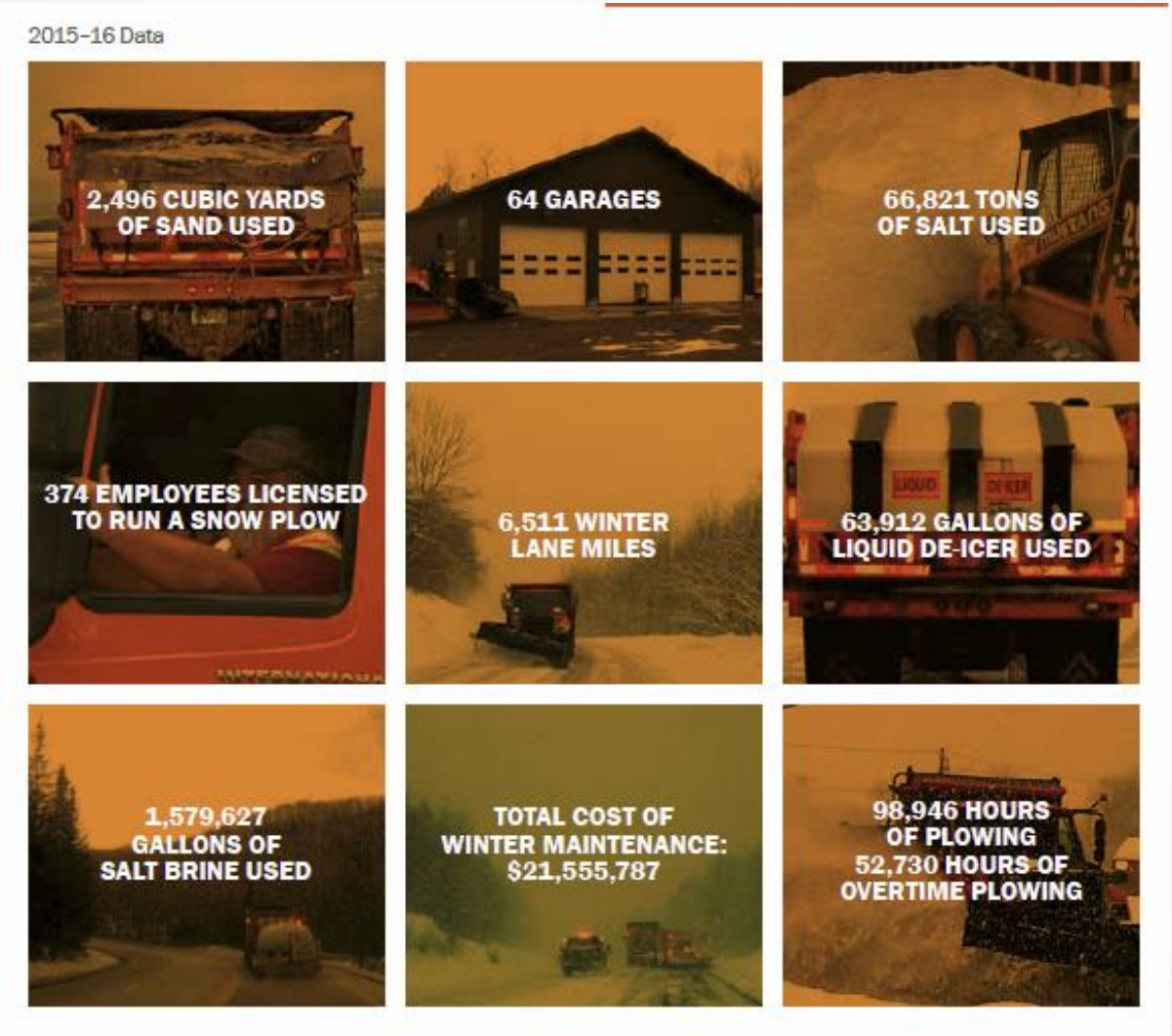
Winter in Vermont

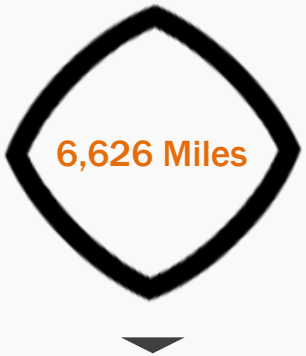
By the Numbers



Winter in Vermont

Key Numbers

Average Snow Fall



Plowing Responsibility

