No salt, please

Municipalities cut back on road salt

WELCOME TO WINTER. Depending on where you live, you may or may not have seen that telltale sign that winter has truly arrived – a salt truck splashing its contents as you struggle along an icy path.

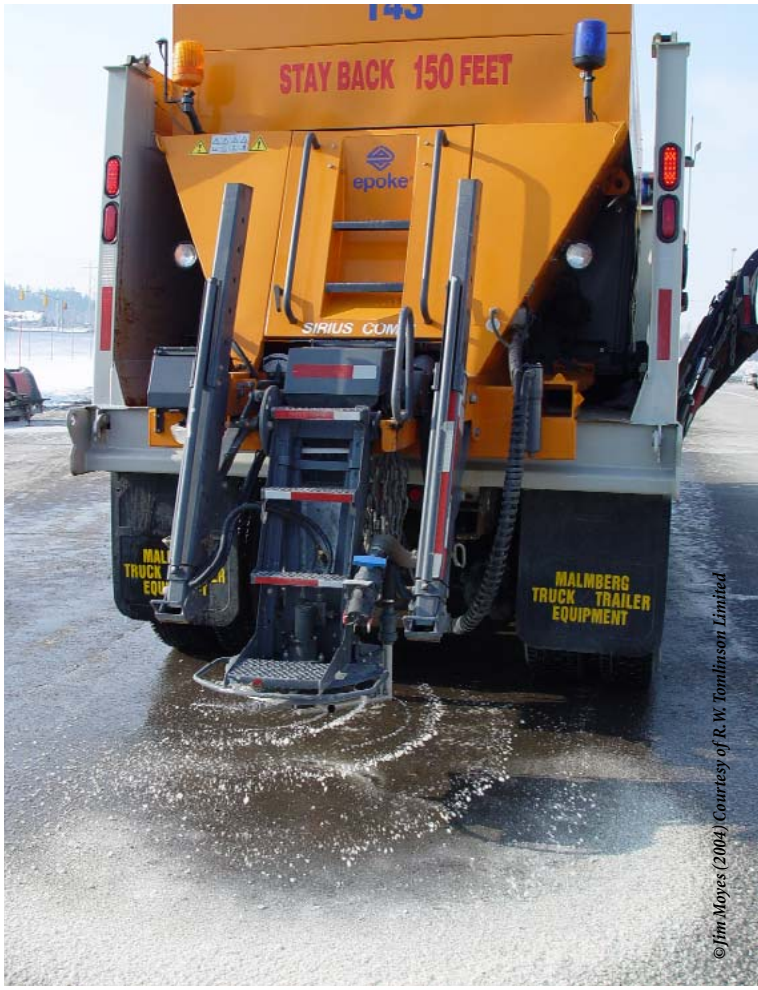
Haven't seen that usual salt truck lately? Perhaps your municipality is part of the wave of change across Canada that is helping reduce this country's dependence on road salt for winter road maintenance.

In 2001, Environment Canada released a five-year scientific assessment that determined that in sufficient concentrations, road salts pose a risk to plants, animals and the aquatic environment. Then, in April 2004, the federal government published a *Code of Practice for the Environmental Management of Road Salts*. The code is designed to help municipalities and other road authorities better manage road salt use to reduce environmental harm while maintaining road safety. And while the government did *not* ban road salts, the discussion around the issue has encouraged city managers to combine improvements in salt storage and use with new chemicals and technologies.

Examples include:

- Anti-icing: application of de-icers before a frost or snowfall to prevent snow and ice from forming a bond with the road.
- Pre-wetting: adding a liquid to solid de-icers or abrasives before application to quicken melting and improve material adherence to the road.
- Electronic spreader controls: these minimize salt wastage by ensuring that the appropriate spreader rate is achieved. Modern groundspeed spreader controls manage salt dispersal based on a vehicle's speed, maintaining consistent and accurate material applications.
- A road weather information system (RWIS): a network of roadway sensors providing real-time, accurate and site-specific pavement surface conditions and weather data, allowing road maintenance decisions to reflect current weather conditions.
- Fixed automated spray technology (FAST) and advanced road weather information systems (ARWIS): these work together to apply anti-icing chemicals in advance of an icing condition.

The result of all of this has been new responses to winter conditions across Canada, with some impressive results. (See



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New model salt spreader hard at work.

Environment Canada case studies at **www.ec.gc.ca/nopp/roadsalt/cStudies/en/index.cfm**).

Take Nova Scotia, the third largest salt-using province behind Quebec and Ontario. Due to fluctuating temperatures and a high number of freeze/thaw cycles because of its proximity to the Atlantic Ocean, an average of 280,000 tonnes of salt per year are added to provincial roads.

The Nova Scotia Department of Transportation and Public Works installed five RWISs in 1995. When a RWIS station is installed, a pre-wetting program is also launched, brine-making equipment is purchased, and salt trucks are retrofitted to enable pre-wetting. The pre-wetting system alone led to a 10 percent reduction in salt use in 2002/03. The department also contracts with the Meteorological Service of Canada (MSC) for forecasting services, including site-specific atmospheric forecasts and pavement temperature and condition forecasts.

