County’s de-icing efforts keep highways clear, safe during winter

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JEFFERSON — In Wisconsin, driving in winter inevitably means dealing with two things: snow and ice. Both can be dangerous, even deadly, and need to be addressed.

That’s where local road crews come in, including those in Jefferson County.

Winter maintenance — which includes plowing, salting and anti-icing roadways — is a key part of the Jefferson County Highway Department’s duties. And in recent years, new methods have been added to its war-on-winter arsenal.

Probably the most well-known method of dealing with snow and ice is rock salt.

“Salt is really the only product that’s chemically able to remove ice or snow,” Jefferson County Highway Commissioner Bill Kern said. “Mechanically, that’s why we plow. We remove snow mechanically with our plows, but you get to a certain point in storms and the plows are only so effective, or you get behind and all you’re going to start doing is creating a icepack on the roadway.”

GOODBYE SNOW AND ICE

GOODBYE SNOW AND ICE — In 2008, the Jefferson County Highway Department began to use liquid salt brine as part of its winter maintenance operations. However, use of the brine was limited until last year when the department moved to a new facility and was able to begin mixing its own brine. Employees now use two processes involving liquids: anti-icing and pre-wetting. That’s in addition to mechanical means of plowing snow and ice. For more photos, click here. — Daily Union photos by Alexa Zoellner.

Icepacks form when traffic runs over snow on roadways, Jefferson County Highway Department superintendent Greg Koeppel said. The ice adheres to the road and there would be “nothing but ice, and inches of it.”

Using salt on roadways is the same concept as putting oil in a frying pan, Kern said.

“You’re trying to break that bond on the roadway by having some kind of product there,” he said. “If you can get something down on (the road), you can help assist in breaking that bond of the icepack really forming hard on the pavement.”

In the past, the Jefferson County Highway Department exclusively relied on rock salt for winter maintenance de-icing operations. Today, that no longer is the case.

"About 2008, we started adding liquid tanks to our plow trucks," Kern said. "It took about three or four years to get tanks on all of our trucks, but at that point, we started using liquids — liquid salt brine — for helping fight storms. Prior to that, it was primarily plowing and using rock salt for de-icing the roadways."

The main reason using liquids is important? Rock salt is expensive, and adding the brine mixtures reduces the amount needed.

At a cost of about $71 per ton from the Wisconsin Department of Transportation (WisDOT) bid, rock salt might not seem that expensive. However, when close to, or more than, 10,000 tons of rock salt is being used per winter, those dollars start to add up.

"First and foremost, the whole reason for doing this — for applying the liquid chemical — is to reduce the amount of rock salt (used)," Koeppel said. "What we're seeing is about 25-percent less salt usage throughout a given year, or a given storm, for that matter. What we used to use on a six-inch snowfall, it's 25-percent less now with using the brine."

There are two processes when using liquids, Kern explained.

"The one process is a pre-wetting," he said. "That's where the guys actually have liquid tanks on their plow trucks and they actually use the liquids with the rock salt as they put it on the roadway. The other process is anti-icing, which is actually going out before the storm and applying a salt brine mixture to the roadway before the storm happens."

While the department has been using brine mixtures as part of winter maintenance for several years, it wasn't until last year's move to the new highway shop that they were able to mix their own brine and expand into anti-icing.

"One of the limitations we had (prior to the move), was that we really didn't have any kind of mixing facility," Kern said. "So we had a few tanks that we were able to purchase and we were able to use those for doing some brine mixing. At that point, we used brine from other counties and tankered that in — typically from Waukesha County is where we got it from for several years — bringing it (to Jefferson County) on tanker trucks and then use that out of the tanks for the pre-wetting."

Kern said that, by having its own mixing facility, the department does not have to have someone on the road at least one to two days a week just driving back and forth between counties to purchase brine.

"We were having to take tanker trucks and run over to Waukesha County to their highway department," Koeppel explained. "We had to buy a tanker load of brine at a time, bring it back to Jefferson County, pump it in our tanks, and from there, we'd have our salter trucks come and fill up and then go out and apply it to the road. Now, it's right here. It's all automated. It's a lot easier now to keep track of usage, costs, and we never run out."

