

Winter roads: juggling salt supplies and alternatives



More frequent plowing is a good alternative to salt use.

Local officials responsible for maintaining city streets, and county and town roads report paying between \$33 and \$180 per ton for their supplies.

PUBLIC WORKS and highway departments across Wisconsin watched warily last summer as the escalating price of road salt and questions of availability raised concerns about restocking their salt sheds. As supply issues faded, local governments secured the salt they needed to face another winter—although, in some cases, at a premium price.

Crossroads newsletter surveyed local officials participating in recent Transportation Information Center (TIC) workshops on winter maintenance and talked to others across Wisconsin to learn how they stocked up for the current ice and snow season. We also asked what alternative treatments they use or plan to try this year.

Impact of a tough winter

States in the Midwest and Northeast battled tough winter storms last year that came early and stayed late. Record-setting snows blanketed parts of Wisconsin and Iowa.

Highway departments and private contractors nationwide used a near-record 20.3 million tons of road salt last winter. The Salt Institute reports that the heavy demand left supplies low at the source just when customers began requesting bids and increasing their bid amounts. The State of Wisconsin, for example, increased its bid amount this year by 351,000 tons.

Weather also affected usual availability of the commodity. The same winter storms that tapped out municipal salt stores combined with spring rains to cause flooding that delayed shipping on the Upper Mississippi River.

Despite rumors of shortages, all counties had access to salt supplies by October, according to Dan Fedderly, Executive Director of the Wisconsin Counties Association. "Cost rather than availability is the main issue now," he says.

The price paid per ton delivered in 2008 varied widely depending on bids and contract arrangements. Local officials responsible for maintaining city streets, and county and town roads report paying between \$33 and \$180 per ton for their supplies. Fedderly says counties purchasing road salt through the state contract paid \$55 per ton on average, a hike of 10 to 12 percent over last year.

Fedderly notes additional supplies will carry a higher price. "The biggest potential problem is another hard winter in areas where towns depend on the county for their salt needs and the county has less available late in the season to supply the locals at the lower price. It could stretch some budgets pretty hard."

Available—but at a price

Local governments contacted for this story that had existing contracts through the state or other agreement saw a moderate increase in the per-ton cost of road salt. The City of Milwaukee, in the final year of an independent three-year contract, purchased 55,000 tons at just over \$38 per ton with a guarantee of 25,000 additional tons at the same price. The 2008 price is a 5.6 percent increase over 2007. Milwaukee

Sanitation Services Manager Wanda Booker says last year her crews used the 25,000 tons and more to manage the city's 7,000 lane-miles of streets and cul du sacs.

The City of De Pere in Brown County purchases road salt under the state contract. They purchased 1,820 tons at \$33 per ton in 2008 versus \$29.50 per ton in 2007. Streets Superintendent John Heesaker says the city cut its order by 200 tons this year and plans to make up the difference by adding a natural sugar beet byproduct (Geomelt) to the mix.

Randy Eide, Director of Public Works for the City of Menomonie, says the \$56 per ton rate the city paid for salt on the state contract in 2008 was a 14 percent increase for them. "Those supplies should take us to April of 2009 after which we expect much higher prices," he observes, adding that he depends on Dunn County for additional salt in snow-heavy years and "they've been good about helping us if they can."

Purchasing road salt on a state contract they renew annually, the City of Appleton in Outagamie County paid \$38 per ton this year compared to \$33 per ton in 2007. Carl Schultz of the city's public works department says they committed to 5,000 tons with



A spreader loads up at one of six salt domes that serve the City of Milwaukee street crews.

an option to purchase 930 tons more at the set price.

The word from several local governments that sent out new requests for salt bids in the spring and summer of 2008 is that when vendors finally secured supplies, the price per ton was steeply higher. Examples include the \$180 per ton rate the Town of Stettin in Marathon County paid for a portion of its 2008 supply and Dodge County's \$160 per ton salt investment. The City of Ashland in northern Wisconsin—where snowfall last winter was below normal—paid \$82 per ton versus the \$43 per ton paid in 2007.

