

SALT &

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Highway Deicing™

for the WINTER MAINTENANCE PROFESSIONAL

Anti-icing With Salt Brine. . .A Key Tool For Winter Maintenance Arsenals In The 21st Century

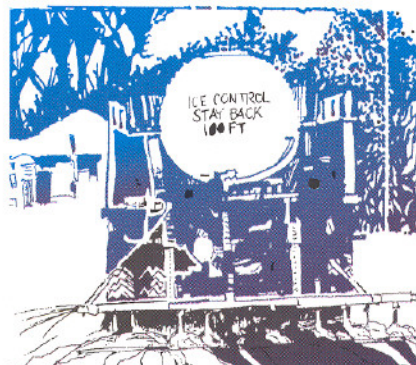
A relatively new weapon in the snowfighter's arsenal in North America is anti-icing. But it has a long history of keeping European roads safe and passable.

Anti-icing measures take place before snow falls and ice forms on the roadway. They aim to prevent the bond of frozen precipitation to the road surface. In some circumstances, anti-icing can dramatically cut the cost of maintaining a safe road surface over conventional deicing. Anti-icing chemicals are applied in liquid form (brine) to road surfaces just before a snow or ice storm. Liquid sodium chloride (NaCl) is the most effective choice for anti-icing above 15°F.

Anti-icing has many advantages.

- The roadway surface is never "lost." Snowfighters respond pro-actively.
- Anti-icing returns road surfaces to normal faster, resulting in fewer accidents and delays.
- Using a liquid ice-melter jumpstarts the melting process because salt needs moisture to be effective.
- Brine doesn't bounce or blow off the road surface so material is more efficiently used.
- If the storm is delayed, salt residue remains on the road ready to begin work when precipitation begins.
- Crews can cover more territory by beginning treatment in advance of a storm.
- Increased efficiency results in use of less salt, minimizing environmental concerns.

Anti-icing products available include sodium chloride, calcium chloride, magnesium chloride, potassium acetate, and calcium magnesium acetate. Each product has its own advantages and dis-



■ "Iowa found salt brine with its eutectic temperature of -6°F works as well as liquid CaCl₂. Liquid calcium chloride is extremely expensive at 63 cents/gallon compared to salt at 6 cents/gallon."

—Tom Donahey, Director of Maintenance Programs, IADOT

advantages. The most common material in use is sodium chloride (salt) brine made from a mixture of rock salt and water. Salt brine will work to -6° F and is a proven anti-icing agent in use throughout the snowbelt.

Some agencies use calcium or magnesium chloride in a brine solution which is effective at lower temperatures, but is more than six times as expensive than salt, and is more difficult to handle. Also, calcium and magnesium chloride residue on road surfaces can attract moisture at lower relative humidity than salt that may result in dangerous, slippery conditions under certain circumstances.

Salt Brine Manufacture

Salt brine is made by mixing rock salt or solar salt with water. Brine concentration should be approximately 23% NaCl. The proportion of salt to water is critical to the effectiveness of the brine. Too much or too little salt affects the freeze point depressing qualities of the brine. The proper brine mixture is 23.3% salt content by weight. This is the concentration at which salt brine has the lowest freezing point, -6°F. It is known as the eutectic point. Salt concentration is measured with a salometer, a specialized hydrometer. Salt is added to the water until an 88.3% salometer reading is obtained. This results in the proper 23.3% salt content.

Commercial brine makers are available at a cost of approximately \$5,000.

Hydrometer / Salometer Chart for Salt Brine

% Salt	Hydrometer Specific Gravity	Salometer Using 0 - 100%
0	1	0
1	1.007	4
2	1.014	7
3	1.021	11
4	1.028	15
5	1.036	19
6	1.043	22
7	1.051	26
8	1.059	30
9	1.067	33
10	1.074	37
11	1.082	41
12	1.089	44
13	1.097	48
14	1.104	52
15	1.112	56
16	1.119	59
17	1.127	63
18	1.135	67
19	1.143	70
20	1.152	74
21	1.159	78
22	1.168	81
23	1.176	85
24	1.184	89
25	1.193	93
26	1.201	96
27	—	100

—see Anti-icing page 3

Salt Institute Presents:

Awards For Excellence In Storage

Six salt storage facilities have won national recognition for the environmental sensitivity of their programs as 1999 winners of the Salt Institute's twelfth annual "Excellence in Storage Award" competition. They were selected from among a record number of applicants and include:

- The City of Lynchburg Salt Storage facility, Lynchburg, VA
- The City of West Des Moines Salt Storage facility, West Des Moines, IA
- The Nashua Maintenance Salt Storage facility, Nashua, NH
- The Town of Clifton Park Salt Storage facility, Clifton Park, NY
- The Town of Yorktown Salt Storage facility, Yorktown Heights, NY
- The Village of Lake Zurich Public Works Salt Storage facility, Lake Zurich, IL

In addition, fifteen winners from previous competitions were recognized for "Continuing Excellence In Storage." These include: Mount Prospect Public Works in Mount Prospect, IL; the City of Geneva, IL; the City of Elgin Salt Storage facility in Elgin, IL; the City of

Kalamazoo, MI; Wright County Highway Department Salt Storage facility in Buffalo, MN; Orangetown Highway Department in Orangetown, NY; Supplemental/Regional Salt Storage facility, Columbia County Highway and Transportation, Wyocena, WI; the Town of North Salem Highway Dept. Salt Storage facility, North Salem, NY; the Village of Addison in Addison, IL; the Village of Northbrook Public Works Center Bulk Storage facility in Northbrook, IL; the Village of Buffalo Grove, IL; the City of Marquette Service Center in Marquette, MI; the Village of Schaumburg, IL; the City of Crystal Lake, IL; and the Village of Arlington Heights, IL.

"These outstanding public works managers deserve credit for the time, effort and professionalism they've taken to invest tax dollars in storage facilities for the salt they use to keep roads and streets safe and passable during winter conditions," noted Salt Institute President Richard L. Hanneman. "This honor recognizes their high standards of environmental protection and worker safety."

Successful applicants meet rigorous standards which include employee

safety programs, proper facility "house-keeping" measures, and protection against rain or snow. "Winners exemplify state-of-the art commitment to environmental and worker protection," explained Andrew C. Briscoe, Public Policy Director of the Salt Institute who chaired an "outside" panel of experts which determined the awards.

Applications for the year 2000 competition may be obtained from the Salt Institute's website or contacting the Institute at:

700 N. Fairfax St., Suite 600
Alexandria, VA 22314-2040
703/549-4648
fax 703/548-2194

or e-mail: info@saltinstitute.org.

Facilities must have been in operation one full year to qualify for entering the Excellence In Storage Award contest. Deadline for completed applications is May 26, 2000.

The Salt Institute is the North American trade association of salt producers and has had a "Sensible Salting" program encouraging proper environmental management of highway salt for nearly thirty years.



**City of Lynchburg
Salt Storage Facility
Lynchburg, VA**

**City of West Des Moines
Salt Storage Facility
West Des Moines, IA**



**Nashua Maintenance
Salt Storage Facility
Nashua, NH**



**Town of Yorktown Salt Storage Facility
Yorktown Heights, NY**

**Town of Clifton Park
Salt Storage Facility
Clifton Park, NY**

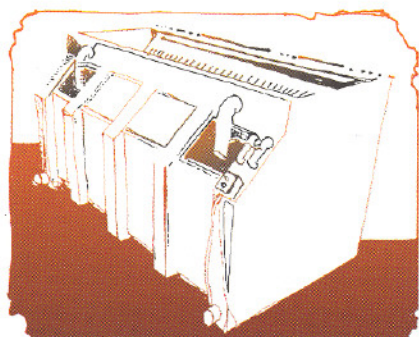


**Village of Lake Zurich
Public Works
Salt Storage Facility
Lake Zurich, IL**



Anti-icing

-continued from page 1



■ Commercial brine making equipment is available for approximately \$5,000.

Many agencies have less costly do-it-yourself brine makers, assembled using water tanks and PVC pipe. Brine is usually made at the local maintenance facility sites and stored in large tanks in locations convenient for loading into saddle tanks on the sides of the V-box or anti-icing equipment.