Snow and Ice Budget

Gallons of Salt Brine Used Annually

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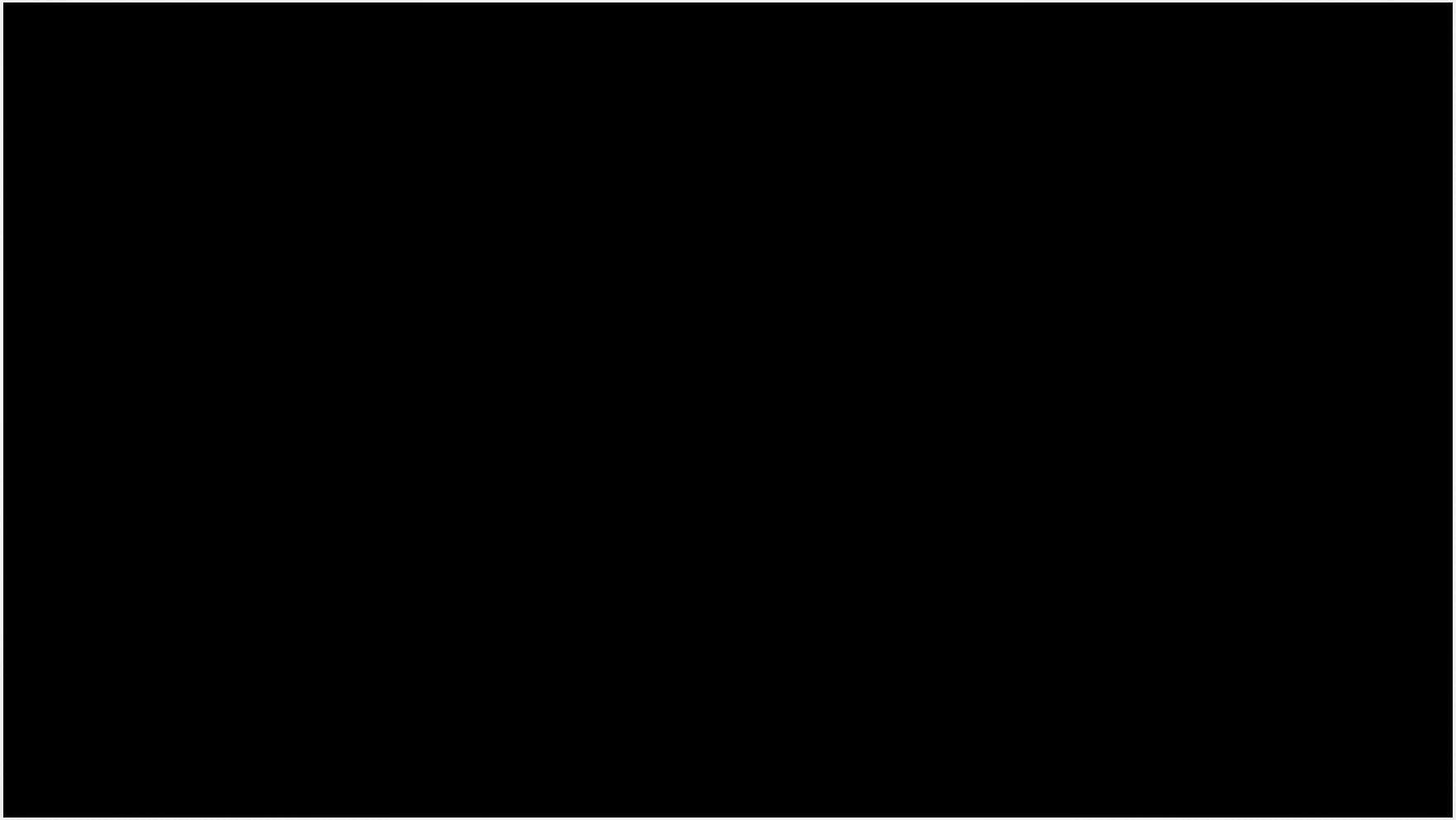
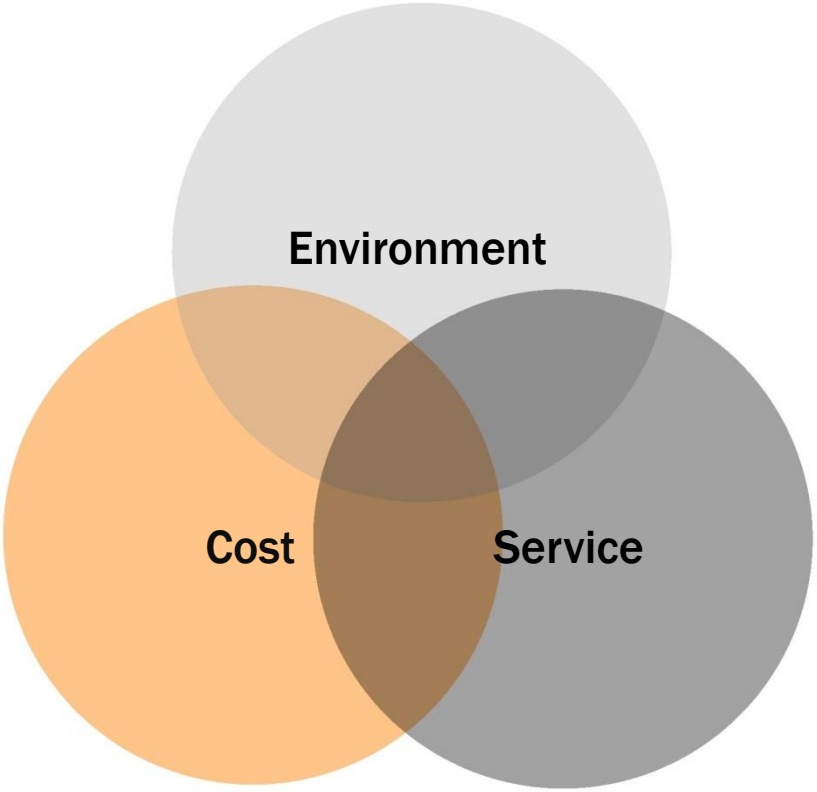
Winter in Vermont

