



**TESTIMONY BY
THE PENNSYLVANIA STATE ASSOCIATION OF
TOWNSHIP SUPERVISORS**

**BEFORE THE
SENATE TRANSPORTATION COMMITTEE**

**ON
WINTER PREPAREDNESS & MODERNIZATION**

**PRESENTED BY
ELAM M. HERR,
ASSISTANT EXECUTIVE DIRECTOR**

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HARRISBURG, PA

Our organization publishes an annual winter maintenance edition of the *Pennsylvania Township News*, which highlights best practices and new techniques. Salt brine is one of the more recent of these advances to be adopted. As with most advances, it does not work for all situations, including dirt and gravel roads, but can be very effective on paved roads. Another technique that many townships use is personalized weather services, both for long-term and short-term winter weather forecasts. These can assist with both long-term planning and more effective snow removal. See the attached articles from our November 2016 edition of the *Township News* for more on salt brine and winter maintenance preparation, including use of weather reports.

Final winter preparation steps involve preparing and equipping road equipment and performing dry runs of snow routes. Many townships put snow removal plans in writing so that residents can be informed of how and when the township will service roadways in their community, as well as which roads are the responsibility of the township, which are maintained by PennDOT, and which remain a private responsibility.

These comments, along with the attached articles, provide an overview of the steps involved in winter maintenance preparation, as well as how townships are currently prepared to face the current winter season. I will now attempt to answer any questions that you may have.



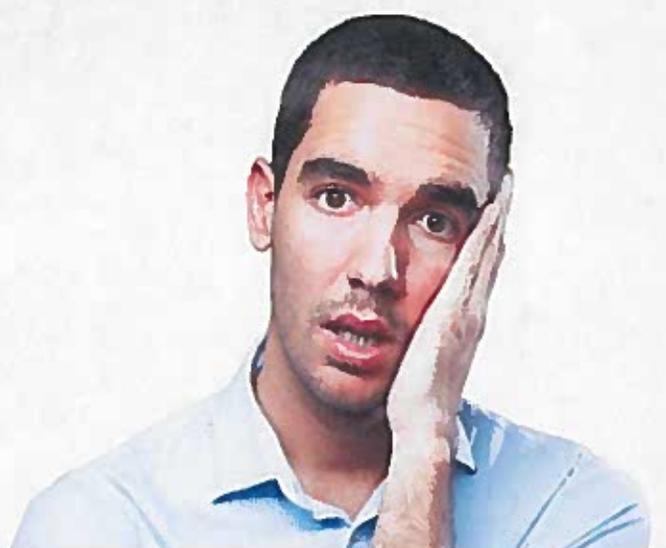
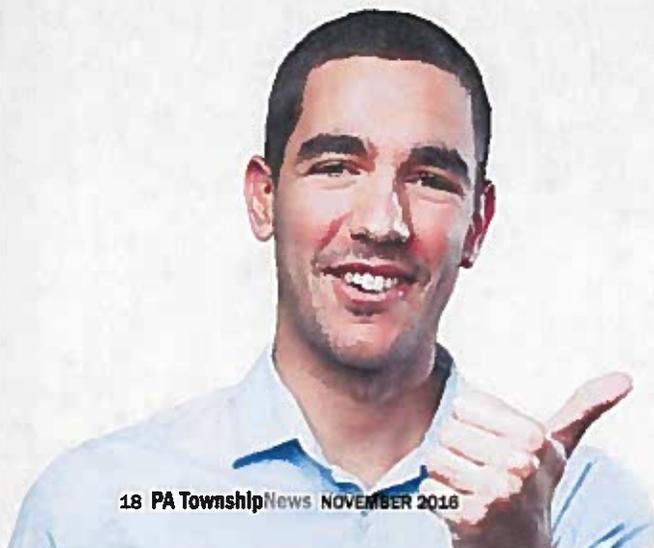
WHOA!

WINTER'S ON THE WAY!

Is Your Township Ready or Worried?

Between fickle Mother Nature and fuming residents, winter can be a stressful time for townships. And experts say that a well-thought-out strategy is not only smart but necessary. The whole idea is to wisely manage your resources — staff, equipment, and materials — to reduce complaints and, most important, make sure everyone traveling your roads stays safe, including your crew.

BY JILL ERCOLINO / MANAGING EDITOR





READY OR WORRIED?

Up every morning at 2, from November to March, Bill Goodrich grabs some coffee and peeks out the window to see what Mother Nature has up her sleeve for the day.

If it's snow, ice, or a combination — and it usually is in Pennsylvania's northern tier — the 77-year-old supervisor and roadmaster for Liberty Township, Susquehanna County, will be behind the wheel of a dump truck by 3 a.m.

Over the next few hours, Goodrich and two other seasoned drivers will rumble over 38 miles of dirt roads, plowing, cindering, and clearing the way for school buses and people who need to get to work.

"We're doing what we have to," he says, "so everyone else can do what they have to."

Forget that it's dark and dangerous out there as the rest of the township sleeps. Nothing, not even his age, is go-

ing to stop Goodrich from moving snow and ice. "As long as I can get up and see the ground," he says, "I'm going to keep at it."

Another diehard driver is Ludwig Zarembinski, the roadmaster for Vernon Township in Crawford County. During the winter, he and his three-member crew are either plowing or sleeping to keep up with the 60 to 120 inches of snow that falls in the township each year.

"We work until the job gets done, and a lot of the time, that means 12- and 14-hour days," says Zarembinski, who has been driving plows for more than three decades. "You have to have good vision, good reflexes, and three or four sets of eyes, but I love it."

"I turn up the country music and just go," he adds with a laugh. "That's how I survive."

The first line of defense

Townships, on the other hand, need something weightier than a Jason Aldean or Buck Owens tune to get through winter, one of the most stressful and unpredictable times of the year.

After all, when everyone else is snuggled under a blanket or watching snowflakes fall from their living room

window, the township supervisors and their employees are the community's first line of defense against snow and ice. It's their job to keep people and the local economy humming along no matter what is coming out of the sky.

In Millcreek Township, Erie County, officials start bracing for snow in October, right after the last piece of Halloween candy is passed out.

That means mobilizing a workforce of 28 equipment operators, who are responsible for clearing 200-plus miles of roads. The township averages as much as 150 inches of snow each year, which requires around-the-clock coverage through March, supervisor and street administrator Brian McGrath says.

"We take it very seriously," says the supervisor, who is also PSATS second vice president. "Our schools may delay classes, but they don't close. Our crews know where they need to be and when to ensure the buses can get to the kids in the morning and get them home safely at night."