Strong argument for alternatives

Over the last 40 years, winter maintenance professionals have tested and adopted various alternative strategies to reduce the use of road salt for ice and snow control. While several of these are seen as effective and environmentally sound, the cost of deicing materials and the investment in equipment needed to apply them made many local agencies hesitate to adopt alternatives. Recent price increases in road salt make a strong argument for considering these strategies.

Two of the most common alternatives—prewetting and anti-icing—use liquid salt brine to improve how road salt performs. Highway and street departments also use alternative chemicals and blends in prewetting and anti-icing to improve deicer performance in low temperature situations.

Prewetting is the process of adding a liquid deicing chemical to dry salt during application to speed up the melting process and limit salt lost when the dry material bounces off the pavement surface. Anti-icing prevents snow and ice from bonding on the pavement by spreading a small amount of a liquid chemical before a storm hits.

Mechanical removal is an “old fashioned” alternative that has gained a foothold in many communities. Agencies are changing policies to include more snow control with plowing, exploring different blade materials and plow configurations to make the method more effective.

A better understanding of the role abrasives like sand play in a winter maintenance program is another milestone in the evolution of snow/ice control strategies. While abrasives do not melt snow or ice, they effectively improve traction and reduce braking distances on packed snow and ice. Best practices today call for limited use of sand where low pavement temperatures render chemicals ineffective or agency policy establishes snowpack as an acceptable level of service for certain roads. The standard for adding salt to abrasives is to mix at a 2-4 percent by weight ratio to prevent abrasive stockpiles from freezing.

Ice and snow control operations that use salt or alternatives make best use of their resources by utilizing customized weather forecasts. Forecasts that include pavement temperature information also help crews time application of deicing chemicals and select the appropriate application rate.

Treating roads, educating the public

As many local officials across the state rewrite snow removal policies and update highway and street operations to explore these and other treatment alternatives, they comment here on how they will handle the snows of 2008-09.

“Born of necessity,” says Dodge County Highway Commissioner Brian Field of his department's plans to experiment with mixes this year. The county is augmenting its 6,000 tons of road salt with 1,000 tons each of two products shown to work well at lower temperatures—IceSlicer, a mined



Many Wisconsin communities are adding pre-storm anti-icing equipment to their winter maintenance programs.

material made up of complex chlorides and trace minerals, and Ice Melter, a manufactured chloride mix. The \$150 price per ton for these deicers, once considered stratospheric, makes them competitive in a year when the county paid almost four times as much for road salt as they did in 2007.

Field says the other strategy he will follow is an active effort to educate the public about the county's efforts. This includes encouraging people to drive slower and stay off the roads in the worst weather.

De Pere's Heesaker says that besides testing the efficacy of a salt/Geomelt mix, the city plans to recalibrate its spreaders and look for ways to improve the application process. He adds, “Depending on the winter, if we really use less salt with this approach, we may cut back our salt order even more next year.”

Patrick Colgrove, Operations Manager for Ashland, says the high price of road salt prompted him to update the city's snow policy, including frequent plowing in lighter snowfalls. They also plan to experiment with prewetting, applying a magnesium chloride mix (purchased from Ashland County) on emergency routes, collector streets and higher traffic areas.

Continues on page 6

Over the last 40 years, winter maintenance professionals have tested and adopted various alternative strategies to reduce the use of road salt for ice and snow control.

Winter roads: juggling salt supplies and alternatives

continued from page 5

Utecht adds that Town leadership strives to be proactive about snow control policies and recognizes that reducing salt use is as much about the environment as it is about cost and availability.

The Dane County Highway Department continues to treat all state highways it manages and most major county highways by prewetting with a brine solution produced in-house. They follow an anti-icing regimen—the pre-storm application of a liquid—for bridges on the Interstate and the beltline that bypasses Madison. Assistant Highway Commissioner Pam Dunphy says they might consider treating other stretches of roadway with anti-icing in future.

Dunphy notes it is difficult to track the recent impact of these methods given two consecutive winters of severe weather. But Dane County's goal remains keeping salt use to a minimum while maintaining safe roads. The county is providing the brine solution it produces to nearby communities this season. The department also conducted an informational meeting on the alternative method last spring for local governments in Dane and surrounding counties.