Materials Overview



The Challenge

Striking a balance



Salt brine is improving the 3 major areas of our Snow and Ice Control Plan.

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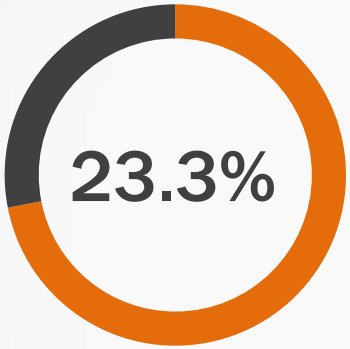
What is Salt Brine?



Approx. 2.5lbs/gallon

Salt Brine

A solution of raw salt and water mixed in a brine maker, tested with a hydrometer to a **23.3%** solution of salt and water, which results into **2.5** pounds of salt per gallon of water.

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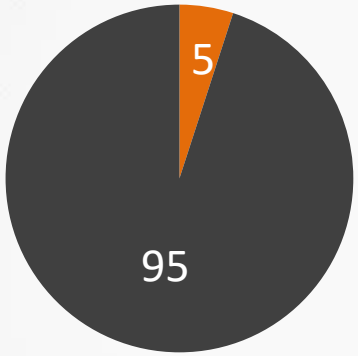
Salt Brine Additives

VTrans adds Magic-0 to salt brine batches



Standard Ratio
95:5 – SB:MMZ

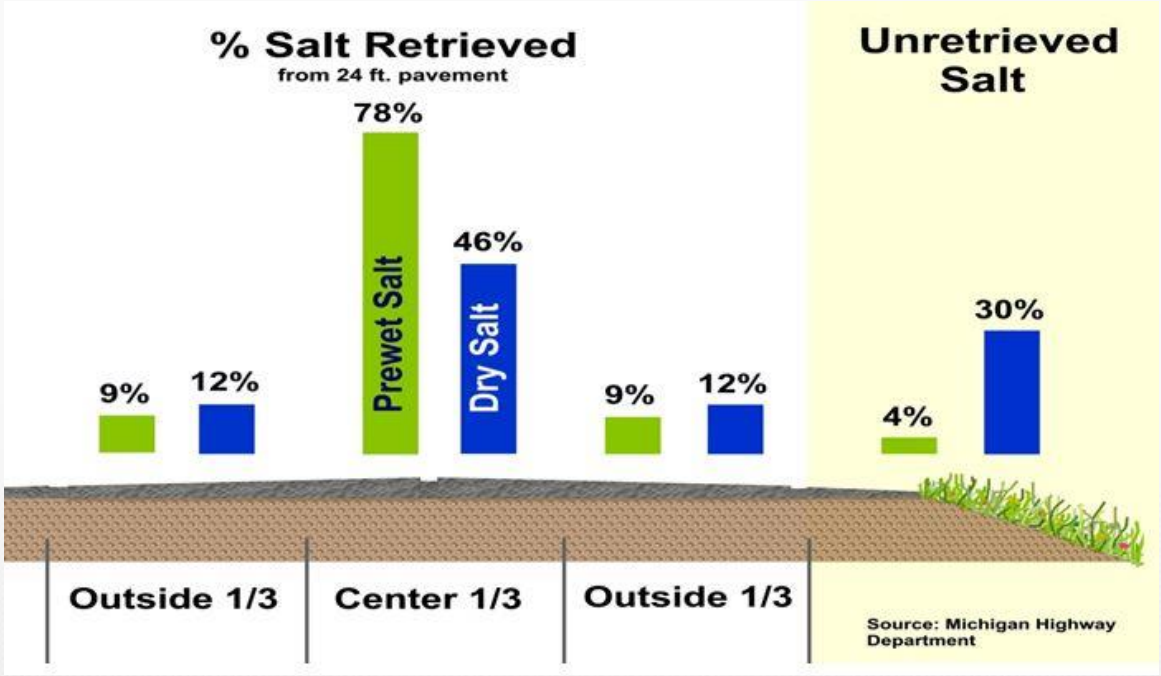
*More MMZ added as needed
–Up to a 70:30 blend

