

Salt Talk

Reducing the Impacts of Road Salt

It has to start with Public Works



Presentation Outline

- Environmental and financial impacts of road salt
- How to change or implement road salt reduction strategies without reducing service levels and safety
- Cudahy Case Study
- Questions & Discussion



Why Reduce Road Salt Application?

- Environmental Impacts
- Financial Benefits



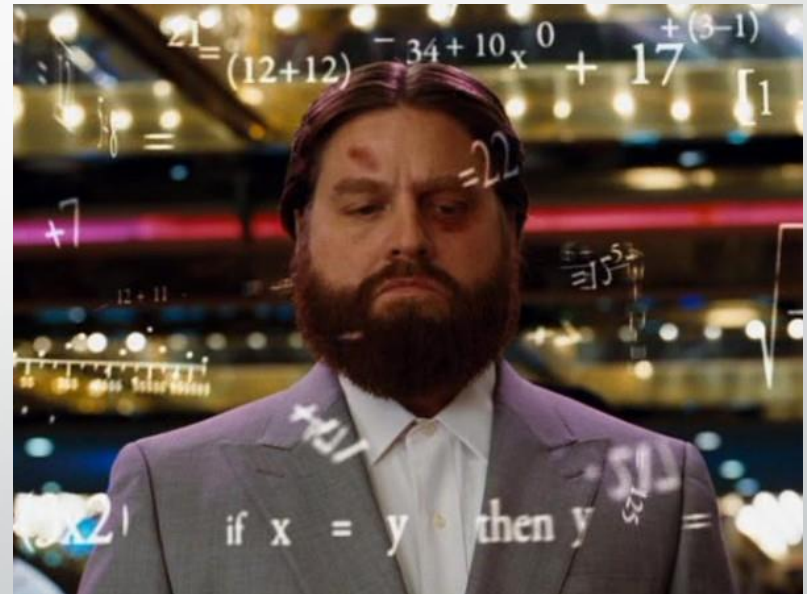
Environmental Impacts of Road Salt

- Road Salt comes in a variety of forms
 - Sodium Chloride (NaCl)
 - Calcium Chloride (CaCl)
 - Magnesium Chloride (MgCl)
 - Potassium Chloride (KCL)
- The common enemy here is CHLORIDE!
- It takes one teaspoon of salt to permanently pollute 5 gallons of water. Once in the water there is no easy way to remove the chloride so it is a pollutant that keeps on giving.



Environmental Impacts of Road Salt

- In 2008-2009, Milwaukee County communities, excluding City of Milwaukee used 55,910 tons of road salt.
- That same season the State of Wisconsin & Milwaukee County used an additional 48,240 tons on county roadways & freeway system within Milwaukee County bringing the total amount applied to 104,150 tons.
- Over the past decade the average tons/year used by communities that make up Milwaukee County is around 32,000 tons; yielding 320,000 tons over that ten year period.* That's 16,000 tandem truck loads or 18.34 billion teaspoons.
- If you add County & freeway usage that's another 380,000 tons, 19,000 tandem truck loads, or 21.83 billion teaspoons!



***Excluding City of Milwaukee**

Environmental Impacts of Road Salt

- 320,000 tons of salt would create a pyramid 133' high (13 stories) on an entire Cudahy City Block (600'x300')!!



Environmental Impacts of Road Salt

- Where does all this salt go? – into the ground water, rivers, and Lake Michigan.
- Lake Michigan holds approximately 1,000,000,000,000,000 gallons of water.
- In many parts outside of the Milwaukee County area like Waukesha, Washington and parts of Racine County, they rely on ground water (well water) for their potable water source.
- Ground water doesn't recharge as quickly as surface water so concentrations of salt would be considerably higher.

Environmental Impacts of Road Salt

- If 1 teaspoon of road salt pollutes 5 gallons of water....
 - Milw. County Communities = 18,384,124,670 tsps. Annually
(Excludes road salt from the City of Milwaukee)
 - Milw. County = 21,831,148,050 tsps annually
 - Total of 40,215,272,720 tsps annually
 - Gallons of water pollution per year from 100 % road salt run-off=
201,076,363,600 gallons
 - Last 10 year total = 2,010,763,636,000 gallons polluted
- That's .2 % the volume of Lake Michigan just from Milwaukee County area over a 10 year period!