Application Equipment

Brine applicators are commercially available for about \$1,000. Some agencies have manufactured their own application equipment using large tanks and PVC piping. Some equipment is designed to be loaded onto the bed of spreading trucks, towed behind maintenance equipment or permanently mounted on truck beds. It can be as sim-

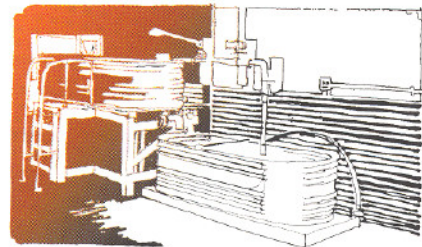
ple as a gravity fed spraying system with a operator controlled cut-off valve or a more complex (and more controllable) pump driven sprayer system. Control should be available to vary spreading rates from 25 to 60 gallons per lane mile.

If large, horizontal tanks are used in the design, consider installing baffles inside the tanks to help prevent the liquid from suddenly shifting in the tank, creating a hazardous control situation for the operator.

Application

Accurate weather and road surface information are critical for the efficient use of anti-icing chemicals. Road surface temperatures, precipitation amounts and form, wind conditions, and road environment (sunlight exposure, surface condition, bridges, etc.) all affect the use and application of anti-icing measures.

Understanding the freeze point depressing qualities of brine is important to its use and application as an anti-icing agent. See the Phase diagram below. As you can see from the chart, the minimum freeze point of salt brine is -6°F at a concentration of 23.3% NaCl. Road surface temperatures are indicated on the side of the chart, solution concentrations along the bottom. The line represents the freeze point of the solution at a given temperature. The colored portion in the center of the chart shows the melting range of brine solutions. The area to the left shows the re-



■ Some Iowa agencies have made their own brine making equipment for approximately \$1,000.

sults of a solution with too little salt, the road surface will refreeze unless more salt brine or deicing salt is applied. The area to the right shows the results with too much salt, and once again the surface will freeze without the introduction of more moisture. As you can see, additional precipitation and heavy traffic can dilute the brine solution allowing the road to refreeze. **ADDITIONAL PRECIPITATION ALWAYS RESULTS IN A DILUTION OF BRINE AT THE ROAD SURFACE.**

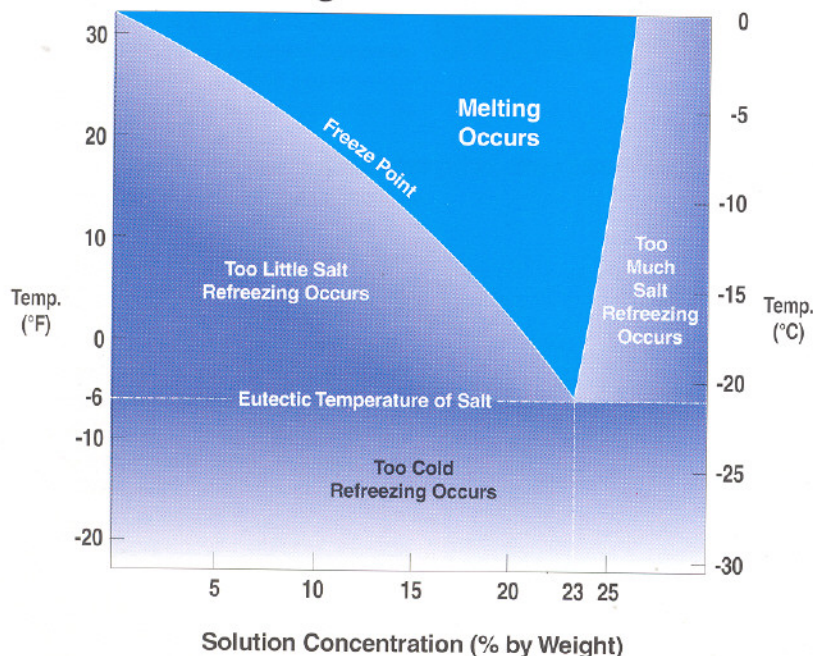
Weather information is getting better with the introduction of doppler radar reports, often distributed over the Internet or to subscribers of weather service providers. RWIS costs continue to drop as the technology becomes more frequently deployed. Everything from air temperature, dew point, optical weather identifiers, to pavement temperature, surface status, and chemical information is available. Some agencies utilize remote television cameras to monitor traffic and bridge conditions. This information will help agencies accurately determine the appropriate application of anti-icers.