To the east, in Northampton County, Williams Township has fewer drivers — seven; fewer miles to cover — 70, which includes 20 miles of state roads; and much less snow, but it's equally prepared to manage the municipality's hilly terrain

"We're out there **doing what we have to** so everyone else **can do what they have to.**"



“You have to have a way to **lend order to the chaos...you** wouldn’t go into a football game **without a plan, right?** It’s the same with **snow and ice removal.**”

when winter arrives. In mid-October, the seasoned crew starts servicing the snow-fighting fleet and has it equipped and ready to go by mid-November, Director of Public Works Mike Strawn says. Each driver is assigned a 10-mile route.

“We’ll adjust our operations to the time of day,” he says. “If a storm starts at 4 in the afternoon, for instance, we’ll work until about 10, get some sleep, and then get back up at 4:30 for the morning rush.”

Those who have weathered a storm or two say well-thought-out strategies like these are not only smart but necessary.

One of those people is snow and ice removal expert John Allin, who oversaw maintenance operations at the 2002 Olympics in Utah and also happens to live in Millcreek Township. Successful snow-fighting plans, he says, focus on managing your most important resources — staff, equipment, and materials — wisely to reduce complaints and make sure everyone traveling your roads stays safe, including the plow crew.

“You have to have a way to lend order to the chaos...you wouldn’t go into a football game without a plan, right? It’s the same with snow and ice removal,” he says. “The key for any community is

to do the best they can with the constraints placed upon them.”

‘Making dollars out of dimes’

Of course, we all know the biggest constraint facing townships: funding.

In an ideal world, local leaders would have an unlimited budget to fight the elements. In the real world, however, supervisors, managers, and roadmasters have “to make dollars out of dimes,” Zarebinski says.

“We’ve got to account for a lot... breakdowns, fuel, salt, manpower, overtime,” he says, “and it’s all while we’re trying to make the roads safe for the public.”

Allin agrees: “Townships have a heck of a lot to juggle.”

And let’s be honest, much of the planning that takes place before winter arrives is guess work because your other adversary, Mother Nature, is full of surprises. Last year, for instance, after a relatively mild season, a crippling storm slammed parts of the East Coast and dumped more than 30 inches of snow in some places.

“That one storm blew lots of municipal budgets,” says Allin, who also owns John Allin Consulting, Inc., and is the

founder of the Snow and Ice Management Association (SIMA).

“Every storm is different, and that’s the hard part,” Williams Township’s Mike Strawn says. “Basically, your budget is a guesstimate. Sometimes, you hit it. Sometimes, you’re way off.”

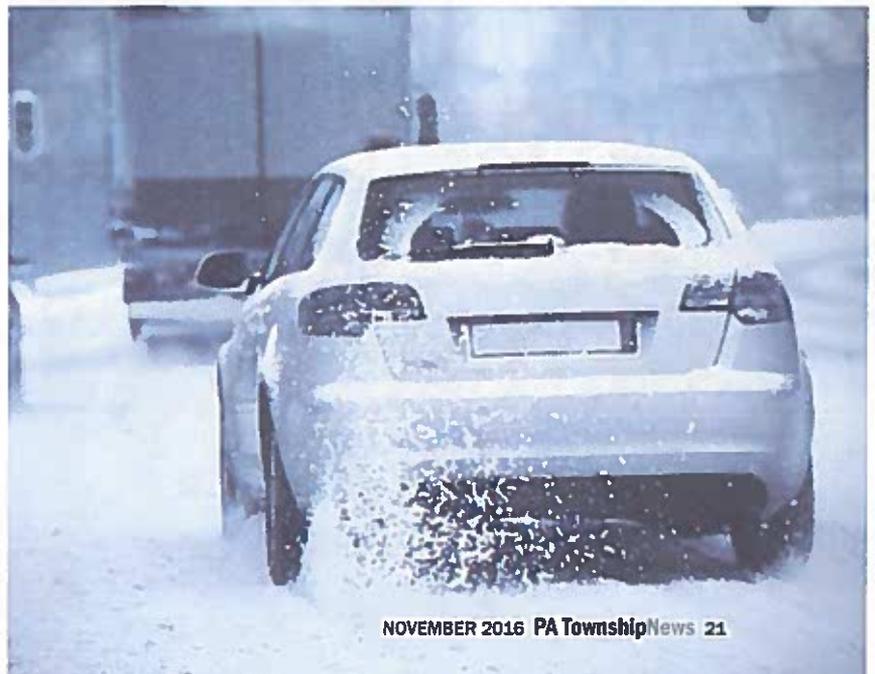
Experts say spring is the time to look at data from the past winter — such as the amount of material used and hours worked per storm — to help you budget and develop a plan of attack for the following year. Despite all of the variables that your township faces, Allin says this approach is the best defense against running out of material or money.

“Look at your history,” he says.

“Look at your spending based on the snow averages you’ve had and the age of your equipment and give it your best shot.” ➤

When everyone else is snuggled under a blanket or watching snowflakes fall from their living room window, the township supervisors and their employees are the community’s first line of defense against snow and ice. It’s their job to keep people and the local economy humming along no matter what is coming out of the sky.

TEGY



EMERGENCY! EMERGENCY!

When winter arrives, a snow emergency ordinance can help clear the way for plows

To manage snowplowing and make sure the roads are clear of vehicles during a snowstorm, many municipalities will implement snow emergencies to restrict or eliminate parking on public roads.

To implement a snow emergency, a township needs to first adopt an ordinance that describes when a snow emergency will be declared, who may declare it, what restrictions will be in effect when one is declared, and how the snow emergency is ended. The ordinance should describe any penalties for residents and others who fail to comply with the declaration and move their vehicles as needed.

The ordinance should describe the criteria for when a snow emergency will be declared. In some townships, it is set at one inch of snow. Others, however, will declare a snow emergency only after three or more inches have fallen. The declaration may come from a roadmaster or township manager; however, this must be outlined in the ordinance.

Generally, snow emergencies restrict parking on township roads or designated routes to ensure that roads can be plowed and treated. Townships in more densely populated areas with limited parking options may direct residents to move their vehicles to a designated area. Penalties for those who don't comply include towing and/or fines.

Usually in these ordinances, the individual who declares the snow emergency is also the person who ends it, which typically happens after the snow has stopped and the township has had an opportunity to clear the necessary routes.

Some townships may have different levels of snow emergencies and place additional restrictions on the traveling public during a more severe storm, such as limiting traffic to vehicles equipped with four-wheel drive, chains, or snow tires so that township personnel can focus on clearing and treating the roads, not responding to accidents.