Environmental Impacts of Road Salt

- Not a big affect. That's just Milwaukee County excluding the City of Milwaukee.
- That's only for a 10 year period.
- The use of road salt began in the 1960s so you have 50 years of increasing roadway mileage & increasing demand to use more
- Those outside of Milwaukee County who rely on ground water have a greater risk of road salt contamination.
- As sand becomes less acceptable due to its impact on surface waterways – many of those outlying communities are relying on road salt.

Financial Impacts of Road Salt

- Face Declining Budgets
- Agencies in Wisconsin are paying \$30.55 more per ton for salt this season than they did a decade ago.
- **Over the past decade public works agencies have had to pay on average 5.7% more per year for salt.**
- What agency out there gets 5.7% increases in their expenses a year.

Salt Purchases - Milwaukee County				
2008-2009			2018-2019	
In 2007-2008 Season all agencies ran out salt by late January				
Cost per ton	Tons Purchase	Seasonal Cost 08-09	Seasonal Cost 18-19	
		\$37.93	\$ 68.48	
State of Wisconsin	43160	\$1,637,058.80	\$2,955,596.80	
Milwaukee County	12750	\$ 483,607.50	\$ 873,120.00	
Bayside	700	\$ 26,551.00	\$ 47,936.00	
Brown Deer	1310	\$ 49,688.30	\$ 89,708.80	
Fox Point	1230	\$ 46,653.90	\$ 84,230.40	
Greendale	1630	\$ 61,825.90	\$ 111,622.40	
Hales Corners	810	\$ 30,723.30	\$ 55,468.80	
River Hills	630	\$ 23,895.90	\$ 43,142.40	
Shorewood	1200	\$ 45,516.00	\$ 82,176.00	
Whitefish Bay	1210	\$ 45,895.30	\$ 82,860.80	
Cudahy	1330	\$ 50,446.90	\$ 91,078.40	
Franklin	4060	\$ 153,995.80	\$ 278,028.80	
Glendale	2900	\$ 109,997.00	\$ 198,592.00	
Greenfield	4640	\$ 175,995.20	\$ 317,747.20	
Oak Creek	6960	\$ 263,992.80	\$ 476,620.80	
St. Francis	1000	\$ 37,930.00	\$ 68,480.00	
South Milwaukee	2500	\$ 94,825.00	\$ 171,200.00	
Wauwatosa	6850	\$ 259,820.50	\$ 469,088.00	
West Allis	9280	\$ 351,990.40	\$ 635,494.40	

How to make changes that will reduce the amount of road salt we use

- Policy & Procedures
- Equipment
- Equipment Set-up
- Calibration
- Training
- Public Information
- Optimization



How to make changes that will reduce the amount of road salt we use

- “But we’ve always done it this way”
- It will require CHANGE on many levels
- Including
 - Managers
 - Elected Officials
 - Staff
 - Public



How to make changes that will reduce the amount of road salt we use

- How do we stop this from being the “norm”?



How to make changes that will reduce the amount of road salt we use

- Institute or revise your Snow & Ice Control Policy:
 - Reviewed every other year
 - Has to be approved by the Board of Public Works
 - Presented each year to the Common Council at the second meeting in November
 - Highlight important and politically challenging policies
- Cudahy Snow & Ice Control Procedures
 - DPW Superintendent goes over procedures every November with Staff
 - Re-Training staff on policies and procedure each year
 - Plow Rodeo – In House.



City of Cudahy

Snow & Ice Control Policy

Updated: Dec. 2012, Oct. 2014, Oct 2016,
Oct 2018



GENERAL

The ability to react promptly and decisively to varying winter weather conditions with regard to snow removal and ice control on City streets is recognized to be an important and necessary function of government for the safety and well-being of the public. The following Policy has been established to provide information for the public and establish guidelines for Public Works staff to follow in order to ensure consistent practices for snow and ice control during winter storm events. The Department's goal is to have all public roadways, parking lots and publically maintained sidewalks passable within a reasonable amount of time after a given winter event. Plowing priorities reflect a commitment to insure that key roads are kept open to serve critical facilities. Each decision to mobilize City forces for the clearing and control of snow and ice is a judgment call based on the particular weather conditions combined with past experience along with the resources available at the time, and therefore may not adhere strictly to this general policy. The City does not have a "bare pavement policy". This means that secondary roadways, some collectors and alleys are not salted to the degree that an arterial roadway is and may during winter months have sections of roadway and alleys that are not clear to pavement.