Milwaukee introduced a salt brine/anti-icing alternative in 2005, using the blend primarily on bridge decks. Booker explains that under the right weather conditions and when the city outfits more trucks to handle the brine solution, they plan to use it more widely.

Meanwhile, tight salt supplies last year prompted Milwaukee to sand lightly traveled roadways late in the season as an interim alternative. "Last winter caused us to look at what we put down and how much road salt is necessary to maintain safe roadways," Booker says. "The department plans to keep monitoring salt use this season so we can manage our supplies effectively and still do the job."

Proactive policies

Stettin was one local government that waited longer than usual for its regular salt vendor to come through with salt supplies at any price this year. Supervisor Gary Utecht says the Central Wisconsin

Township purchased only 150 of the 350 tons it hoped to stockpile at the vendor's premium price of \$180 per ton and later managed to buy an additional 200 tons at half the price from Marathon County. He is in talks with the county about joining the state contract in future.

Ongoing efforts this season to manage and reduce salt use include making greater use of pavement temperature sensors on trucks that help the drivers adjust application rates according to conditions. Utecht adds that Town leadership strives to be proactive about snow control policies and recognizes that reducing salt use is as much about the environment as it is about cost and availability.

This is the eighth year the City of Beloit is using liquid blends to treat roadways. Among the first local governments in the state to experiment with liquids, Beloit follows this approach on every street in every storm. It keeps road salt use to a minimum, says Public Works Director Christine Walsh, noting the community reduced its salt use by one third with alternatives. The city had salt to spare last year for other municipalities in the "southern snow belt" that ran short.

Beloit mixed its own treatment blend for the first time last season. Using a computer to keep the formula uniform, they developed a mixture consisting of 80 percent

salt brine, 15 percent Geomelt and 5 percent calcium chloride. Walsh says they apply a costlier 50/50 blend of brine and Geomelt in deep cold temperatures. Road crews also receive annual training on blends, application rates and equipment settings. "We want the drivers to understand our management philosophy on snow control, why we do what we do," Walsh says. "Since we can't increase the budget for time and materials, we need to do it right the first time."

Appleton uses a combination of plowing, salting, prewetting and anti-icing in its winter operations. This includes a salt brine blend the city began purchasing from Outagamie County two years ago. Schultz says all trucks in the winter fleet are equipped for prewetting, ready to apply salt brine or calcium chloride as conditions warrant. Last year, one third of the vehicles regularly went out with the brine solution. Schultz says his department sees real advantages in using this approach. It reduces the amount of salt needed for application, helps activate the salt quickly and minimizes or eliminates the need to re-apply. Managing its road salt supply in 2007 with this regimen, Appleton helped fill the temporary gap between salt deliveries for nearby townships when a storm caught them off guard.

Balancing safe winter roads with environmental cautions,



A truck equipped for anti-icing applies a liquid blend on a Beloit city street as a preventive ice and snow control measure.

Menomonie is also making an effort to reduce road salt consumption. The northwest Wisconsin city uses a combination of methods for ice and snow control. Eide says crews typically use straight salt on main connecting roads, and rely on plowing and sanding to manage secondary streets. In a snowy winter when it is hard to stay ahead of accumulation, Eide says they expect residential streets to get snow packed.

Learn what works

Clearly, the push to test and try alternatives for treating winter roads has gained momentum

with local governments across Wisconsin in recent years. The reality of high-priced road salt hit home in 2008 as an incentive for adopting other methods. Many highway and public works departments now add "cost-saving" to a list of reasons that include alternatives that are effective, innovative and ecologically sound.

Local officials who want to learn more about these alternatives and how they work under different climactic conditions can request related fact sheets from TIC or download them from the TIC website. See a list of these and

other publications in the *Resources* section on page 11 of this issue.