For sample snow emergency ordinances, townships should go to connect.psats.org and type "snow emergency" in the search box or call PSATS at (717) 763-0930.

READY OR WORRIED?

And while you're considering how to spend your funding, you'll want to figure out how you're going to save it, too.

Townships can stretch their winter road budgets by doing a little preseason research into the use of different materials, plow blades, suppliers, and services. You may also decide to pair up with neighboring municipalities to share equipment and labor or hire a local contractor to move some — or all — of the snow.

'We're prepared'

Like every other municipality, Tobyhanna Township in Monroe County has a limited winter budget and workforce — five full-time drivers and two part-timers.

Ed Tutrone, who started as a part-time plow driver and worked his way up to director of public works, has developed a system over the years that makes smart use of both.

After a major storm, Tutrone will call in a subcontractor, who's paid an hourly rate, to help with snow removal. This ensures that the township's five drivers aren't pushed beyond their physical limits, that overtime costs are kept in check, and that residents get timely service.

"We can't afford a 24-hour workforce like PennDOT," he says, "so it helps to have that extra set of hands."

Subscribing to a private weather service also helps Tutrone manage his workforce.

Between emails and calls to the company, National Weather Forecasting, which provides a forecast pinpointed to the township, Tutrone not only has a good indication of when a storm will start but also when the threshold for plowable snow will be met. He can schedule his crew accordingly and says the service's \$1,700 annual fee is money well-spent.

"It doesn't matter if it's summer or winter," Tutrone says, "we're prepared. It's been an extremely useful tool for us."

Tutrone has plenty of salt and anti-



skid on hand before the first flakes fall, too. "Our shed holds 600 to 700 tons of material," he says, "and it's full now so if we get a lot of snow this year, I still have a full budget to work with."

To save money on materials, Tutrone buys antiskid directly from a local quarry and salt through cooperative purchasing agreements with the Pocono Mountain Council of Governments and COSTARS, a state program that has helped hundreds of municipalities reduce and stabilize their snowfighting costs.

Other products available through COSTARS include calcium chloride and aggregate. *(Editor's note: To learn more about the program, sign up for the "Saving You Time and Money with COSTARS!" workshop. See the details on page 62.)*

"PennDOT is a major purchaser, and townships that piggyback on our contracts benefit from a better cost," says Jon Fleming of the Bureau of Maintenance and Operations, adding that the partnership between townships and the agency should extend beyond these purchasing agreements.

Each PennDOT district, for instance, holds a meeting before winter starts to discuss its snow-fighting operations. Fleming urges township officials to attend, learn, and build relationships with the regional staff.

"We're all trying to accomplish the same thing: getting traffic to move from point A to point B," he says, "and we should be sharing knowledge back and forth to better manage costs and personnel."

Allin agrees, noting that with their multi-million budgets, state transportation agencies are able to experiment with money-saving innovations that are often valuable to municipalities, too.

PennDOT, for example, uses thousands of tons of salt each season and is always looking for ways to save money on this basic material. Technology is helping, Fleming says.

This winter, the agency is installing weather sensors on state roads to monitor the temperature, a key indicator of the amount of salt to use. PennDOT is also testing an automated vehicle location system that provides real-time information about its drivers, including how much material they're using and how long it's taking them to complete a route. ➤

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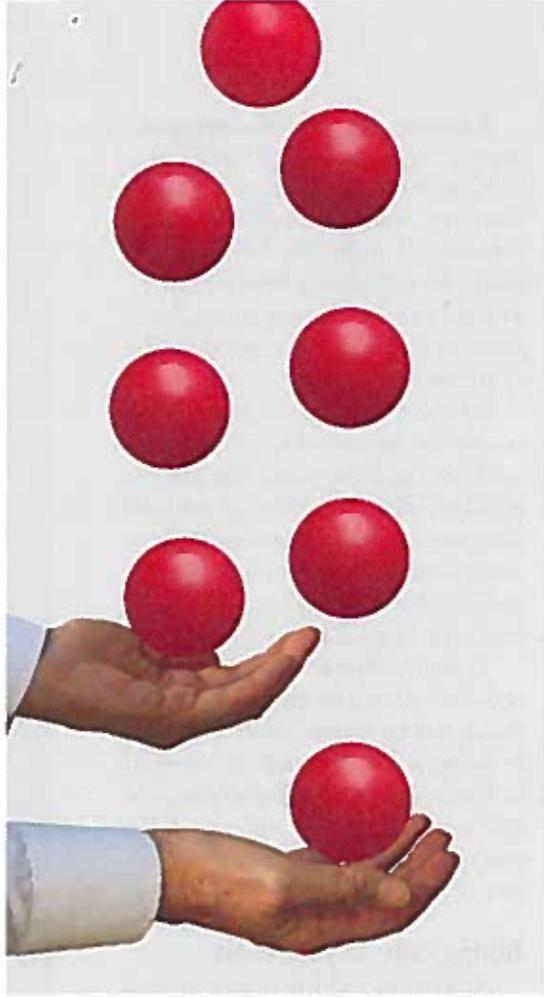
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READY OR WORRIED?

"A system like this allows managers to monitor operations so they can educate employees about material use," Fleming says. "If we can save 2 to 3 tons of salt per shift, those numbers start adding up very quickly."

"The DOTs are leading the way in advancements," Allin adds, "and that's great for townships that don't have money to experiment with new techniques."

Put it in writing

Of course, some roadmasters may

In an ideal world, local leaders would have an unlimited budget to fight the elements. In the real world, however, supervisors, managers, and roadmasters have "to make dollars out of dimes" to juggle everything that winter throws at them.

be tempted to curse their snow-fighting budgets. Instead, Allin says, it helps to view your spending plan as an opportunity to guide local decision making.

The goal should be to think of every possible obstacle ahead of time, form contingency plans, prepare for the worst, and hope it doesn't happen.

"Funding focuses your priorities," he says. "It forces you to ask yourself, 'What can we do with the money we have?', 'What are we trying to achieve?', and 'What are the triggers to go plow snow?'"

Essentially, your budget establishes the foundation for your snow removal plan, which should outline services supplied, plow routes, and a reasonable schedule for equipment operators.

Allin says townships should consider the following: When will plowing start — at 1 inch or 2? How quickly will the work be completed — within five hours of a storm or 12? What will you do when equipment breaks down? What areas will be plowed first? And how long will drivers work before taking a break?

Many townships have done the same thing the same way for years and have a well-oiled machine of a crew, but sooner or later, there will be someone new in the driver's seat, and you might not be there to show him the ropes. Therefore, Allin says, it's critical that you put your snow operations plan in writing.