Equipment

- Choose the right equipment
- Get rid of tailgate spreaders
- Equip units with belly-plows
- Roll-off spreader/anti-ice/box
- Get away from manual controls
- Anti-Icing Tank/Sprayer
- Pre-Wetting Technology (Brine)



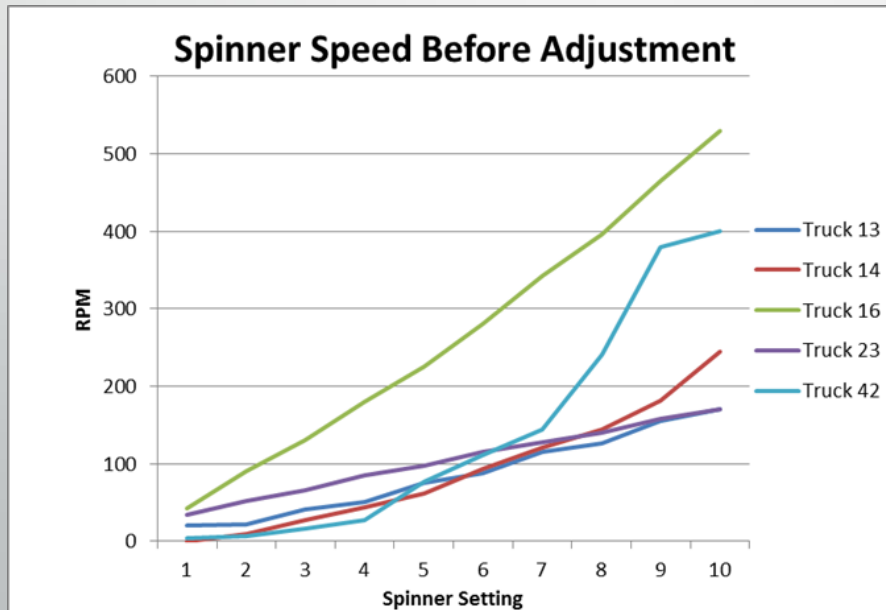
Equipment Setup

- Proper controller setup is crucial!
- If it's brand new, isn't it already set up correctly?
- Current fleet of Force 5100, 6100 and Monroe MC270 Controllers