- Effective Freezing Point of Salt Brine: **-6 degrees**
- Effective Freezing Point of Salt Brine with Magic-0: **-15 to -20 degrees**
- Magic-0 cost: **$1.24 per gallon**
- Salt Brine with additive: **$0.10-$0.15 per gallon**

Salt Brine Application

Pre-Wetting

- **Pre-Wetting:** Applying liquid de-icer to solid material at the spinner.
- Reduces bounce and scatter.
- Activates salt more quickly.
- Less material needed per lane mile.



Salt Brine Application

Pre-Wetting

	Dry Application (No Pre-wet)	Pre-wet Application
Initial Application	500 lbs/lm	500 lbs/lm
Retained	46% = 230lbs	93 % = 390lbs
5 cars @ 38mph	30% = 69lbs	80 % = 363lbs
Total remaining after 100 cars @ 38mph	15% = **10.5 lbs**	78% = **290 lbs**

Salt Brine Application

Other factors

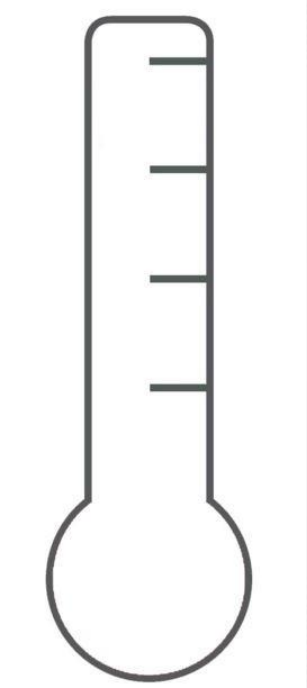
- **Speed** is the biggest factor in determining scatter and bounce.
- Salting at slower speeds keeps more salt on the roadway.
- **Pre-wetting** with salt brine allows faster application speeds.
- **25mph** is considered the target speed for salting.

Salt Brine Application

Other factors

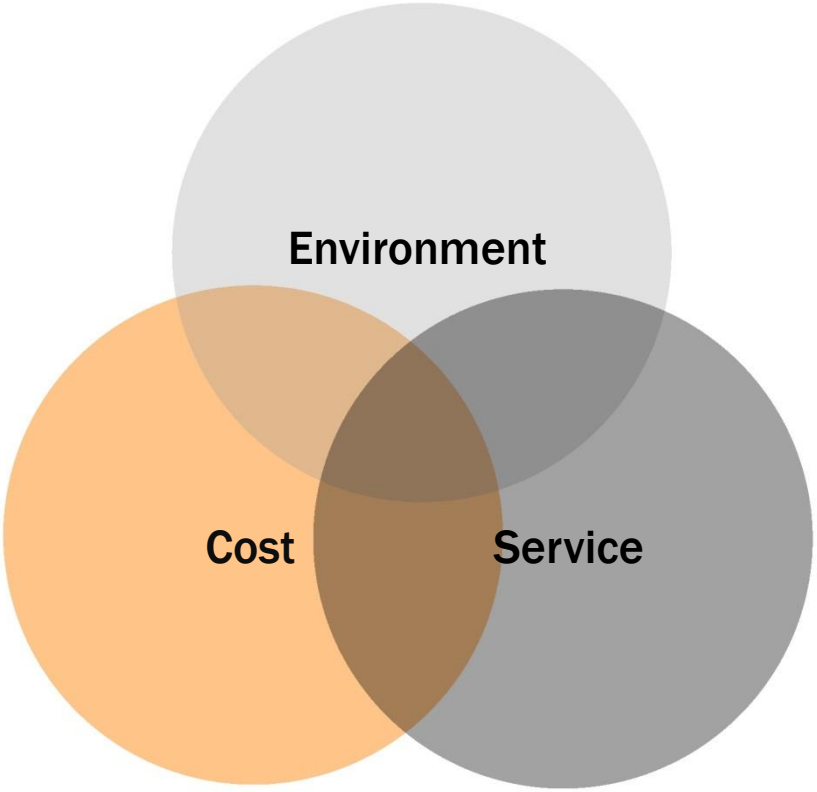
- **Temperature** is another primary factor in salt usage.