"God forbid the guy in charge retires, whether it's God's doing or something else...," he says.

The planning and writing process will take some time so it's wise to start the day after the last storm in the spring when the season is still fresh in your mind.

The township supervisors and staff should sit down and talk about the winter just past, including what worked, what didn't, and what will need to change next winter.

It's valuable to include local emergency responders, such as police, firefighters, and ambulance crews, in these discussions, too. If a resident calls for help from an area that hasn't been plowed yet, township road crews may need to head out in front of a fire truck or ambulance to clear the way, and planning that "back and forth" must happen well before winter arrives. ➤

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READY OR WORRIED?

In addition, township officials should pull out updated township maps and a set of colored markers and start plotting the road crew's plowing and salting routes. Even if those routes haven't changed, you can't overestimate the val-

ue of having them in writing and ready to hand to anyone you call for backup.

Those routes will be determined, in large part, by what will be the quickest and most efficient way to clear the roads. Some municipalities, for example, lay routes out in relation to the maintenance building so that crews can make the best use of time and have the easiest access to the building if they need to return for repairs or supplies.

Townships also need to determine who's going to "blow the whistle" to mobilize plowing operations. In Liberty Township, Susquehanna County, supervisor and roadmaster Bill Goodrich makes the call after looking out his window. In other municipalities, the police or the local 911 center alerts the road crew.

Having such a detailed plan is good not just for the township staff but for residents, too. Now, when they call and ask when their road will be plowed, why some areas are cleared before others, or what time all the roads will be open, you'll be able to give a best estimate backed up by a solid written plan.

"A reality of snow removal is that not everyone can be first, and not everyone will be happy," Allin says. "And in today's world, the public is constantly looking over your shoulder so the more information you can provide, the better your chances of warding off unnecessary vitriol."

Taking care of your crew

And there's another, distressing reality of snow removal: Plowing is a thankless, dangerous job.

"These people are out there in life-threatening, horrendous conditions, performing a service that most people take for granted," Allin says.

Just ask Mike Strawn, who operates a plow for Williams Township in Northampton County, which is home to three treacherous mountain ranges.

"We're always going down a steep hill," he says, "and even though we use double chains all winter long, I've been in situations where the plow has slid off the road.

"You just hang on and hope for the best."

Brian McGrath of Millcreek Township in Erie County agrees: "You haven't lived until you've been behind the wheel of a 30,000-pound snowplow and hit a manhole. It gives you quite a jolt."

Safety precautions can begin with something as simple as requiring plow drivers to wear seatbelts or providing accommodations for equipment operators. In Williams Township, for instance, the new public works building includes sleeping quarters for the crew. ➤

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READY OR WORRIED?

"Rather than send them home for four hours, our guys eat and sleep here at the building between shifts," Strawn says. "This ensures they're well-rested. It's been a real time-saver for us."

Many townships also send their drivers to training regardless of how long they have been on the job. Sure, if they're experienced, they will undoubtedly hear some things they've heard before, but that's the idea: to be reminded of the tasks that become routine and can slip through the cracks, like equipment care and maintenance and even dressing appropriately to ward off hypothermia and frostbite.

PSATS, for instance, has partnered with PennDOT, LTAP, and the State Transportation Innovation Council to offer the new and improved Salt and Snow Management course, which covers a number of topics, including winter



maintenance plans and "smart" salting. (Editor's note: For a list of upcoming dates, go to page 64 or log onto www.ltap.state.pa.us.)

Allin says that training like this not only protects your drivers' health and welfare but also protects the township in terms of liability. "Keep those train-

ing certificates and put them in your personnel files," he says. "If there's an accident and you're sued, you have proof of training and learning safety measures."

Caring for snow removal equipment is another way to protect crews and make sure your fleet is ready to go, especially if that first snowfall hits earlier than usual.

Washing all the equipment down should be the first order of business, since salt and metal don't mix. All hoses, belts, fittings, and lights should be checked and repaired, and then checked again before winter arrives.

Staying safe also means being aware of changes to the plow route and of changing weather and road conditions. Marking potential hazards is a good idea, too, because as anyone who's driven a plow truck knows, the world looks a lot different when it's blanketed in white and even the familiar becomes unfamiliar.

That's why Allin recommends that drivers commit a plow route to memory by taking a "dry run" when the weather is clear. He says that making notes about landmarks or geography to watch for when plowing can save time, money, and wear and tear on the vehicle.

McGrath agrees. "There's a lot to be said for familiarity."

Communication and the community

When winter hits, snow and ice



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Plowed-in driveways, damaged landscapes, and crushed mailboxes can escalate tensions. Townships, however, can avoid some of those confrontations with residents by spreading the word — early and often — about their snow and ice removal plans and ordinances.

aren't the only things that townships have to deal with. Angry residents are another.

Plowed-in driveways, damaged landscapes, and crushed mailboxes can escalate tensions and prompt fist-shaking and phone calls.

"When you get 150 inches of snow, you're out a lot and damage happens," McGrath says.

"But, man, when you break something, they're all up in arms," Tobyhanna Township's Ed Tutrone says.

Townships, however, can avoid some of those confrontations by spreading the word about their snow and ice removal plans and ordinances, which often require residents to move their parked cars off the road during storms. Allin says do this early and often before winter arrives.

"An educated resident is a more understanding resident, and it's up to the township to do the educating," he says, advising officials to put as much information as possible on their website and social media pages and in their newsletters and local newspapers.

Patton Township in Centre County, for example, has an entire page on its website, twp.patton.pa.us, devoted to, among other things, explaining the township's parking restrictions, plowing procedures, and how residents can avoid plowed-in driveways.

"The reaction from residents has been positive," says Steve Casson, the township's director of public works. "We get commended all the time on our snow and ice removal."

"That's the thing about residents and snow...," Mike Strawn adds. "One storm, they criticize you, and the next one, they compliment you."

"The bottom line, though, is that there is only so much you can do," he adds. "You have to have broad shoulders and thick skin with this job." ♦

MAILBOXES, ETC.

Be careful and accountable to minimize property damage disputes



A heavy, wet snow is falling, the plows have been out for hours, daylight is breaking, and the township phone rings. It's a resident telling you that one of the road crew knocked down his mailbox, and he wants to know what will be done about it.

What will your answer be?

For many townships, that depends on the circumstances. But no matter what, the answer will be a lot easier to give — and back up — if you have a policy in place before winter arrives.

Some townships replace mailboxes only if the plow hits it, not if the box is felled by snow flying off the plow. Others have a more liberal replacement policy. Decide what's right for your township, put it in writing, and share it with residents.

