



Conquering the Fear of Liquids!!

Conquering the Fear of Liquids!

Brine making, Anti-Icing, De-icing and Pre-Wetting

Jeff Beeler

Street Superintendent
City of Warsaw, Indiana

- 14 Years working in municipalities
- 10 years at a county highway and 5 years so far at the City
- Started working at county as a ditch monkey and worked my way up to a supervisor then had the opportunity to take over at the City of Warsaw as Street Superintendent

- I attended my first APWA Snow Conference my first year at the City down at Cincinnati which gave me the spark to advance our liquids program.
- When I came to the City, they had been dabbling in a liquids program but had never taken it any further. Now I had the confidence and resources to do so.

I hope you will take from
this class **CONFIDENCE**
in implementing an
effective liquids program
in your organization.

Efficiently and Cost Effectively

Topics to be Covered

- Brine Making
- Anti-Icing
- Pre-Treating salt
- Pre-Wetting salt
- Constructing a **cost effective** pre-wet system at the spinner
- De-Icing

Video

Brine Making

“Time is Money”

but in a municipalities’ case I see it as

“Time Saved is more Work Completed”

In our line of work, knowing that we are always way ahead of what needs done, why get better?

(That was sarcasm for those with out a funny bone 😊)

Brine Making:

This is what we started with...



Inside view



Problems with this setup

- 6 hours to make around 1,000 gallons.
- There is no good way to do a clean out because of the design.
- Location: low water supply and on a metered line.

Problems with this setup

- Constant checking of when brine reached 23%. Then having to pump off tank and start over for next batch. Which was approximately 350 gallon per time.
- We need about 11,000 gallons to treat the whole city. We were only able to treat a select few roads.

Time to Upgrade

- ✓ Henderson brine maker with blending station- \$50,000
- ✓ Red-Line Cross conveyor- \$10,000
- ✓ Storage tanks, Piping, Pumps- \$15,000

Total \$75,000

Things to keep in mind when ordering equipment:

- Tanks to meet the specific gravity of liquids you are using
- Pumps (plastic best- no corrosion issues) that can push around heavy material
- Power supply needed for electric motors
- Good drain system to sanitary or storage (plastic)

Things to keep in mind when ordering equipment:

- Outdoor salt water rated electrical connections and switches
- Good water supply (well water if possible)
- If you do not use loader to load salt use a conveyor. An auger will pack salt to sides unless perfectly dry.
Treated salt is not dry.

**What does
our setup look
like now?**



Flink
Mobile Screening

Bechtel
Construction



Henderson

Brine Xtreme
PRO

CALCIUM -3000

CALCIUM CHLORIDE TANK #2 -2000

SALT BR



Henderson

Brine Xtrem

— 2500
— 2000
CALCIUM CHLORIDE TANK
#1

— 2000
CALCIUM CHLORIDE TANK
#2

Redline
INSTRUCTION MANUAL

120/208 V





SALT BRINE TANK #1

— 2000

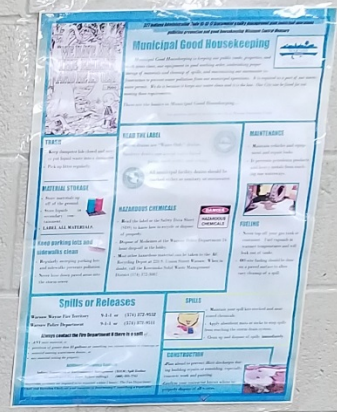
SALT BRINE TANK #1

— 2000
— 1500
— 1000
— 500

SALT BRINE TANK #2

— 2000
— 1500
— 1000
— 500





Municipal Good Housekeeping

STORAGE
All hazardous materials should be stored in approved containers in a secure, well-ventilated area. Containers should be labeled and dated. Do not store hazardous materials in restrooms, break rooms, or other areas accessible to the public.