- It takes over **5X** more salt at 20 degrees than it does at 30 degrees to melt the same amount of ice.



The Challenge

Why use salt brine?



Salt brine is improving the 3 major areas of our Snow and Ice Control Plan.

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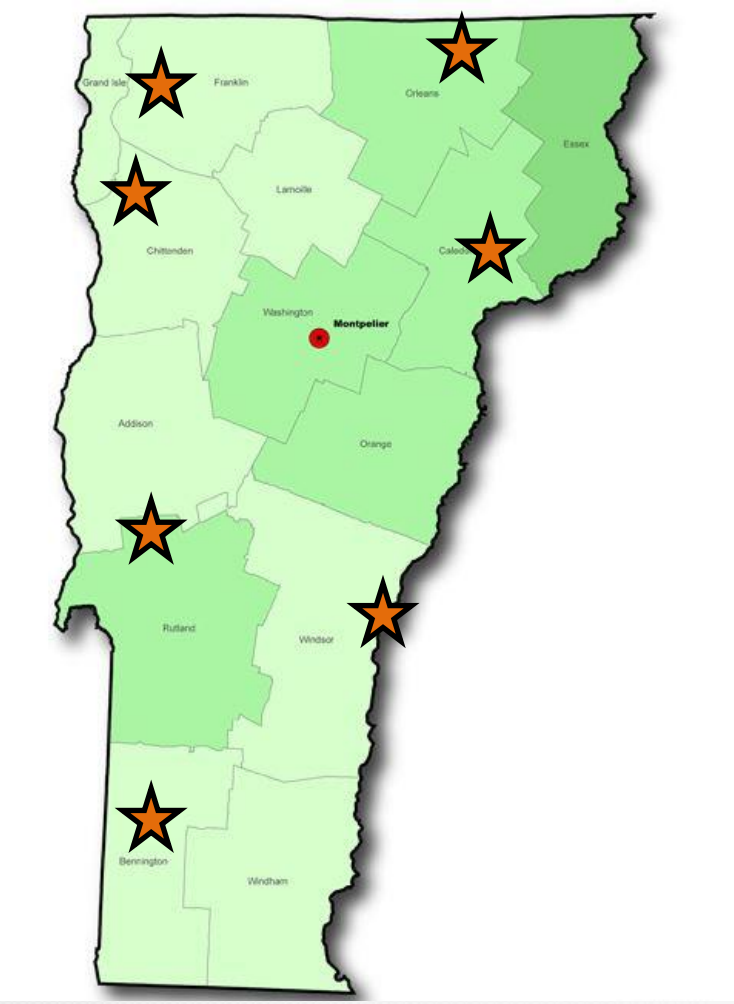
Salt Brine Manufacturing

How we're meeting our needs.

Vermont has 7 brine makers scattered throughout the state.



- St. Albans
- Colchester
- Brandon
- Windsor
- St. Johnsbury
- East Dorset
- Derby

Salt Brine Manufacturing

Brine Makers

AccuBrine

- First brine maker purchased by VT (2007).
- Accounts for 3 of Vermont's 7 brine makers.
- Produces 5,000 gallons of brine per day.
- Requires intensive cleaning.

Brine Extreme

- First purchased in 2012.
- Accounts for 4 of Vermont's 7 brine makers.
- Produces 7,000 gallons of brine per day.
- Self-cleaning.