In Millcreek Township, Erie County, officials use every resource available — their cable-access channel, website, and magazine and the local news media — to advise residents to install stakes along the edge of their property to protect mailboxes and lawns from plow blades.

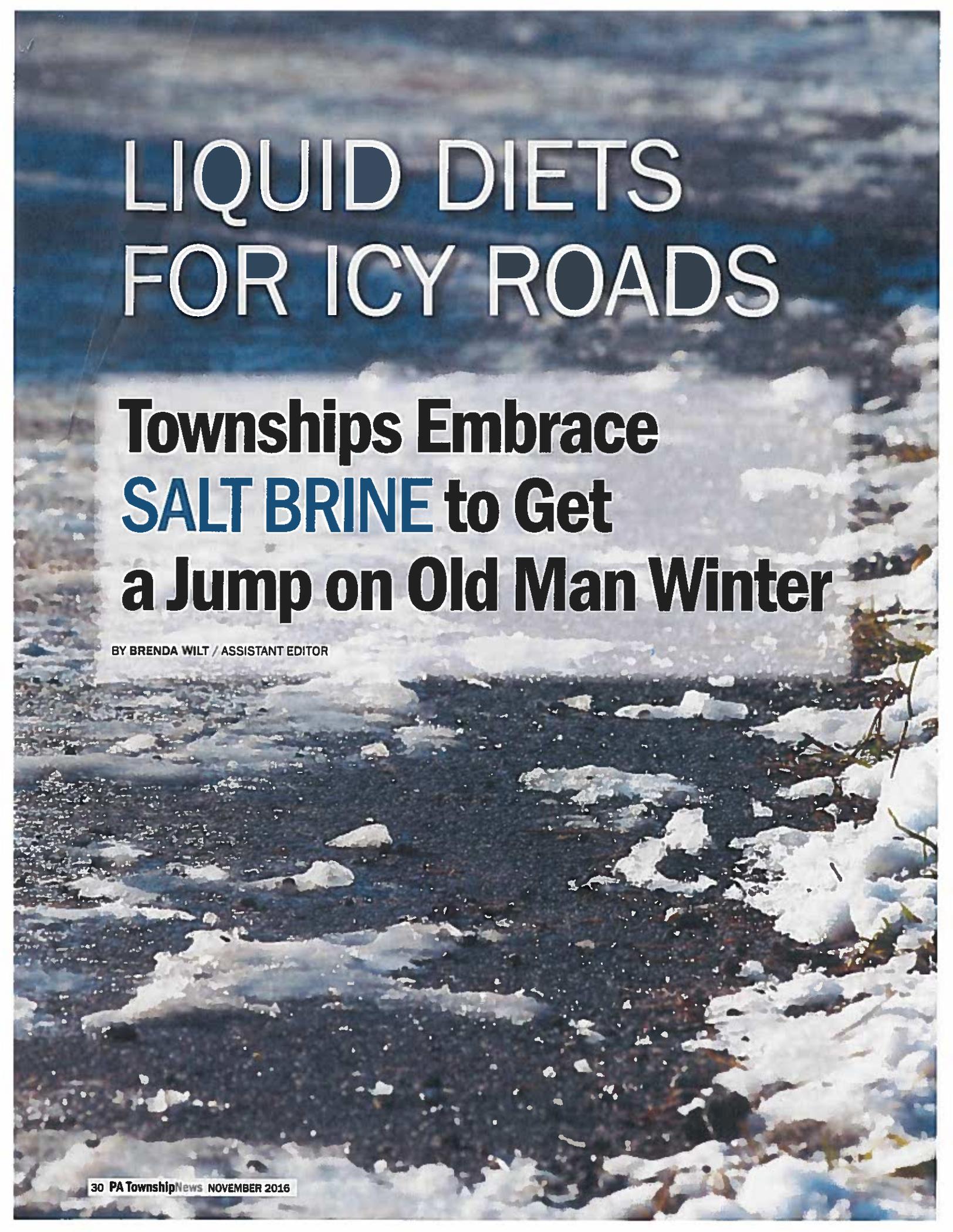
"When you get 150 inches of snow, you're out a lot and damage occurs," supervisor and street administrator Brian McGrath says. "If the plow hits a mailbox, we'll fix it. If it's the snow that hits the box, then it's up to them to repair."

Townships may also want to provide residents with information, available from the U.S. Postal Service, about the proper way to install a mailbox.

In areas where repeat problems occur, township officials may want to suggest that residents invest in a "swing-away" mailbox, which gives way when hit by flying snow and spins a complete 360 degrees before coming to a rest in its starting position. This type of box is even a requirement in some parts of the country.

By providing information and options, taking responsibility when the township driver is at fault, and enforcing a policy uniformly, townships will be better able to help residents weather the storm — and possibly a downed mailbox.





LIQUID DIETS FOR ICY ROADS

Townships Embrace **SALT BRINE** to Get a Jump on Old Man Winter

BY BRENDA WILT / ASSISTANT EDITOR

Salt, combined with plowing, remains the most effective, economical, and safest method for clearing winter roads. Some townships, however, are borrowing a page from PennDOT's book and adding salt brine to their arsenal of winter weaponry, both for pretreating roads and prewetting the rock salt they will spread during the storm. By taking a good look at your needs and educating yourself on liquid deicers, you can incorporate salt brine into your snow management program. You just might save a few bucks as well.

The state Department of Transportation (PennDOT) has long used salt brine to help keep roads from freezing over. After seeing the results of that use, Hemlock Township in Columbia County decided to try the salty solution on its own paved roads.

The resourceful public works crew turned an 1,100-gallon tank into a homemade brine maker, using a trash pump to circulate the rock salt and water mixture.

The resulting salt brine went into a 500-gallon tank on one of the township trucks, which sprayed it on the roads. The system worked fine, supervisor and roadmaster Frederick Klinger says, but it just wasn't big enough.

"We couldn't make enough brine to do what we wanted," he says.

This summer, the township purchased a commercial brine-making system that will enable the crew to make 3,600 gallons per hour. A 2,600-gallon storage tank will ensure that the township always has salt brine on hand for pretreating its 26 miles of blacktop in the winter and controlling dust on its 22 miles of unpaved roads in the summer.

The township has already seen about a 30 percent savings in materials since it started using salt brine and has saved on overtime costs as well, Klinger says. Money is not the primary motivation, however.

"The biggest benefit is safety," he says. "Getting ahead of a storm increases safety for the traveling public, as well as the road crew."