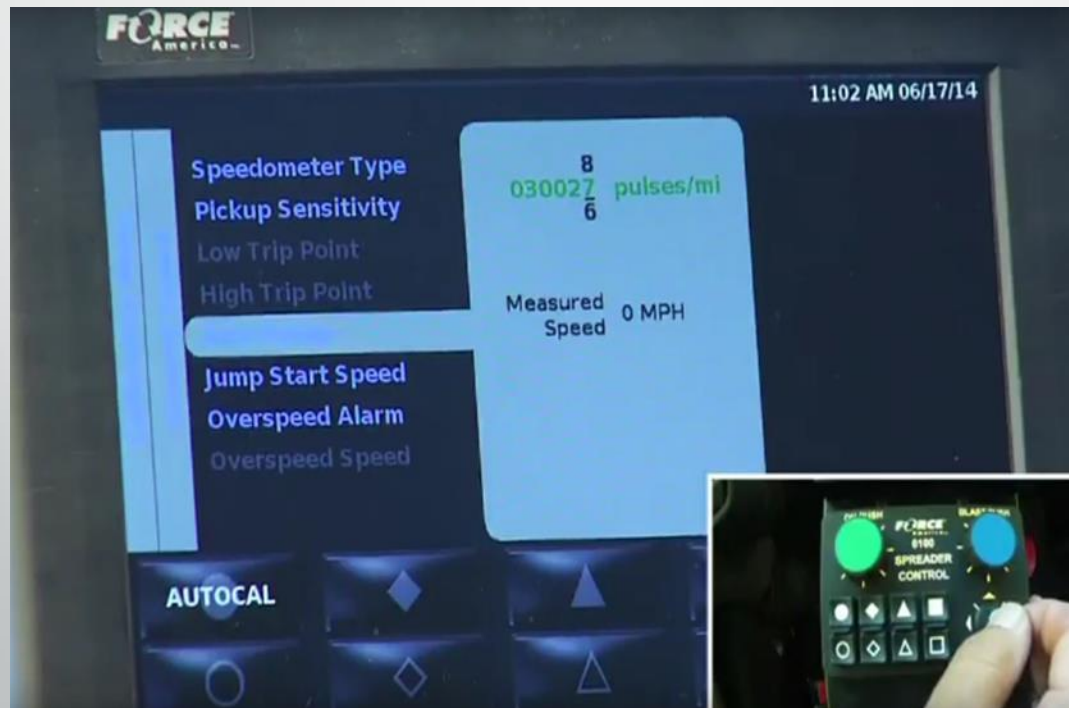
Equipment Issues

- Trucks using different amounts of salt
- Spinner speeds not consistent across fleet
- Feedback errors
- Auto-mode failures; defaulting to manual mode randomly



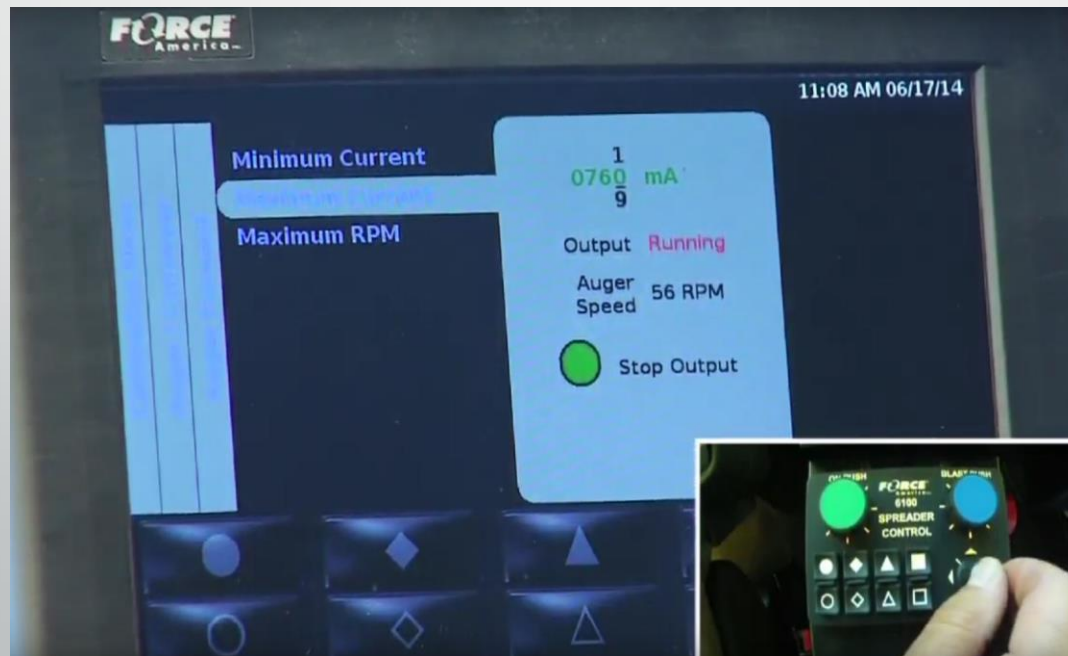
Adjusting Ground Speed

- If you only make one adjustment, make sure your groundspeed sensor is correctly set. If the controller doesn't know how fast the truck is moving, it cannot accurately apply material
- Axle Pulses per Mile is the setting to adjust (Force 6100/5100)
- Use the AUTOCAL feature to record pulses over a pre-measured mile
- Use a partner to adjust as you drive a given speed.



Setting Auger and Spinner Settings

- Setting a min/max is so the controller knows the full operational speed of the auger (conveyor) or spinner
- Warm up the truck and hydraulics while setting the parameters; bring the truck off idle (1200-1500 RPM)
- Min. setting is when the auger or spinner just starts to barely move
- Max setting is when the auger or spinner is just reaching max speed and no longer increasing
- **Note: you may not want full maximum speed of spinner, so set the max at the maximum speed you would use during application.