Salt Brine Manufacturing

Brine Storage

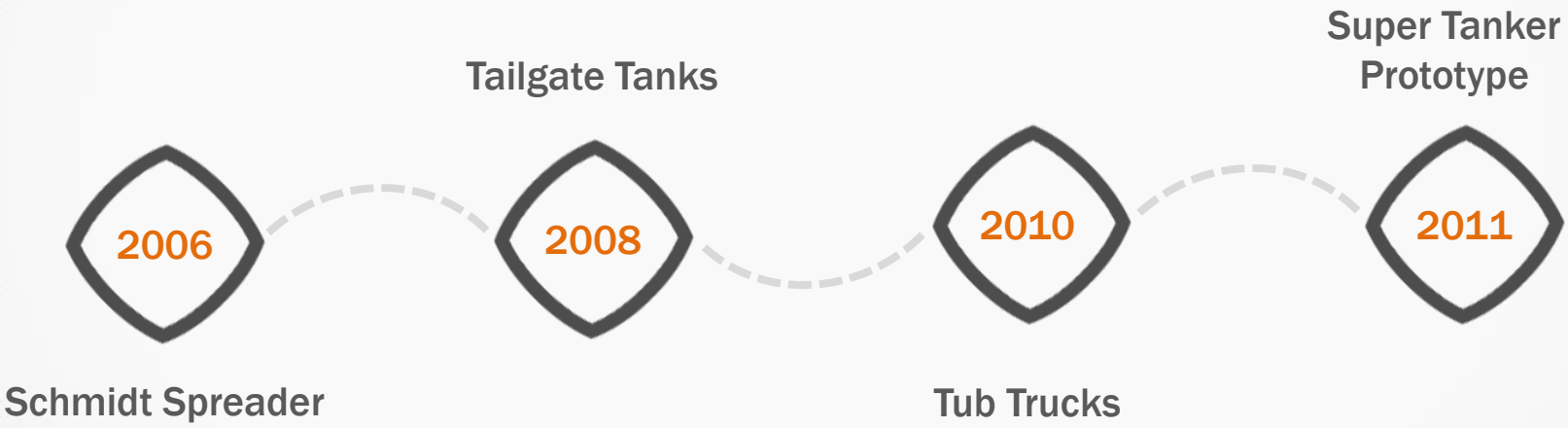
- Each storm event requires approximately 12,000-15,000 gallons of brine per facility.
- Garages with brine manufacturing capabilities have **six** 6,000 gallon tanks.
- All other garages have **two or three** 6,000 gallon tanks.

Salt Brine Distribution

- Vermont currently has 4 tractor trailer units and 4 trailer mounted tanks.
- Used for moving brine to garages throughout the state.
- Can be used for roadway application in extreme cases.

Truck Innovations

Evolution of the brine tank



Schmidt Spreader

2006-2008

- Initial tool for salt brine application.
- Useful for oatmeal.
- Limited anti-icing capabilities.

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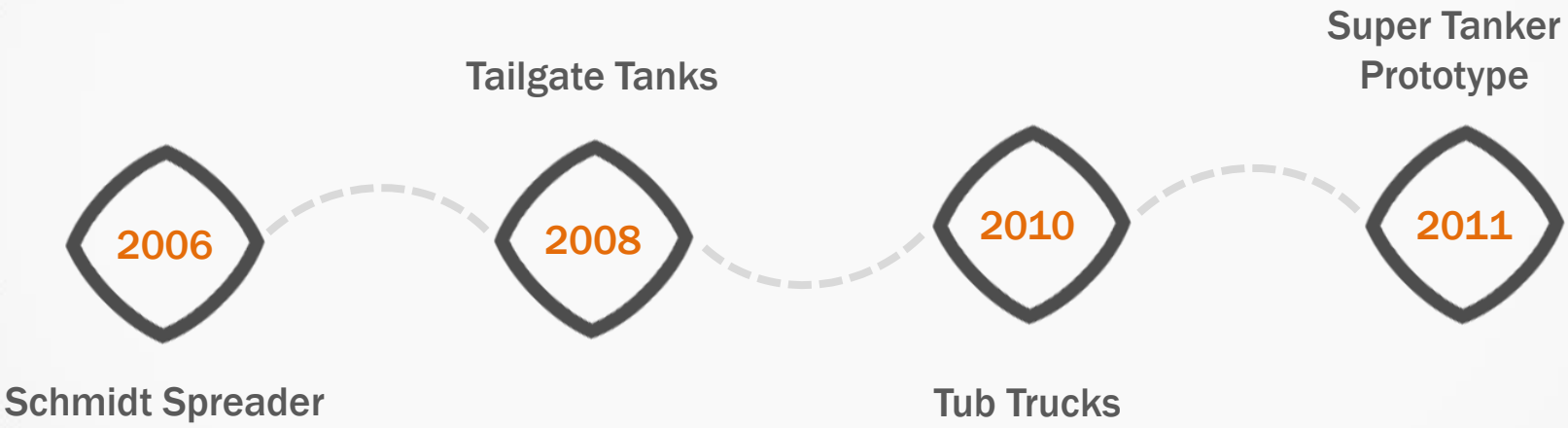
Truck Innovations

Evolution of the brine tank



Tailgate Tanks

2008-2009

- Simple means of giving existing trucks liquid capability.
- Cost effective.
- Limited capacity.