Salt brine is gaining popularity among townships as both an anti-icing agent to keep ice from bonding to the road surface and as a prewetting agent for rock salt and antiskid. Like Hemlock, townships are finding that salt brine lowers material and manpower costs and, quite simply, works better than salt alone. The best news for townships is that PennDOT recently added salt brine to the approved materials for liquid fuels funds expenditures (see page 71).

Townships should realize, however, that there is a learning curve when it comes to using liquid chemicals on

roads, says Diana Clonch, president of snow management consulting firm DW Clonch, LLC, and former Ohio Department of Transportation manager. Road crews must educate themselves on how chemicals work and how to apply them so that they can use the right tool on the right road under the right conditions.

"The more you learn," Clonch says, "the better you can make good choices."

Being more mindful

Salt has long been part of a road crew's arsenal of winter weather weapons. The U.S. Geological Survey says that in 2014, highway deicing accounted for 43 percent of the salt manufactured in the U.S. — more than was used for any other purpose.

In recent years, however, attention has fallen on the environmental impact of salt as a deicer. Road salt not only deteriorates infrastructure but also has a negative effect on plant life and waterways as it washes off road surfaces.

"There's been a huge change in the snow and ice community over the last decade or so," Clonch says. "We have become more mindful of the resources that are used."

Consequently, researchers have tried



Hemlock Township in Columbia County purchased a new brine-making system this summer. Clockwise from top left: The brine maker and storage tank are housed in a fabric covered "hoop" building next to the municipal building. A hose hookup allows the brine to be pumped into a tank on a truck for application. (Photos courtesy of the township.)

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to find environmentally friendlier alternatives to salt for deicing roads, from other chemicals to agricultural products from such unlikely sources as beets, corn, and in Wisconsin, cheese. At the end of the day, however, the use of salt combined with plowing remains the most effective, economical, and safest snow and ice control method available, according to PennDOT.

This is one of the reasons for the increased use of salt brine. Although it is a 23.3 percent salt solution, unlike rock salt, it stays on the road. When used to prewet rock salt, it minimizes the likelihood of the solid bouncing off the road and into the surrounding environment.

Of course, salt, or sodium chloride, is not the only chemical deicer available. Calcium, magnesium, and potassium chlorides, various acetates, and urea are also used for various purposes. Each



Mount Joy Township in Adams County purchased a brine-making system last year, along with a large tank and sprayer system for one of its trucks. (Photo courtesy of the township.)

chemical has different characteristics and temperatures at which they are effective, but they all do the same thing: lower the freezing point of water. (See

the sidebar on page 35 for the characteristics of various deicing chemicals.)

Salt brine works at temperatures down to about 15 degrees Fahrenheit, Clonch says. For temperatures below that, other chemicals may be blended with the salt brine to make it more effective. Blending chemicals can also make the resulting solution less corrosive and "stickier" so that it adheres better to pavement.

Still, sodium chloride remains the chemical of choice for both PennDOT and municipalities in Pennsylvania due to its availability, cost, performance, and ease of storage. Although it has primarily been used for prewetting rock salt and antiskid to reduce bouncing and scattering, it is gaining ground as an effective anti-icing agent.

Prevention is best

Historically, public works departments' response to winter weather has been reactive: Snow, sleet, or freezing rain falls, and then the department deploys its trucks to plow or spread rock salt. Waiting until after the storm starts to treat the roads, however, allows snow and ice to bond to the road surface, Clonch says, which requires more salt and more time to break the bond and start melting the ice.

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— spreading material before precipitation starts — prevents that bond between the snow and ice and the road surface. An added bonus is that the material can be applied up to several days before the storm arrives.

“Prevention is always the best measure in snow and ice control,” Clonch says. “It takes four times more salt to deice a road than it does to pretreat it.”

PennDOT cites a number of additional benefits to anti-icing, including:

- Brine creates better pavement conditions and improved friction, which can reduce accidents.
- Cleanup is easier after a storm due to less bonding of ice to the pavement.
- Materials can be applied during regular working hours, reducing some overtime costs.
- Brine sticks to the road surface and is not scattered by wind or traffic,

leading to more efficient use of materials.

• If the storm is delayed, the dried salt residue remains on the road and begins to work once precipitation begins to fall.

In an article for *Moving Forward*, the quarterly newsletter of PennDOT’s Local Technical Assistance Program (LTAP), Robert M. Peda of Navarro & Wright Consulting Engineers says that the timely application of anti-icing brine can cut the cost of maintaining a safe road surface by as much as 90 percent. Once melting begins, rock salt that is applied during the storm will begin to work more quickly since it requires moisture to become “active.”

Townships take the plunge

Townships across Pennsylvania are buying salt brine systems as an investment in winter maintenance improvement and safety. Mount Joy Township in Adams County purchased a brine-making system last year.

“We were looking for more cost-effective ways to treat our roads,” super-

TO BRINE OR NOT TO BRINE

Conditions must be right for successful anti-icing

Using salt brine to pretreat roads can be a great tool if done at the right time and under the right conditions.

PennDOT offers the following guidelines for when to

undertake anti-icing operations:

- before forecasted frost, freezing fog, or black ice on bridge decks and pavement trouble spots at a minimum, as well as on hills, curves, shaded areas, ramps, and intersections;
- before light sleet and light or moderate snowfalls;
- during normal, low-traffic volume, non-overtime work hours;
- at least two hours before the onset of precipitation on first priority and high-traffic routes, or at least before snow and ice can bond to the road surface; and
- when the pavement temperature is at or above 15 degrees Fahrenheit or the pavement temperatures are forecast to rise or stay above 15 degrees F.

Liquid anti-icing should not be done under the following conditions:

- when a storm is forecast to begin as rain;
- when winds are greater than 15 mph;
- when the anti-icing agents may cause snow to stick to the road under blowing or drifting conditions; and
- when the pavement temperature is below 15 degrees F or forecast to fall below -5 degrees F.



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visor John Gormont says. "The past few years, we have had a number of storms that salt brine would have been perfect for, with dry, powdery snow and little accumulation."

The township purchased a system that includes two 5,000-gallon storage tanks and an application tank for a truck. A dedicated well to provide water for the system was dug at the end of the township's salt shed, where the brine system is located. Although the municipality has not seen much savings on salt, it is paying less overtime.

"I believe there is a real value and cost savings in labor," Gormont says. "We expect payback on the system in a short time."

In its first year of brine making, the township used rock salt. This year, however, it will bid for 50 tons of solar salt to make brine and continue to use rock salt as a solid deicer.

Gormont says that the salt brine not only eliminates the need for plowing during light nuisance storms but also eases cleanup after heavier storms. The township pretreated its roads before last season's winter storm Jonas, which dumped more than 30 inches of snow on much of the state.