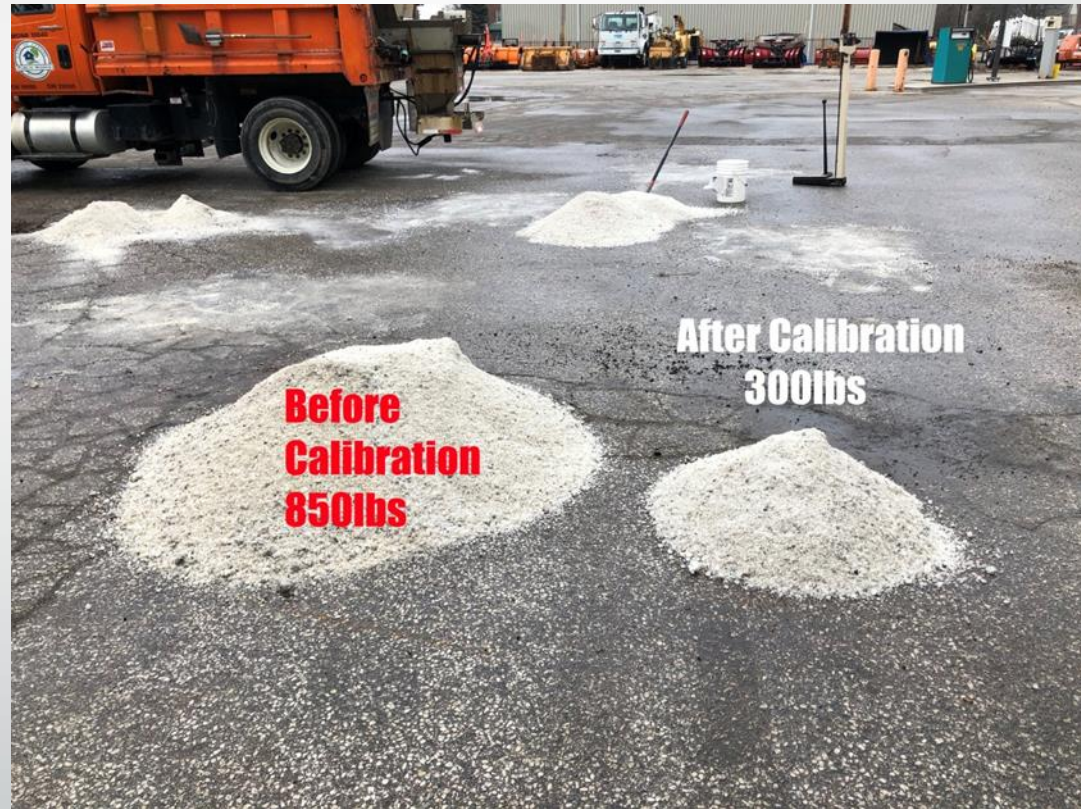
Calibration

- Load truck with material and run auger in preparation of test
- Under the Material Displacement menu you can choose to use portable scale.
- While the controller counts turns of the auger, dispense at least 200lbs of material.
- Weigh the material and enter into the controller.
- New calculated LB/REV will be provided.



Pro-Tip: Quick Calibration Check

- Enable SIMSPEED
- Set speed to 30MPH (2min mile)
- Set lbs/mi anywhere between 200-400
- Run truck in place for 2 minutes, use a stop watch.
- Weigh material
- Compare value to you application setting



Making Brine for Pre-Wetting and Anti-Icing Applications.

- Fully automated brine creation with data logging.
- Brine is created accurately at 23.3%.
- Makes brine faster than the rate at which the staff can apply it.
- Remote access via iPhone/iPad
- Truck/Tank Fill Station
- On demand product blending with CaCl



Optimization – Pre Wetting

- The City always pre-wets the salt with salt brine during application.
- Reduces waste to bounce and scatter off of roadway
- Activates salt immediately without relying upon traffic agitation.
- Speed ice melting at lower temps.
- Reduced salt application by 25%