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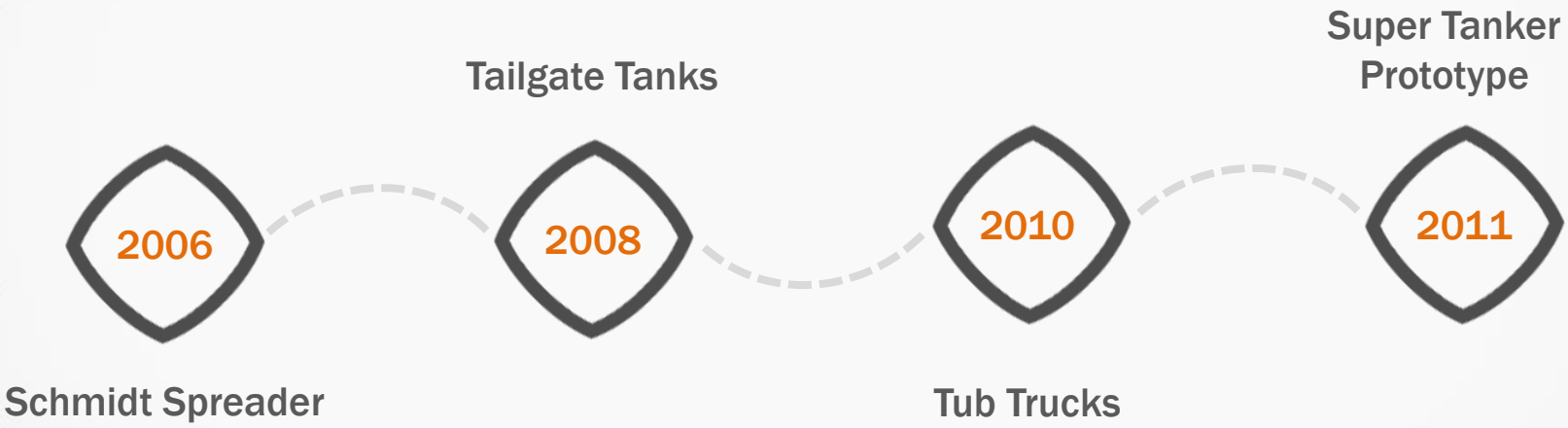
Truck Innovations

Evolution of the brine tank



Tub Trucks

2009-2010

- Attempt at increasing brine capacity.
- Single Axle Capacity: **450 gallons**
- Tandem Axle Capacity: **600 gallons**
- Still not enough capacity to meet Vermont's needs.

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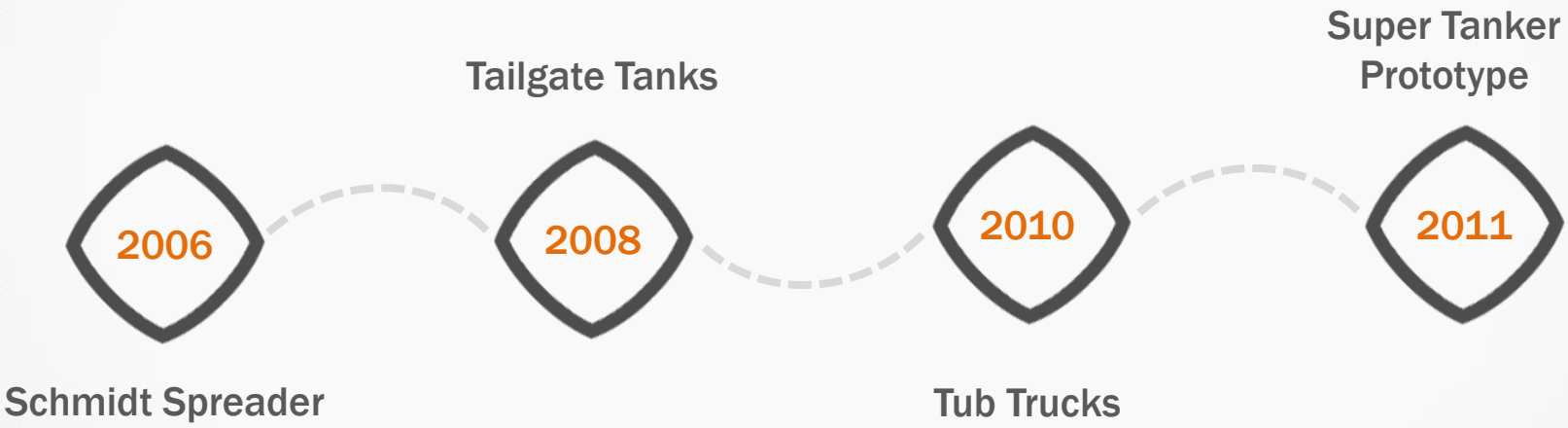
Truck Innovations