"It made it much easier to clean the roads after the storm," he says. "The brine system has fit us to a 'T.'"

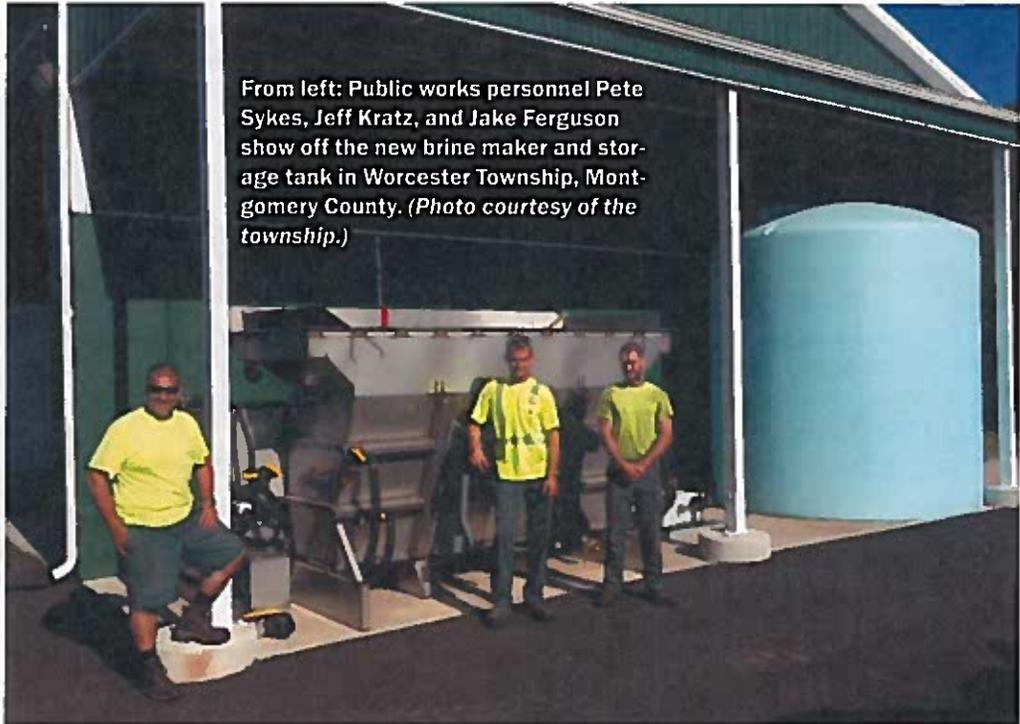
Better road safety was the motivating factor for Worcester Township in Montgomery County to purchase its first brine-making system in September. Not that cost savings didn't come into the picture, though.

"For really small storms, salt brine can be used in lieu of plowing," manager Tommy Ryan says. "If we can eliminate plowing in a storm or two each season, we can better control overtime costs."

A 6,100-gallon storage tank will hold the prepared brine, and two trucks, each with 925-gallon tanks, will apply it to the roads.

"We hope to save about 50 percent in materials that we usually put down before a storm," Ryan says. "Still, economics did not drive the decision; safety did."

This is the second municipality in which Ryan has worked that installed a brine system. In his former job, he no-



From left: Public works personnel Pete Sykes, Jeff Kratz, and Jake Ferguson show off the new brine maker and storage tank in Worcester Township, Montgomery County. (Photo courtesy of the township.)

Chemicals for ice melting differ in their characteristics

Salt and other chemicals used for pretreating roads, sidewalks, and other areas each have unique properties. Those characteristics help road departments, airports, and other users determine which one to deploy given the conditions.

Here are a few of the most common deicers:

- **Sodium chloride (NaCl)** — The most common deicer, ordinary salt is effective to about 15 degrees Fahrenheit. It is endothermic, which means it draws heat from its surroundings, and requires moisture to melt ice. It is the most corrosive and environmentally damaging of the deicers but also the most widely used.

- **Calcium chloride (CaCl₂)** — This chemical is effective to -20 to -25 degrees F. It is exothermic, which means it releases heat as it melts. A potential downside is that it pulls moisture from the air and keeps pavement moist, which can cause damage to the road surface during freeze-thaw cycles.

- **Magnesium chloride (MgCl₂)** — This chemical is also exothermic but does not release as much heat as calcium chloride. Its lowest effective temperature is 0 degrees F. At temperatures between 15 and -20 degrees F, it is more effective than sodium chloride but less effective than calcium chloride. It also pulls moisture from the air and is 53 percent water itself, which means more must be applied to get the same melting capacity as sodium and calcium chloride.

- **Potassium chloride (KCl)** — The lowest effective temperature for this chemical is about 25 degrees F, limiting its applications for ice melting. Like sodium chloride, it is endothermic, drawing heat from its surroundings.

- **Urea** — Sometimes used because it is more environmentally friendly than the chlorides, this chemical is endothermic and is effective to about 25 degrees F.

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ted a fringe benefit from the use of salt brine: public awareness.

"In West Bradford Township, I was shocked by the public reaction to the 'white lines' on the road [caused by the salt brine spray]," he says. "The township received lots of positive feedback about the public works' preparation for the storm because the brine application was more visible than the traditional salt spread. The visual resonated with folks; they could see the path driven by the trucks.

"I thought I knew all the advantages to brine, such as lower cost and ability to apply it up to 48 hours before a storm, but I didn't anticipate the 'psychology' of anti-icing with brine."

Jason Dailey, public works director for Cranberry Township in Butler County, says using salt brine on hills, intersections, and more remote roads gives the plow operators a little extra



Large brine-making systems, like this one in Cranberry Township, Butler County, require some training for the public works crew. (Photo courtesy of the township.)

time to get to those trouble spots.

"We use it on areas with known safety issues or roads that we know plows won't get to right away," he says. "We are getting fewer complaints from outlying areas, and plow operators are seeing that the snow and ice cover is melting before they get there."

The system has two 5,000-gallon storage tanks, and the township just purchased another 10,000-gallon tank. The township also has a 3,000-gallon tank of magnesium chloride that it will blend with the salt brine for use in lower temperatures.

This may seem like a lot of brine, but Cranberry has agreements with six other communities to purchase the solution. Each municipality has an electronic fob that tracks how much brine it takes each time and keeps them from going over the amount in the agreement. These municipalities are mostly using the brine for prewetting rock salt, Dailey says, which Cranberry also does. (See the box on the next page for more about selling brine to other municipalities.)