HAZARDOUS CHEMICALS
Hazardous chemicals should be stored in approved containers in a secure, well-ventilated area. Containers should be labeled and dated. Do not store hazardous chemicals in restrooms, break rooms, or other areas accessible to the public.

SPILLS
Spills of hazardous materials should be reported immediately to the appropriate authority. Spills should be contained and cleaned up according to the appropriate spill response plan.

Spills or Releases
In the event of a spill or release of hazardous materials, the appropriate authority should be notified immediately. The spill should be contained and cleaned up according to the appropriate spill response plan.





LOAD IN

LOAD OUT

STERIL

Brine Making

Brine Making Experiences

- Even when sold as a set and go system-
DON'T LEAVE IT
- On our system we are able to make 6,000 gallons of brine per hour with untreated salt
- When using Cargill Clear-Lane our production rates dropped down to 3,000 gallons per hour.
- Clean your system after every brine making to keep it functioning properly

Brine Making Experiences

- Regular road salt will always have “salt” that will not melt. Be prepared to do some shoveling for clean out. We added another pipe in the bottom to help melt more salt.
- 23.3 % mixture is just a guideline
(Anti-icing can go higher if not storing)
don't let it be a hang up, we shoot for 22%-24%
- Storing brine at over 26% will lead to fallout in your tanks

Brine Making Experiences

- Larger handle valves are easier to turn over time as the materials begin to build up and winter drags on.
- Clean tanks after every season
- Install filters on your brine maker when filling storage tanks
- Place filters on hoses as you fill your trucks

Anti-Icing

Time to Spray







Public Works
80651
Street Dept.

80651



81

Public Works



Street Dept.

TRANSFORCE AT
HUGSBORG

Service Industries, Inc.

The When's and What's of Anti-icing

- **When to Anti-Ice?**
 - . . . that is the question.
- Not before rain but before it snows. Not a great answer but when in doubt, spray. As an option, just do main roads on those occasions where weather could go either way.
- There has yet to be a temp where we have not anti-iced with our brine/additive mixture or with straight chemical

The When's and What's of Anti-icing

- Brine 23%_(ish) can go higher if spraying immediately
- (ICC) Inhibited Calcium Chloride (for us)
- **NEVER** Anti-ice with straight brine or you will watch your work, time and **money** blow away with traffic. **Always** add an additive. It will keep your salt from blowing away.
- We always do a minimum of 10% of our additive which is enough to keep it down

The When's and What's of Anti-icing

- The colder temps get, the more ICC added
- Brine is always your base while your additive is your percent
- Temperatures are based on what road temps will be when snowing begins (normally)
- 10% - 25 degrees and above
- 25% - 18-24 degrees
- 50% - 10-18 degrees
- 75% - 5-10 degrees
- 100% - 4 degrees and below

The When's and What's of Anti-icing

- We apply at 35-50 gal per lane mile
@ 10%-75%
- At 100% ICC - 15-25 gal per lane mile
- Know your product:
 - How it works (mixed, straight or both)
 - When it works (temperature range)
 - What is it best for (sticky factor or temp drop)

Pre-Treating

Pre-Treating

- Treat your pile at about 8 gal per ton.
The colder it is the more material it will hold without getting sloppy.
- We do our mixing with a loader and one of our small spray trucks. Two loader buckets is about 7 ton so we would do about 60 gal. If temps are going to be around 0 we have done up to 12 to 15 gal and had good results.
- Others have used a pug mill and worked well

Pre-Treating

- Pre-Treating has been much cheaper to do ourselves rather than buying treated based upon salt prices from the INDOT road salt program and current chemical prices.
 - Treated salt Fort Wayne District \$88.95
 - Untreated salt Fort Wayne District \$70.82
 - Difference \$**18.13**
 - Chemical \$0.97 x 8 gal per ton \$**7.76**
 - Savings per ton \$**10.37**
 - Or \$**10,370** per 1000 tons (Mile of chip and seal or block of paving)
 - *(Treat it when you need it!!)*