Anti-Ice

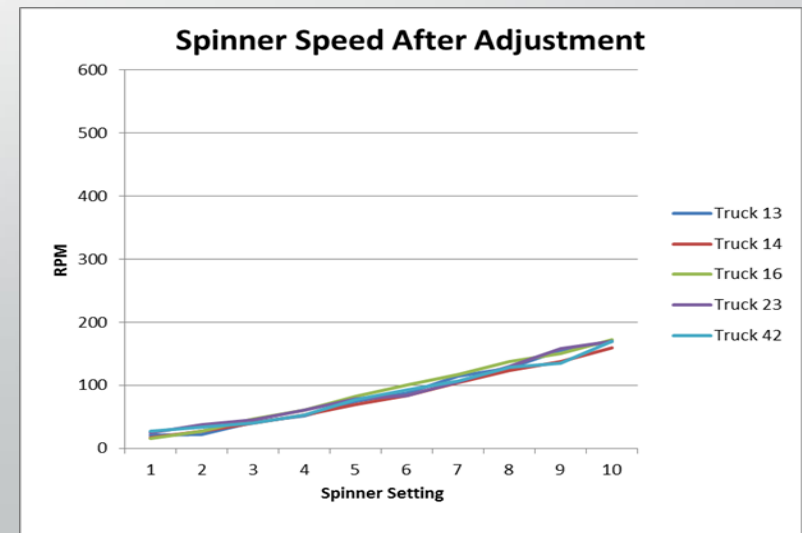
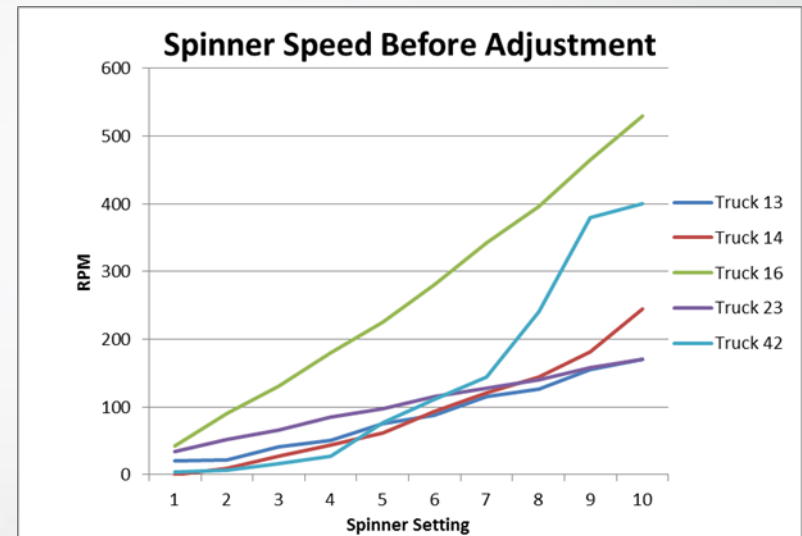
Applying Brine Before the Storm

- Prevents the ice from bonding to the road surface
- More efficient use of road salt
- 1 application is approximately 80 lbs of salt per mile, prior to the storm
- We are able to brine all the roads in 1 regular shift
- Less callouts for small after-hour salting operations.



Optimization – Spinner Speeds

- Spinner speeds were different in every truck on the fleet
- Truck 13 on setting six (6) was the same as setting two (2) on Truck 16
- Use of noncontact tachometer to plot every speed setting of every truck.
- Adjusted max speed of spinner to bring them into the same range
- Determined regular spread setting for operators.



RoadWatch Air/Pavement Thermometer

- New salt trucks are ordered with RoadWatch thermometers
- Air and pavement temps are displayed on the operating screen
- Operators and managers can monitor these values to ensure proper application of material.



How to Train Staff

- Put your most tech savvy people on this
- Mechanic buy-in
- More is not better
- Don't Touch
- Observation



Public Information

- Use your website, newsletter, and social media sources to explain your agency's policy and application.
- Anti-Icing – Get the word out.
- Bare pavement policies – Get the word out.
- Council/Board Meetings in November of every year.



