

COMMITTEE OF THE WHOLE JUNE 17, 2002

WINTER DE-ICING MIXTURE

Recommendation

The Commissioner of Engineering and Public Works recommends:

1. That sand be eliminated from the current mix of de-icing material used in urban areas, except when specifically designated for use by the Director of Public Works; and,
2. In consultation with the Director of Purchasing Services, that notwithstanding the current Purchasing Policy and Procedures, staff be authorized to purchase up to 6,000 tonnes of "ClearLane" de-icing mixture from Cargill Limited, Pickering Ontario, at \$71.01 per tonne (delivered and including taxes), for the purposes of conducting a trial in the 2002 – 2003 winter season, to be used in the west portion of the City.

Purpose

To advise Council of the elimination of sand from the de-icing mixture, and to seek authorization to purchase new and emerging technologies to use on a trial basis.

Background - Analysis and Options

A. Elimination of Sand From De-icing Mixtures Used in Urban Settings

For a number of years, the Public Works Department has used a mixture of salt and sand as de-icing material for roads and sidewalks. On the City's gravel roads in the rural areas, the mixture is 90% sand and 10% salt. The salt is added to the mix to ensure the sand does not freeze when stored in the piles, and to ensure that it spreads evenly across the road surface. On gravel roads, the purpose of the material is to provide a friction layer between the vehicle tires and the snow. Too much salt would cause the road to thaw, creating ruts and potholes.

The current mixture that is used in the City's urban areas is based on 70% salt and 30% sand. The higher salt content is designed to provide de-icing capabilities on paved roads, as well as ensure the sand does not freeze.

The Ministry of Transportation recommends that salt be applied at a rate of 130 kilograms per kilometer of two lane highway, to a maximum of 170 kilograms per kilometer of two lane highway. In order to ensure that there is an adequate salt content on the road to prevent snow and ice from freezing to the pavement, significant amounts of material are needed when performing a salting/sanding operation. To achieve the Ministry's desired rate of salt on the road, 185 kilograms of the current 70/30 mix is required to achieve the minimum rate, and 242 kilograms of material is required to reach the maximum salt content. If the mixing of the salt/sand mixture is not totally accurate, i.e. not enough salt, additional material is required to be placed on the road. The maximum current rate set by the Manager of Road Maintenance Services is 310 kilograms of 70/30 mix per two lane kilometer.

The inclusion of sand in the de-icing mixture causes a number of problems.

- As more material is used, larger storage facilities are required, requiring additional expenditures.

- Spring street sweeping takes longer due to the volume of material on the road to be cleaned up. Currently, it takes approximately 4 weeks to clean the entire City, using 10 street sweepers. As there is so much material left on the road at the end of the winter, the sweepers are constantly having to empty their loads, resulting in less actual sweeping time per day.
- The use of sand creates additional dumping expenses for the street sweeping operations. Once the Keele Valley landfill site is closed, alternative, more expensive, locations will need to be used in order to dispose of this material.
- During the wet rainy periods, the sand also ends up being washed into the City's catch basins. Although most of the material will go into the sump, during a heavy rainfall, some will travel into the sewer pipes, increasing cleaning requirements. Some will flow out to the outfalls and become sediment in the streams, rivers and ponds.
- The sand in the catch basin sump must be disposed of at a landfill site, at a cost to the City.
- During dry periods in the spring, the sand on the road creates dust.

Studies also indicate that sand contributes to a high airborne particulate matter (PM), which is inhaled and can cause respiratory problems. The research in Albany, NY, Denver, CO, and Reno, NV studied the impact of sanding on ambient particulate loadings and found that sanding contributed from 44% to as high as 75% of the total PM.

As a result of the studies, changes were made to winter maintenance operations to reduce or eliminate the use of sand, and in addition, new standards were developed for street sweeping operations in Denver.

Furthermore, sand provides no de-icing capabilities. The objective of the City's winter maintenance procedures is to provide bare pavement as quickly as possible, in order to ensure that the City's residents are impacted as little as possible. Sand does nothing to provide a bare pavement condition.

As a result of the above, it is recommended that the City eliminate the use of sand in its de-icing mixture in the urban areas, and sodium chloride (rock salt) be applied at rates not greater than those recommended by the Ontario Ministry of Transportation.