With the limited storage at the previous highway facility, running out of brine was not uncommon.

"We only had a limited amount of storage for the brine and if we got a good size storm, we'd run out," Koeppel said. "We only had so much on hand. Of course, we could send the tanker back to Waukesha to try to get another load, but they're trying to do the same thing we are and the supply would get tight at times, not to mention the cost of trucking is huge."

The trucking and labor costs were a "headache," according to Kern. All of that was on top of the price of the brine.

"I think it was right around 30 cents per gallon is what we were purchasing (the brine) for," he commented. "That's just the material costs; it's not the labor or trucking costs. We're still calculating numbers from this winter, but we're thinking somewhere in the 25-cent-per-gallon range right now for the liquid salt brine."

The mixing facility at the Jefferson County Highway Department has the capability of producing 3,000 to 5,000 gallons of brine produce an hour that can be stored in six, 6,000-gallon tanks.

There are several salt brine mixtures utilized by the department, according to Koeppel. Whether straight salt brine is used or other substances are added depends on the weather and what process is taking place.

Pre-wetting typically uses one of two brine mixtures: straight salt brine or salt brine and calcium chloride. Straight salt brine is made by mixing water with rock salt so there is a concentration of approximately 23.3-percent salt. The calcium chloride mixture is 90- to 95-percent salt brine and 5- to 10-percent calcium chloride.

Pre-wetting, which takes place during a winter "event," involves the rock salt being sprayed with the brine solution as it goes through the spreader and comes down to the spinner.

"It's the same product (rock salt), but we're wetting the salt before it hits the roadway," Koeppel said. "There's a couple different reasons why we do that. Number one, it starts the salt activating quicker. It's already working with its own moisture, so it starts to activate very quickly. Number two, it sticks to the road better. Instead of being dry rock salt and bouncing so much, it has a tendency to stick to the road."

Anti-icing, which takes place prior to a winter event and does not involve straight rock salt, uses a 90-percent salt brine, 5-percent calcium chloride and 5-percent beet juice mixture.

"We can get some extra life on the roads with salt brine by adding beet juice to it," Koeppel explained. "The reason for that is, the beet juice seals (the product) down on the road. It adheres it to the road and makes it stay longer.

"Salt brine by itself, in a few days, it'll get dry and dusty," he continued. "Then, a couple days after a snowstorm, you see that white haze in the air — that's the dry salt residue blowing off. It's great if you use it within a couple of days, but if you're going to stretch out four, five, six days, you add some beet juice to it, it seals it down and keeps it there. It doesn't dissipate."

The purpose of the calcium chloride in both the pre-wetting and anti-icing processes is to lower the freezing point of the solutions.

"Let's say we know we're going to have below-zero temperatures, the salt and the salt brine itself doesn't have as much power to work with as it gets colder," Koeppel said. "But now we add a little calcium chloride with that, and now the stuff works in below-zero temperatures, just by adding a few percentages of calcium chloride to it in this mixture."

The Jefferson County Highway Department performs pre-wetting on 390 lane-miles of state highways, including parts of Interstate 94, U.S. Highway 16, State Highway 26 and U.S. Highway 12, and 521 lane-miles of county trunk highways and various town highways. For anti-icing, the department covers bridge decks, Interstate 94, State Highway 26, Highway 16, parts of Highway 12 and several county highways.

The brine mixtures cannot completely replace the rock salt, Kern pointed out. The rock salt still is needed — just not as much of it.

That doesn't stop employees from complimenting the success of the anti-icing efforts.

"I am so impressed (with this process)," Koeppel said, giving it two thumbs up. "I really am. … On the lighter (storms), the brine will take care of it. On the heavier storms, we're still going to have to send trucks out, but it's going to buy us a couple of hours. In the beginning of the winter season, there were three particular events — one was a frost event, the other two were light snows — that we went out and did the anti-icing.

"We were just getting this thing fired up this year and were really wanting to experiment and see what this could do for us," he continued. "Those three particular times, we did not have to call any of our guys in to come jump in a truck and mechanically do anything. We sat and watched (the snow and ice) melt off (the roads) through our windows at home."