Case Study – City of Cudahy

- From 2006 to the 2013-2014 snow season, the City used on average 38.23 tons of salt per event.
- For the 2013-2014 season Cudahy DPW used 17.8 tons of salt per event
- For the 2016-2017 season City had two anti-icing units & applied brine to all streets, parking lots & City maintained sidewalks.
- The last two seasons 2016-2017 & 2017-2018 Cudahy reduced its salt use to 13.9 tons per event.
- Actually saw a decrease in crashes & severity
- Total reduction in salt use since 2012-2013 season nearly 58.3%. Netting a savings in 2018 of \$40,602



Cudahy

Land Area 4.77 sq miles

Population 18,600

149.2 lane miles, avg width street = 37'

Fully developed, mostly urban section with parking

1.4 miles of STH 794 to maintain

8 miles of Arterial roadway

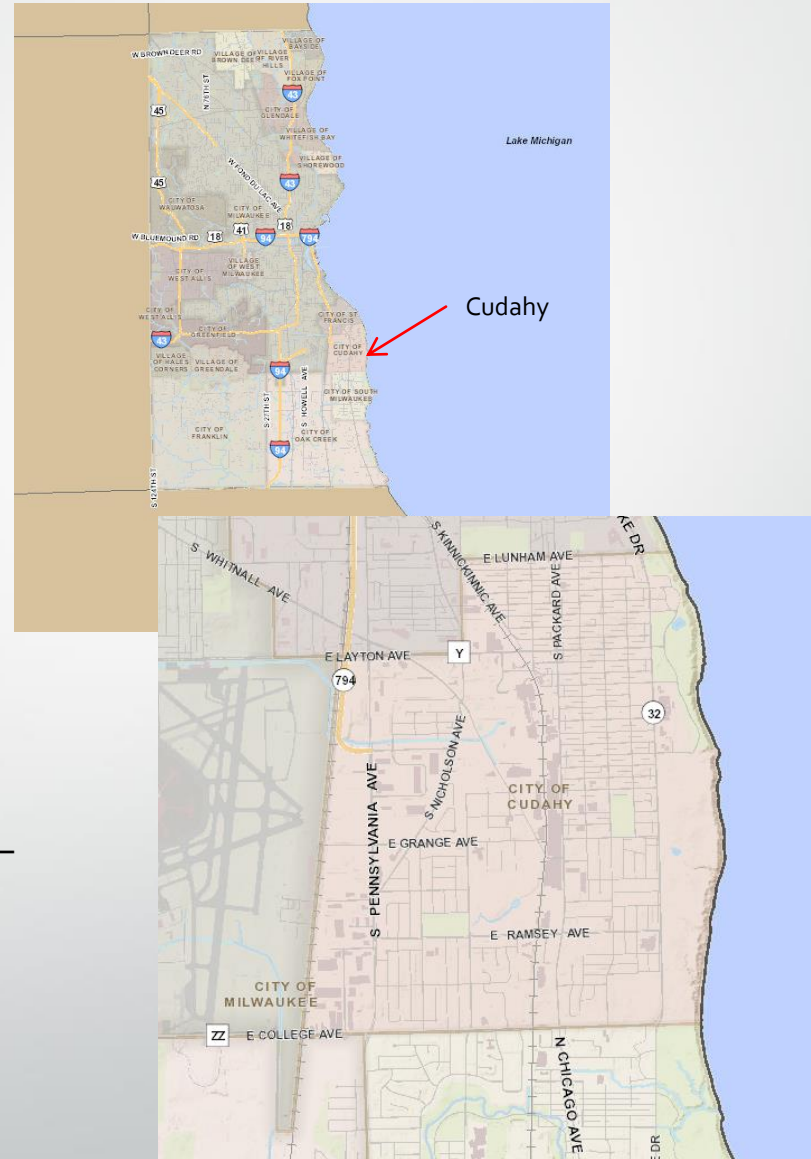
13.1 miles of alleys

2.2 miles sidewalk, 2 miles bikepath

5.76 acres of Parking lot

Public Work Department

16 personnel for winter operations



Cudahy Winter Operations

- When possible (weather & Moisture dependent) – continuous pre-storm brine application on streets, sidewalks & parking lots (not alleys)
 - 2 Anti- Icing Units
 - Kubota used for sidewalks
- Salting Operations
 - 3 routes, continuous salt on arterials & around schools
 - Secondary roadways spot salt 100' from approach to the intersection & through intersection
- Plowing Operations – Takes minimum of 11 people (16 hr max)
 - 4 Routes: 2 trucks per route (salter w/wing, straight blade)
 - 2 in alleys
 - 1 kuobta on sidewalk
- Pre-wet salt mixture
- Blades down over an inch, will use belly plow during snow-ball snow