Pre-Wetting

Pre-Wetting

“ Wetter the Better ”

- When wetting salt at the spinner, all the material being sprayed is going down on the road where you want it, so you cannot over apply
- *The concern is –*
How often do you want to fill your tanks?
In Europe they are pushing 70 gal per ton.
- We are currently around 15 to 25 per ton

Pre-Wetting

- We built our own for older trucks that turn on and off if belt or auger is running by using a relay tied into the electric valve.
We then added a bypass switch in cab for unloading purposes to cut electric to pump.
- With these units we do not have flow control based on speed and application rate.
- Our parts were bought at Big R or Agro-chem

Pre-Wetting

- Tanks can be purchased from many vendors and will be the most expensive part.
- Filter liquids before pumping. You should use a filter just smaller than your chosen spray tips to prevent clogging.
- After each use, clean your spray system with water. Place liquid that will not freeze in the tank, if trucks will be exposed to cold temperatures.
 - We use biodegradable RV anti-freeze

Pre-Wetting

- Wash out all new plastic tanks to insure they are clean from shavings that were made while cutting out holes.
- Place a pressure gauge on sprayer line, to insure that you are not reaching the pumps cut out point. If high pressure is maintained the longevity of the pump will be reduced. If high pressure occurs, move to one size larger tip.
 - We have 1 #5 tip and 2 #6.

Constructing Your Own Pre-Wet Kits



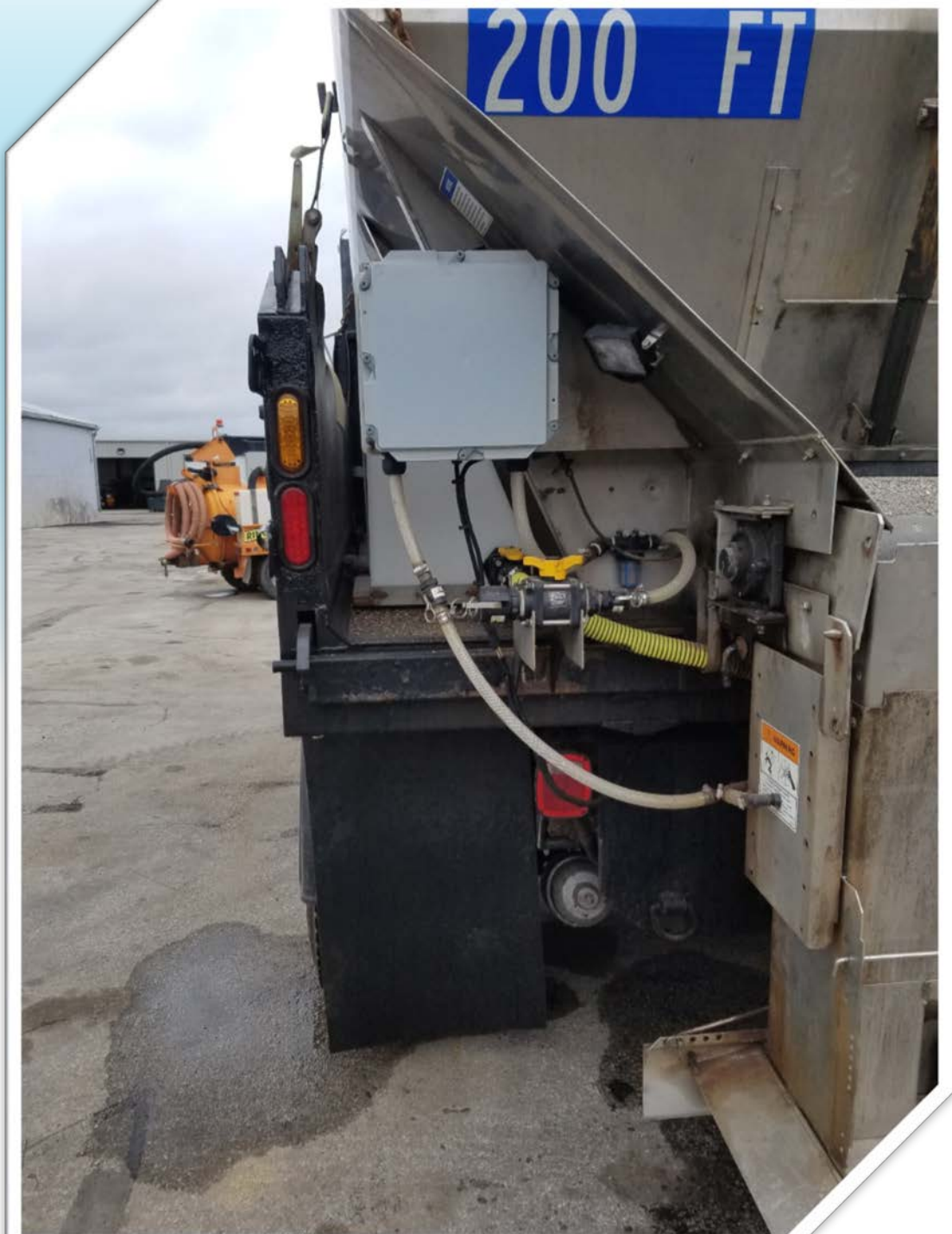
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E2020XT