Notwithstanding the above, sand in the de-icing mix is of assistance when significant amounts of freezing rain are experienced. The sand does provide traction in such circumstances. As such, a small amount of the 70/30 mix will be available for use during such storms, as designated by the Director of Public Works.

B. Use of New Technologies / Alternative Chemicals

Over the past few years, a lot of attention has been given to the use of road salt. As a result, numerous technologies have been tried to increase the effectiveness of the salt, while at the same time, reduce the amount needed to maintain safe road conditions. These technologies include the use of pre-wetting devices (both for use in the storage facilities, and on-board the spreader vehicles), as well as the development of new types and mixtures of de-icing materials.

On-board pre-wetting systems would require significant changes and modifications to the City's entire in-house and contracted fleet of spreader vehicles. In addition, storage tanks would be required at each salt storage facility to house the liquid. As such, on-board de-icing is not something that Public Works staff are investigating at this time.

As many municipalities do not want to change over equipment, or incur additional modifications to vehicles, chemical companies have been trying to develop alternative chemicals, or alternative mixtures using sodium chloride (salt) as the base.

Cargill Limited has produced one such modified salt product, and it is called "ClearLane". This product combines traditional road salt, with magnesium chloride and cane molasses.

The addition of magnesium chloride increases the effectiveness of the salt, providing lower operating temperatures. Traditional road salt becomes ineffective when road and air temperatures reach -12 C. The addition of magnesium chloride lowers this temperature to -15C, and also leaves a residue on the pavement to prevent early freeze-up after the roads have been ploughed.

The cane molasses is a food grade USDA approved product. Its addition to the mix reduces the amount of stray salt from leaving the roadway. Normally, salt will bounce when applied. At times, this results in material not always being where it would do the best job. With the tackiness created by the molasses, the bounce factor is significantly reduced. Users of the product indicate that it can be applied at rates 20 – 40 % less than traditional straight road salt.

Current prices for de-icing materials are as follows:

Salt \$53.19/tonne (filled before October 31 each year), inc. taxes and delivery
 \$54.63/tonne (filled after October 31 each year), inc. taxes and delivery

Sand \$9.86/tonne, inc. taxes and delivery

Stockpiling and mixing \$1.61/tonne

ClearLane \$71.01 including taxes and delivery

The following table shows the cost per two lane kilometer for various de-icing materials.

| Material | Spread Rate | Cost / km |
|-------------------|-------------|-----------|
| Straight Salt | 130 kg/km | \$6.92 |
| Current 70/30 Mix | 185 kg/km | \$7.59 |
| ClearLane | 104 kg/km | \$7.55 |

- ClearLane recommended application rate is 20% less than straight salt
- Prices based on existing tender results and a quotation from Cargill Limited, plus stacking cost of \$1.61 per tonne (104/1000 x \$72.62)
- 70/30 mix cost based on \$41.01 for 1000kg of mixed material (185/1000 x \$41.01)

As can be seen, the change to an alternative de-icing agent would cost less per lane kilometer than using the current mix of sand and salt, yet it is higher than going to 100% salt. If it is found that the ClearLane can be used at rates less than 80% of the recommended salt application rate, it would become as economical as straight salt, with the added benefits of reduced bounce, lower operating temperatures, as well as overall reduced salt use per kilometer.

In an effort to fully investigate the use alternative de-icers, it is recommended that Public Works staff be authorized to conduct a trial using the ClearLane product during the 2002-2003 winter season, and a report be prepared at the end of the season outlining the costs, and effectiveness of this product. The trial would involve the use of approximately 6,000 tonnes (enough to fill one salt dome), and would run the entire winter season.

Conclusion

By eliminating sand from the de-icing mixture used in urban settings, there will be less material on the road in the spring to clean up and dispose of, less dust produced, existing storage facilities can be better utilized and new storage facilities can be made smaller.

The trial use of alternative de-icing materials will allow staff to determine the cost effectiveness of such materials, allowing the City to move towards reduced salt application without any negative impact on road safety. For the upcoming winter season, it is recommended that a trial be undertaken using Cargill Limited's "ClearLane" product.

Attachments

N/A

Report prepared by:

Brian T. Anthony, Director of Public Works

Respectfully submitted,

Bill Robinson, P. Eng.
Commissioner of Engineering and Public Works

Brian T. Anthony
Director of Public Works