Paul Richard, operations analyst for the transportation department's Highway Operations, told *Summit* that the RWIS network will be expanded from 19 to 31 sites. "This will cover all of our National Highway System network at a spacing of 25 to 40 kilo-

metres between sites," he says. "We are also expanding our brine-making capacity and the number of trucks with brine-dispensing units."

In 2001, the City of Toronto became one of the first municipalities in Canada to develop and implement a salt management plan, which included upgrading equipment with electronic spreader controls, introducing pre-wetting and anti-icing techniques, and installing RWIS throughout the city. New salt-handling practices were also introduced, which provided training to operators and management staff, and created communications and monitoring programs to support these changes. The result: more than $1 million in savings for the winter of 2001/02.

Add that to a FAST system installed on the Highway 401/416 interchange ramp near Prescott, Ontario, which led to a 100 percent reduction in accidents without applying any road salts containing chlorides. A cost/benefit analysis showed the investment was recovered in the first year of operation. Ontario is now planning to install similar systems elsewhere in the province.

Bob Hodgins, president of EcoPlans Ltd, in Kitchener, Ontario, a team of environmental consultants who authored several of the Environment Canada case studies, says the biggest challenge for municipalities is how to develop and implement effective salt management strategies in a climate of fiscal restraint.

"Unfortunately, it is not always easy to convince those that control the purse strings in a municipality that it requires investment in equipment, materials and labour to realize significant savings in winter maintenance operations," he says. "It takes a strong champion to lead the charge against a formidable foe – institutional inertia."

This "inertia" is rooted, he says, in half a century of road maintenance habits and fear of change that carry costs and risks. The key, he says, is for municipalities to use a pilot project approach to introduce new methods and technologies and then to "get some early wins and invest the savings into the next improvement."

The 4 Rs of material use are key to effective salt management, says Hodgins: 1) use the right material, 2) in the right amount, 3) in the right place, 4) at the right time. Here is a brief overview of the current trends in equipment, material and labour according to Hodgins.

Whether using chemicals, such as salt, or abrasives, such as sand, it is important to use only the amount needed and to keep it there long enough to work. New groundspeed-oriented electronic controllers meter out salt or sand at the right amount regardless of truck speed, unlike the old system which required the truck operator to maintain fairly constant speed – impossible in a busy urban settings. The new spreaders must be properly calibrated and each time the spreader is serviced the calibration must be checked.

Applying material at the right time is also important. Salt was traditionally applied after snow accumulated. The salt would then have to melt through the snow to the road surface to break the snow/pavement bond. This is time-consuming and chemical-intensive.

Today, better storm tracking allows chemicals to be placed on roads early enough to prevent the bond, which requires less salt and early road clearing.

Previously, snow and ice control decisions were made based on generic weather reports from local radio or television stations. Modern snow fighters get specialty forecasts tailored to their area; larger municipalities and the provinces use their own mini-weather stations with in-road sensors, or RWIS sites.

While weather forecasts are based on air temperatures, pavement temperature is the most relevant to snow-fighting decisions. Frost only occurs on road surfaces if pavement temperature is below the dew point and below freezing. Pavement temperatures are usually warmer than air temperatures. Infrared thermometers are now mounted on trucks to monitor actual pavement temperatures.

"This can save wasted chemicals, but more importantly can improve safety by having a more timely response to deteriorating road conditions," says Hodgins.

Spreaders are also changing. Solid salt does not melt snow or ice; it must first dissolve in water to form brine, which does the melting. Today, brine is applied to roads rather than solid salt, often from tanks holding a liquid chemical sprayed onto the sand or salt as it is applied. This "pre-wetting" technique helps salt work faster and keeps it from bouncing off the road.

Many are taking this further by "anti-icing" or spraying liquid chemicals directly onto the road. The liquid prevents frost and black ice or a snow/pavement bond from forming. It also uses much less salt. However, using straight liquids requires properly trained snow fighters and good pavement temperature information.

The two key changes in materials are a reduction in the amount of salt used in sand/salt mixtures and the use of liquid chemicals for pre-wetting salt and sand or for anti-icing.

Many municipalities still use sand/salt mixtures as high as 50 percent for roads, says Hodgins. However, the trend is to use only 3-5 percent salt in the sand to keep the pile from freezing so it can be spread and used where traction is needed. If roads must be plowed clear, then straight chemicals are used.

The second trend is the use of different liquid chemicals depending on temperatures. Sodium chloride tends not to be used below -7° to -10°C; calcium chloride and magnesium chloride can be used at much lower temperatures. There are also manufactured liquids on the market that use agricultural products with lower operating temperatures.

And all the new techniques require operator training plans, says Hodgins. He cites new training products available through the Ontario Good Roads Association, the Transportation Association of Canada and the Salt Institute. "Simply by training supervisors and operators on the 4 Rs of salt management, municipalities can achieve a 10-20 percent savings in salt use through reducing waste," he says. "This savings can help to finance equipment improvements."

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