Case Study – City of Cudahy

- 2013-2014 supervisory changes, changes in personnel (mechanics)
- 2013-2014 salters all calibrated by hand (took about 2 weeks for 6 pieces of equipment)
- 2013-2014 season – use of belly plows & using plows during lighter snow events
- For the 2013-2014 season Cudahy experienced more salting events (73) then in 2012-2013 (64) but used 33% less salt
- In 2015 the City installed brine making equipment & spent 2015-2016 learning & making adjustment to the application of brine
- 2016-2017 & 2017-2018 season reduced salt use an additional 25.3% by anti-ice application & pre-wetting mixture
- Service levels improved because all streets including local roadways received the brine treatment
- Slight decrease in crashes from 2013 to 2016. 25% decrease in crashes from 2016 to 2018. Assuming its because of the anti-ice treatment.
- Able to use surplus in 2017 & 2018 to purchase new plows & controllers for older trucks.

Case Study – City of Cudahy

Possible Salt Savings - Milwaukee County Communities

2018-2019

Base on early & seasonal fill for State Bid

Cost per ton

\$68.48

	Tons Guaranteed	Cost 2018-2019	Adjusted Annual Cost w/Calibration only	Adjusted Cost w/Calibration & Anit-icing	Financial Savings	Salt reduction (tons)
State of Wisconsin	26000	\$1,780,480.00	\$ 1,192,921.60	\$ 1,020,215.04	\$760,264.96	15158
Milwaukee County		\$ -	\$ -			
Bayside	480	\$ 32,870.40	\$ 22,023.17	\$ 18,834.74	\$14,035.66	280
Brown Deer	1200	\$ 82,176.00	\$ 55,057.92	\$ 47,086.85	\$35,089.15	700
Fox Point	850	\$ 58,208.00	\$ 38,999.36	\$ 33,353.18	\$24,854.82	496
Greendale	1400	\$ 95,872.00	\$ 64,234.24	\$ 54,934.66	\$40,937.34	816
Hales Corners	600	\$ 41,088.00	\$ 27,528.96	\$ 23,543.42	\$17,544.58	350
River Hills	300	\$ 20,544.00	\$ 13,764.48	\$ 11,771.71	\$8,772.29	175
Shorewood	700	\$ 47,936.00	\$ 32,117.12	\$ 27,467.33	\$20,468.67	408
Whitefish Bay	1250	\$ 85,600.00	\$ 57,352.00	\$ 49,048.80	\$36,551.20	729
Franklin	1900	\$ 130,112.00	\$ 87,175.04	\$ 74,554.18	\$55,557.82	1108
Glendale	1200	\$ 82,176.00	\$ 55,057.92	\$ 47,086.85	\$35,089.15	700
Greenfield	2500	\$ 171,200.00	\$ 114,704.00	\$ 98,097.60	\$73,102.40	1458
Oak Creek	5500	\$ 376,640.00	\$ 252,348.80	\$ 215,814.72	\$160,825.28	3207
St. Francis	1000	\$ 68,480.00	\$ 45,881.60	\$ 39,239.04	\$29,240.96	583
South Milwaukee	1700	\$ 116,416.00	\$ 77,998.72	\$ 66,706.37	\$49,709.63	991
Wauwatosa	4200	\$ 287,616.00	\$ 192,702.72	\$ 164,803.97	\$122,812.03	2449
West Allis	5000	\$ 342,400.00	\$ 229,408.00	\$ 196,195.20	\$146,204.80	2915
Total Reduction						32520

Optimization

- The act, process, or methodology of making something as fully perfect, functional or effective as possible
- Review Policy & Procedures at least every other year
- Calibrate & test equipment before the seasons begins
- Field observation – is it working the way you want it to
- Make Adjustments
- Hold onto data – it's the only way to determine whether you made an impact

In Summary

- Policy & Procedures
- Equipment & Setup
- Calibration
- Training
- Public Information
- Optimization

Salt Reduction Annually

- City of Cudahy
 - 775 tons reduced annually
 - 445,240,518 tsps.
 - Water pollution reduction 2,226,202,590 gallons
- Milwaukee County Possibility
 - **32,520 tons potential**
 - 18,682,866,700 tsps.
 - Water pollution reduction 93,414,333,500 gallons