TIC's annual series of *Winter Maintenance* workshops regularly address trends and treatments, and feature speakers with hands-on experience. Pat Colgrove from Ashland, who attended a recent session in the series, says the program gave him a chance to pick up valuable information about running a winter operation, but also to share his own insights. "The workshop really helps me connect with others who face the same challenges I do and stay in touch with the latest ideas." ■

Contacts

Wanda Booker
City of Milwaukee
414-286-2332
Wanda.Booker@milwaukee.gov

Patrick Colgrove
City of Ashland
715-682-7061

pcolgrov@coawi.org

Pamela Dunphy
Dane County Department of Public Works, Highway and Transportation
608-266-4036

Dunphy@co.dane.wi.us

Randy Eide
City of Menomonie
715-232-2207

reide@menomonie-wi.gov

Daniel Fedderly
Wisconsin Counties Association
715-505-9242
hwype@wwt.net

Brian Field
Dodge County Highway Commission
920-386-3653
bfield@co.dodge.wi.us

John Heesaker
City of De Pere
920-339-4062
jheesaker@mail.de-pere.org

Carl Schultz
City of Appleton
920-419-6036
Carl.Schultz@appleton.org

Gary Utecht
Town of Stettin
715-571-1484
utechsa@yahoo.com

Christine Walsh
City of Beloit
608-364-2929
walshc@ci.beloit.wi.us

Resource

www.saltinstitute.org
Website of the Salt Institute, a nonprofit salt industry industry association that reports on trends in salt use for winter roadway safety.

Why not a sand/salt mix?

In a year when some local governments in the state paid a premium to stockpile road salt for their winter maintenance operations, many are asking: *Can't I stretch my dollar by mixing sand and salt?*

In fact, the assumption that sand-to-salt ratios of 50/50, 60/40, 70/30 or 75/25 are effective treatments is misguided. TIC agrees instead with research that shows mixing salt and sand (beyond the 2-5 percent salt needed to freeze proof sand stockpiles) does not improve the effectiveness of either material.

Weigh the facts

Sand and salt work at cross-purposes. Sand improves traction when it is on top of ice or snow pack. In a salt/sand mix, as the salt begins to melt the snow pack, the sand sinks and mixes with the snowpack. Once the sand is gone from the surface, it does nothing to improve traction. Sand mixed with salt also reduces the melting effectiveness of the salt.

There are other costs of using a salt/sand mix to consider. It usually increases the overall application rate, so actual reduction in salt use and cost savings may be less than expected.

For example, in a change from applying salt at an application rate of 300 lbs per lane mile to a 75/25 sand/salt mix applied at 800 lbs per

lane mile, the salt component of the mixture is 200 lbs per lane mile for a 33 percent reduction. Assuming a salt price of \$60 per ton and a sand price of \$4 per ton in this scenario, material costs go down only \$1.80 per lane mile. Adjust the equation to a sand/salt ratio of 70/30 and the savings are \$0.68 per lane mile. And mixing two-thirds sand with one-third salt saves nothing in material costs over straight salt.

If the route is 10 centerline miles (20 lane miles) or more, it may take an additional trip to the yard to refill the sand/salt mix. The labor and equipment costs for this trip wipe out the nominal savings on materials. Add to that the resource outlay for sand cleanup in the spring and the cost of the mixture is higher.

The mix may vary and assumptions about continuous salting or spot salting hills, curves and intersections all factor in. But it helps to do the math before assuming salt and sand combined reduce costs.

Save salt, meet conditions

Highway and streets departments that use sand to cut back on salt often designate lower traffic volume roads where sanded snowpack is an acceptable level of service. They plow the roads and sand hills, curves and intersections for traction. The approach assumes these roads will be snowpacked but passable.

There are other methods for cutting back on salt use without using sand.

- Put plow blades on the ground earlier in the storm and decrease salt application rate. Removing more snow means it takes less salt to melt the rest.
- Vary application rate within a route. Reduce salt use mid-block and apply normal rates at hills, curves and intersections.
- Try prewetting while reducing dry salt application rate 20 to 30 percent. More salt stays on the road with prewetting and it takes less salt to provide the same level of performance.
- Consider anti-icing— pre-storm application of liquid deicers to break bond between snow and pavement makes it easier to clean-plow using less salt.

Combine strategies

Stretching salt stores while maintaining winter roads in safe condition demands different strategies depending on weather conditions and road classification. Both salt and sand, used in the proper applications, are effective tools in a winter maintenance operation. Calculating the costs and carefully considering the value of each strategy is helpful in identifying the most cost-effective approach.