DANGER

DANGER

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NEW HAVEN, IND.





SHURflo

8000-543-236

12VDC 1.8 GPM OPEN FLOW

 **DO NOT PUMP FLAMMABLE LIQUIDS**
NO BOMBEE LIQUIDOS INFLAMABLES
NE POMPER PAS DES LIQUIDES INFLAMABLES

APPOX PERFORMANCE AT OPERATING PRESSURE			SHUTOFF PRESSURE
30 PSI	40 PSI	50 PSI	60 PSI
GPM	GPM	GPM	
1.47	1.41	1.36	

MAX AMPS: 7

MFG: 12/08/11
4568191

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(0554) PVC Braided 3/4"

STAINLESS STEEL BOLT
FKM SEALS
100% TEFLON SEATS

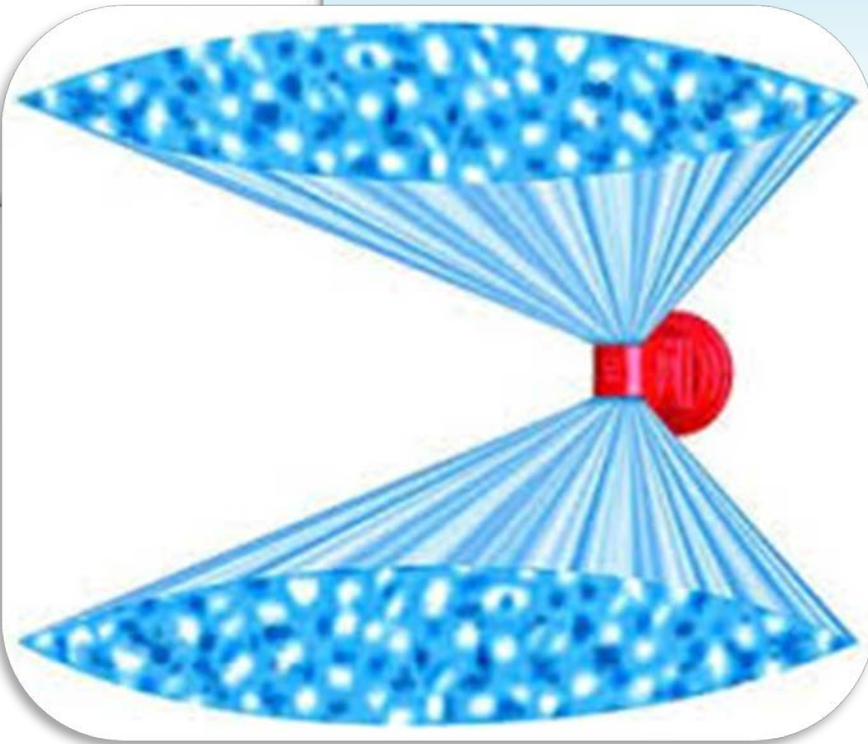
• STAINLESS STEEL BOLTS
• FKM SEALS
• 100% TEFLON SEATS
OPERATING CONDITIONS
100 P.S.I. MAX @ 70° F.
75 P.S.I. MAX @ 150° F.