Success Stories

More than 16 U.S. states regularly use anti-icing or are experimenting with how it fits into their winter maintenance programs. Leading the way are Iowa and Illinois.

Iowa was one of fifteen states involved in a 3-year SHRP anti-icing project starting in the winter of 1993-94. Iowa chose to test salt brine as its anti-icing test material. The pilot results were so successful that Iowa continued to use salt brine and has expanded its use to the point during the 1998-99 winter season, IA DOT used four and half million gallons of salt brine. Its fleet of 1,000 snowplows all have the capability to apply liquid for prewetting and a num-

Phase Diagram for Salt



Anti-icing

—continued from previous page

ber of units are designated strictly for anti-icing. You may want to order the Iowa DOT's 30-minute video with the particulars. Contacts in Iowa to call for more information include: Dennis Burkheimer, IA DOT Winter Operations Administrator in Ames at 515/239-1355 or fax 515/239-1005; Tom Donahey, director of maintenance programs at IA DOT at 515/239-1388; and Charles Pickett, highway maintenance supervisor for IA DOT who can provide you information on building your own brine maker phone 515/225-3322.

The Illinois Department of Transportation, Division of Highways, Bureau of Operations, has produced an excellent 68-page manual in September 1998 entitled "Guidelines for Liquid Chemical Application for Snow and Ice Control." Contact Elizabeth Hawk at IL DOT, phone 217/782-2984.

Also, the Federal Highway Administration has invested in promoting the use of anti-icing via a new video titled "The New Generation of Snow and Ice Control." Copies of the new FHWA video can be obtained by calling:

202/366-1557 or faxing them at 202/366-9981.

Summary

Anti-icing measures are an important weapon in the snowfighter's arsenal. The appropriate use of anti-icing techniques results in:

- Returning to bare pavement conditions more quickly, saving lives and reducing property damage due to fewer accidents, as well as

the reduction of traffic delays and avoiding the resulting reduction of losses to local economies;

- Reduction in the quantity of deicer use, resulting in cost savings and less environmental concerns; and
- Reduction in the manpower necessary to maintain safe road conditions, resulting in less overtime costs, less operator fatigue and safer working conditions.

MEETINGS DOWN THE ROAD

International Public Works Congress & Exposition

September 18-23
Denver, Colorado
816/472-6100; fax 816/472-1610
e-mail: apwa@apwa.net

Planning meeting for the Transportation Research Board (TRB) Fifth International Symposium on Snow Removal and Ice Control to be held in Sept. 2000

September 20-22, 1999
Roanoke, Virginia
Contact TRB 202/334-3472; fax 202/334-2299

1999 Annual Conference and Exhibition of the Transportation Association of Canada

September 26-29
Saint John, New Brunswick, Canada
Gilbert Morier or Marc Comeau or call 613/736-1350; fax 613/736-1395

Transportation Research Board Annual Meeting

January 9-13, 2000
Washington, DC
Contact TRB 202/334-3472; fax 202/334-2299

Visit The Salt Institute's Website For Information On Highway Deicing Salt

For up-to-date news and information on winter highway maintenance including the use of highway deicing salt, check out the Salt Institute website at:

www.saltinstitute.org

The website contains basic information on deicing, news bulletins about developments in the field, links to other agencies, research facilities, and on-line weather services and an easy means to order SI training and public education materials or send e-mail to SI staff.

And...“Sensible Salting” Training Materials

If you've used Salt Institute publications such as *The Snowfighters Handbook*, you may want to get materials free online. Check out the online “Sensible Salting” materials at:

www.saltinstitute.org/43a.html

And let us know what other materials we can provide via the Internet to help you get ready to fight next winter's storms.

Order Your Updated Snowfighters Video Now For Training

More than 800 copies of the Salt Institute's Snowfighters video have been purchased by agencies responsible for winter roadway maintenance. The video is now updated as of July 1999. To order a copy of Snowfighters for \$20 plus \$3 shipping, call Martina Moran at 703/549-4648 or fax a request to her at 703/548-2194 or order from our Internet website: www.saltinstitute.org



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