Educate yourself

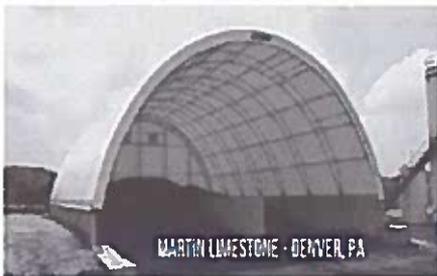
Townships that may want to begin using salt brine need to consider several things, Diana Clonch says. First, you must determine what level of service you want to provide. Do you want bare pavement or just passable roads? If you're trying to get bare pavement, you have to use liquids, she says.

Also, do you have mostly high-volume paved roads or low-volume gravel roads?

"You don't want to use chemicals on unimproved roads," she says. "For these, you typically plow and then use anti-skid."



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A member of the public works crew in Cranberry Township, Butler County, fills the brine tank on a salt truck. The brine will be used to prewet the salt as it is applied to the roads. (Photo courtesy of the township.)

Second, determine what tools you have to work with and what you will need to add if you introduce liquids. This may include a homemade or commercial brine-making system, a water source, salt, storage capacity, and a prewetting and/or anti-icing application system.

"All of this costs money," Clonch says. "You can't just look at the initial cost but also the life-cycle cost, including any savings. I know of municipalities that have introduced liquids into their program and have saved anywhere from 20 to 50 percent."

Before incorporating salt brine or any other liquids, do your homework, Clonch says.

"Become educated on the materials and when and how to use them," she urges. "You also have to understand the weather conditions and use the right materials for the conditions where you are." (See the box on page 34 for the best conditions for anti-icing operations.)

For example, crews must understand that the optimal solution for salt brine is 23.3 percent salt dissolved in water, she says. Putting more salt in is not going to lower the freezing point any more.

Also, salt brine weighs more than water — a little over two pounds more per gallon. Townships need to make sure any storage tanks are hefty enough

to withstand the added weight, as well as whatever they are sitting on. When used under the right circumstances, salt brine is a very good tool, Clonch says. The guidelines for applying different materials at different rates under certain conditions are just

that, however — guidelines, not rules. That's why public works departments must learn to determine the conditions of their own roads and know what the weather is doing and is likely to do.

"You don't just get a commercial driver's license handed to you," she says. "You have to study, be trained, and learn how to use a plow. You have to educate yourself equally to use salt brine.

"It's up to you to make sure you know what you are doing," she adds. "You are responsible for what you put down on the road."

In an article for *Snow Business*, Clonch also suggested gathering information on what other municipalities are doing and ask about best practices. Find out how they are using liquids, how it's working, and what successes and failures they have had.

Any time new equipment or processes are introduced, road crews must be schooled in calibration as well. You need to measure what you are putting down, Clonch says.

"Understanding the calibration process and when calibration may be necessary are critical elements to achieving

SELLING SALT BRINE

PennDOT sets rules for intermunicipal salt brine sales

Recently, PennDOT included a salt brine specification in Publication 447, *Approved Products for Lower Volume Local Roads*, that allows municipalities to use liquid fuels funds to purchase equipment to make, store, and distribute salt brine. It also allows municipalities that make salt brine to sell it to other municipal governments.

If a municipality wants to purchase salt brine from another municipality using liquid fuels funds, it must follow these steps:

- 1) Each municipality must file a written agreement in its liquid fuels folder. The folder must also include a letter signed by both municipalities agreeing to the price or other method of payment.
- 2) The municipality that makes the brine must keep a record of the date, time, and percentage of salt in the mixture when it is made. The seller must also test the brine's salt content on the day that the purchasing municipality receives it.
- 3) The brine should meet a reading of as close as possible to 23.3 percent salinity before it is transferred to the purchasing municipality.
- 4) The seller must include with the invoice a statement on letterhead that verifies the salt percentage and gallons purchased. Both the seller and the purchaser must retain a copy of this statement in their liquid fuels folder.

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efficiency," she wrote in an article for the *APWA Reporter*. "Over-application and misrepresented product use can be costly and detrimental on many levels."

Clonch said that at a minimum, calibration should be considered:

- at least annually;
- when new equipment is received;
- following vehicle maintenance and/or modification, especially to the hydraulics, controller, and/or auger;
- upon a change in the type of material being applied (such as *prewetted salt versus dry salt*); and
- upon signs of application issues.

Standard calibration charts and other resources can be found in the *Salt Institute's Safe and Sustainable Snow Fighting*, available at www.saltinstitute.org/road/snowfighting.

Working together

For some townships, salt brine and other liquids may not make economic sense. These municipalities will continue to rely on plowing, antiskid, and rock salt to treat their roads. Cost savings are still possible, however, especially when communities work together.

Buying salt through a council of governments or co-op can achieve economies of scale and save everyone money on their snow-fighting materials. Middle Paxton Township in Dauphin County joined with neighboring Dauphin Borough to construct a joint storage facility for salt and antiskid.

The municipalities received a county grant as a result of gaming proceeds



from the nearby Hollywood Casino. Although the township periodically shares equipment and manpower with the borough, the four-bay salt shed was the first large joint project, Middle Paxton Township supervisor Jim Fisher says.

"The borough will store salt in the first bay, and the township will store salt and antiskid in the second and third bays," he says. "The fourth bay will be a mixture of salt and antiskid."

The salt shed, which formally opened in late September, is located next to the township building, which is just across the borough line. Borough trucks will drive up to the shed, and township loaders will fill them up, Fisher says.

"It just makes sense for us to work together," he says. "It's a win for everyone." ♦

Middle Paxton Township and Dauphin Borough in Dauphin County held a ribbon-cutting ceremony for their joint salt shed in September. From left: Middle Paxton Manager Julie Seeds, Dauphin Borough Council President Steve Bomgardner, Middle Paxton Supervisor Jim Fisher, state Rep. Sue Helm, Supervisors Larry Cooney and Wilbur Evans, and Dauphin County Commissioner Mike Pries. (Photos courtesy of Middle Paxton Township.)

Follow these steps for environmentally responsible snow and ice control

There is no way to get around it: Using chemicals to fight winter weather has environmental drawbacks. A presentation by the Western Transportation Institute of Montana State University offered the following environmental best management practices for snow and ice control:

- Regulate the application of materials to prevent over-application.
- Use specialized equipment to apply the right amount in the right place at the right time.
- Use the appropriate materials for the conditions.
- Cover and store snow and ice control materials on an impermeable surface; use secondary containment for liquids.
- Calibrate application equipment.
- Train operators in proper application, calibration, and cleaning procedures.
- Practice good housekeeping at municipal garages and salt storage sheds.



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