NT SOLD BY
NES & SON
A-CITY, IND.
AVEN, IND.







PRE-WET BYPASS ON

PRE-WET BYPASS

PARTS FOR PRE-WET SYSTEM

Part Number & Description	Quantity	Price
8000-543-236 Pentair Shur Flo 1.8 GPM Pump	1	72.99 each
3/4" ID (1" OD) Clear braided hose	Varies	1.30 per foot
Electrical Junction Box	1	33.50 each
HB150 1 1/2" Hose Barb	2	1.84 each
HB07590 3/4" MPTX 3/4" Hose 90	4	.92 each
PLUG075 3/4" Poly Pipe Plug	2	1.83 each
RB075050 3/4" x 1/2" Poly Red Bushing	2	1.72 each
RN050038 1/2" x 3/8" Poly Reducer Nipple	2	1.31 each
75C Female Coupler 3/4" Hose Barb	4	6.43 each
150F Male Adapter 1 1/2" Male Thread	2	3.39 each
150CAP 1 1/2" Cap	2	8.66 each
V150 1 1/2" FPT 1 1/2" Ball Valve	2	30.29 each
V150SL 1 1/2" 3way Poly Valve (Side)	1	47.96 each
HBT075 3/4" Poly Hose Barb Tee	2	1.52 each
LSTM07550C Strainer	1	16.92 each
GHFT075A Garden Hose Fitting	1	3.10 each
3NTT34 3/4" Poly Nozzle Body Tee	3	1.05 each
EL07590 3/4" Poly Pipe Elbow 90 Degree	4	2.08 each
75F Male Adapter 3/4" Male Thread	3	3.04 each
SL07545 3/4" Poly Street Elbow 45	1	4.14 each
HB075 3/4" Male Thread x 3/4" Hose	2	.73 each
TEE150 1 1/2" Poly Tee	1	5.69 each
150C Female Coupling 1 1/2" Hose Barb	2	8.66 each
150F Male Adapter 1 1/2" Male Thread	4	3.39 each
NIP150SH 1 1/2" x Short Poly Nipple	4	1.97 each
75E Male Adapter 3/4" Hose Barb	4	3.04 each
3NTL34 3/4" Nozzle Body Elbow x HB-Poly	3	.93 each
8027NYB Teejet Cap Nylon	3	.52 each
TTJ6011004VP Turbo Twinjet	3	4.49 each
1 1/2" ID Yellow/Black Fertilizer Hose	Varies	2.49 per foot
V Box Tank	2	500.00 each
Estimated cost		\$1447.65