Evolution of the brine tank



Super Tanker Prototype

2010-2011

- Originally designed by a VTrans employee.
- 1,200 gallon liquid capacity.
- 6 ton salt capacity.
- First style to utilize a spray bar.

Super Tanker Version 2

2011-2012

- Manufactured by vendor.
- Vermont added 4 to the fleet in the first year.
- Although it met liquid capacity needs, solid capacity was still insufficient.

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Super Tanker Today

2012-Present

- Increased solid capacity to 8 tons without sacrificing liquid capacity.
- 75 Super Tankers in use today.
- Easily disassembled.
- Meets or exceeds all material needs.

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Super Tanker Today

2012-Present

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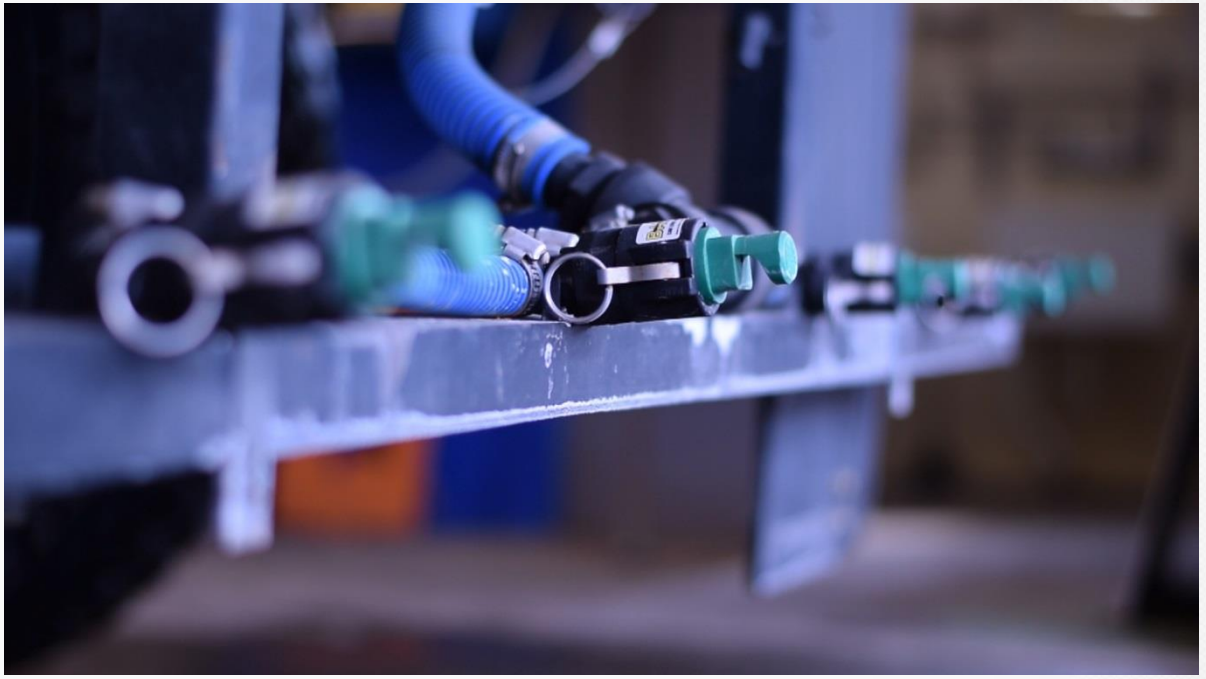
Super Tanker Spray Bar



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Vermont now has sufficient assets to effectively utilize salt brine in all garages throughout the state.

Questions?