****Plumbing Parts are Banjo Fittings**

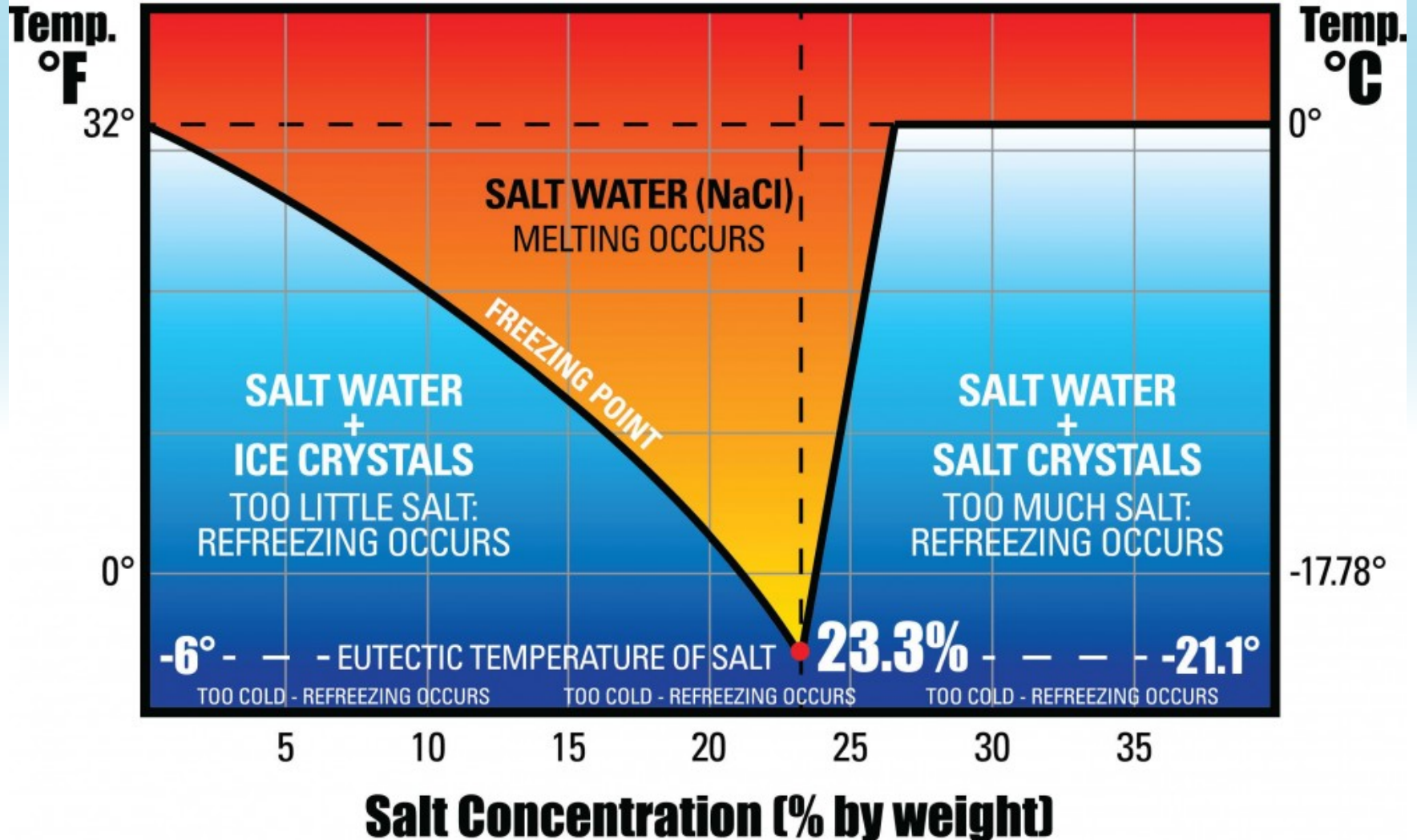
De-Icing

De-icing

- Liquid De-icing is a little tricky.
More attention must be given to be successful
- De-icing can be done without an additive, if the temps are around 15 degrees and above
- Material concentration needs to be at **23.3% or a slightly lower**
- If your material is at a higher concentration you wind up with an ice skating rink on your roads

De-icing:

SALT BRINE - PHASE DIAGRAM



Data courtesy of the Federal Highway Administration (FHWA)

De-icing:

Salt Brine Statistics and Rock Salt

Salt brine eutectic 23.3% @ 59° F

Salt brine specific gravity at 23.3% 59°F 1.179

Pounds of salt per gallon of brine 2.28 lbs @ 23.3% 59°F

Salt weight per cubic foot ASTM spec D 632 approx 80 lbs

Salt weight per Cubic Yard ASTM spec D 632 approx 2160 lbs

Freezing Point of Salt Brine by Percent of Weight

% of NaCl By Weight	Spec. Grav. 15°C - 59° F	Freeze Point °C	Freeze Point °F
0	1.000	0.00	32.0
1	1.007	-0.58	31.0
2	1.014	-1.13	30.0
3	1.021	-1.72	28.90
4	1.028	-2.35	27.80
5	1.035	-2.97	26.7
6	1.043	-3.63	25.5
7	1.051	-4.32	24.2
8	1.069	-5.03	22.9
9	1.027	-5.77	21.6
10	1.074	-6.54	20.2
11	1.082	-7.34	18.8
12	1.089	-8.17	17.3
13	1.097	-9.03	15.7
14	1.104	-9.94	14.1
15	1.112	-10.88	12.4
16	1.119	-11.90	10.6
17	1.127	-12.93	8.7
18	1.135	-14.03	6.7
19	1.143	-15.21	4.6
20	1.152	-16.46	2.4
21	1.159	-17.78	0.0
22	1.168	-19.19	-2.5
23	1.176	-20.69	-5.2
23.3 (E)	1.179	-21.13	-6.0
24	1.184	-17.00	-1.4
25	1.193	-10.40	13.3
26	1.201	-2.30	27.9
26.3 (S)	1.203	-0.00	32.00

Pounds of Ice Melt Per Pound of Salt

Temperature Degrees F.	One Pound of Sodium Chloride (salt)
30	46.3 lbs of ice
25	14.4 lbs of ice
20	8.6 lbs of salt
15	6.3 lbs of salt
10	4.9 lbs of salt
5	4.1 lbs of salt
0	3.7 lbs of salt
-6	3.2 lbs of salt

E = Eutectic point

S = Saturation point

Eutectic Point: is the percent of weight, which a chemical solution has the lowest freeze point.

Saturation Point: is the point which water will receive no more of another substance in a solution

19	1.143	-15.21	4.6
20	1.152	-16.46	2.4
21	1.159	-17.78	0.0
22	1.168	-19.19	-2.5
23	1.176	-20.69	-5.2
23.3 (E)	1.179	-21.13	-6.0
24	1.184	-17.00	-1.4
25	1.193	-10.40	13.3
26	1.201	-2.30	27.9
26.3 (S)	1.203	-0.00	32.00



De-icing

- A thin ice glaze (freezing drizzle) can be immediately resolved with a liquid application
- Once an accumulation has occurred (snow pack or ice event) a solid salt application immediately followed by a liquid application can prove to be helpful.

De-icing

- We had a winter weather event occur where temps started out at 31 degrees in the afternoon with rain/sleet, then dropped to -11 by 4 am in the morning. It resulted in having areas with packed ice and snow in our downtown area due to all of the traffic. At -11 degrees we applied 300# of salt per In mile directly followed by 100% ICC at 30 gal per In mile; the salt burrowed down through the ice and the ICC then burnt it off from the road up. In 45 minutes, the roads were bare and running water at -11 degrees!

Encouragement

DON'T GIVE UP!!! STICK WITH IT!!!

- At times, these treatments can give you instant results and good roads. Other times, it takes 30 minutes to start working.
- Don't react too quickly.
- Give the material time to work.
- When you anti-ice your material starts in liquid form and through evaporation ends up a solid. With dry snow it will take a bit more time to return to liquid form, which is when the snow/ice melt occurs.

Encouragement

- Selecting good materials is a good thing but having a vendor that really knows their material, how it works and what you can expect, is priceless.
- Remember just because the material you put down did not meet your expectations, doesn't mean that it didn't work.
It might just mean your expectations were wrong.
- To get better you must be patient and humble about your process.

Perceived Failures
are actually
Educational
Opportunities

~OLD WISE MAN

Thanks old wise man for the encouragement when I needed itJeff B.