
# Unlocking Winter Savings

2019 Michigan Winter Operations Conference

Rich Domonkos, Indiana LTAP


# INDIANA LTAP WINTER MAINTENANCE ACTIVITIES

- On-site snowplow "Best Practices" training
- On-site "Getting Started with Liquids" course
- On-site salt spreader calibration training
- Online – eLearning snowplow courses
- Salt management/Stormwater Management best practices
- Winter Maintenance Research

PURDUE UNIVERSITY | Local Technical Assistance Program

# OBJECTIVES FOR TODAY

- Road Salt Management
- Understanding our equipment
- Levels of automation for deicing
- What to calibrate – how to calibrate
- Where to find available resources

# UNDERSTANDING DEICING MATERIALS LOOKING BACK AND MOVING FORWARD

"THE FARMER HAS TO BE AN OPTIMIST OR HE WOULDN'T STILL BE A FARMER."

*WILL ROGERS*

# ROAD SALT MANAGEMENT

What factors impact chloride/salt usage?

- Public Safety
- Level of Service
- Cost of materials
- Environment Concerns
- Infrastructure Concerns
- Others?

# KEY FACTS ABOUT SALT

Domestic Production and Use:

1. Domestic production of salt was estimated to have increased by 5% in 2018 to 42 million tons.
2. Twenty-six companies operated 62 plants in 16 States.
3. The top producing States were, Kansas, Louisiana, Michigan, New York, Ohio, Texas, and Utah.
4. These seven States produced about 92% of the salt in the United States in 2018.
5. The estimated percentage of salt sold or used was, by type, rock salt, 43%; salt in brine, 40%; vacuum pan salt, 10% and solar salt, 7%.
6. Highway deicing accounted for about 43% of total salt consumed

https://www.usgs.gov/centers/nmic/salt-statistics-and-information

# KEY FACTS ABOUT SALT

## SALIENT STATISTICS—UNITED STATES:

- Events, Trends, and Issues:
- The winter was slightly colder than average in 2017–18
- The greater number of winter weather events required more salt for highway deicing
- Local and State governments in cold regions had depleted stockpiles
- Early start to 2018-19 winter increase demand and unit price

| Salient Statistics—United States | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| Production | 45,300 | 45,100 | 41,700 | 40,000 | 42,000 |
| Imports for consumption | 20,200 | 21,600 | 12,100 | 12,600 | 17,000 |
| Exports | 935 | 830 | 716 | 1,120 | 950 |
| Consumption: | | | | | |
| Apparent | 65,300 | 63,600 | 51,600 | 49,000 | 57,000 |
| Reported | 55,600 | 52,300 | 48,400 | 48,000 | 51,000 |
| Price, average value of bulk, pellets and packaged salt, dollars per ton, f.o.b. mine and plant | | | | | |
| Vacuum and open pan salt | $ 180.61 | $ 188.87 | $ 197.78 | $ 200.00 | $ 200.00 |
| Solar salt | $ 75.35 | $ 102.04 | $ 99.69 | $ 100.00 | $ 100.00 |
| Rock salt | $ 48.11 | $ 56.32 | $ 56.74 | $ 55.00 | $ 58.00 |
| Salt in brine | $ 9.08 | $ 10.27 | $ 8.29 | $ 10.00 | $ 10.00 |
| | | | | | |
| Employment, mine and plant, number | 4,200 | 4,200 | 4,000 | 4,100 | 4,100 |
| Net import reliance as a percentage of apparent consumption | 29% | 33% | 22% | 23% | 28% |

USGS science for a changing world https://www.usgs.gov/centers/nmic/salt-statistics-and-information

# KEY FACTS ABOUT SALT

## SALIENT STATISTICS—UNITED STATES:

- Large reserves: economic and sub-economic deposits of salt are substantial in principal salt-producing countries. The oceans contain a virtually inexhaustible supply of salt
- Domestic Resources: Rock salt and salt from brine are primarily in Kansas, Louisiana, Michigan, New York, Ohio, and Texas.
- Saline lakes and solar evaporation salt facilities are in Arizona, California, Nevada, New Mexico, Oklahoma, and Utah.
- Almost every country in the world has salt deposits or solar evaporation operations of various sizes.

| World Production and Reserves: | | |
|---|---|---|
| Country | Mine Production | |
| | 2017 | 2018 |
| United States | 40,000 | 42,000 |
| Australia | 11,000 | 12,000 |
| Austria | 4,600 | 4,600 |
| Brazil | 7,400 | 7,500 |
| Canada | 12,000 | 13,000 |
| Chile | 8,500 | 9,500 |
| China | 67,000 | 68,000 |
| France | 4,500 | 4,500 |
| Germany | 13,000 | 13,000 |
| India | 28,000 | 29,000 |
| Mexico | 9,000 | 9,000 |
| Netherlands | 6,940 | 7,000 |
| Pakistan | 3,600 | 3,600 |
| Poland | 4,450 | 4,500 |
| Russia | 5,800 | 5,800 |
| Spain | 4,500 | 4,500 |
| Turkey | 5,500 | 5,500 |
| United Kingdom | 5,100 | 5,100 |
| Other countries | 47,200 | 47,000 |
| World total (rounded) | 288,000 | 300,000 |

USGS science for a changing world https://www.usgs.gov/centers/nmic/salt-statistics-and-information

# KEY FACTS ABOUT SALT

## SALIENT STATISTICS—UNITED STATES:

- Substitutes:
- No economic substitutes or alternatives for salt exist in most applications.
- Calcium chloride and calcium magnesium acetate, hydrochloric acid, and potassium chloride can be substituted for salt in deicing, certain chemical processes, and food flavoring, but at a higher cost

| World Production and Reserves: | | |
|---|---|---|
| Country | Mine Production | |
| | 2017 | 2018 |
| United States | 40,000 | 42,000 |
| Australia | 11,000 | 12,000 |
| Austria | 4,600 | 4,600 |
| Brazil | 7,400 | 7,500 |
| Canada | 12,000 | 13,000 |
| Chile | 8,500 | 9,500 |
| China | 67,000 | 68,000 |
| France | 4,500 | 4,500 |
| Germany | 13,000 | 13,000 |
| India | 28,000 | 29,000 |
| Mexico | 9,000 | 9,000 |
| Netherlands | 6,940 | 7,000 |
| Pakistan | 3,600 | 3,600 |
| Poland | 4,450 | 4,500 |
| Russia | 5,800 | 5,800 |
| Spain | 4,500 | 4,500 |
| Turkey | 5,500 | 5,500 |
| United Kingdom | 5,100 | 5,100 |
| Other countries | 47,200 | 47,000 |
| World total (rounded) | 288,000 | 300,000 |

USGS science for a changing world https://www.usgs.gov/centers/nmic/salt-statistics-and-information

# KEY FACTS ABOUT SALT

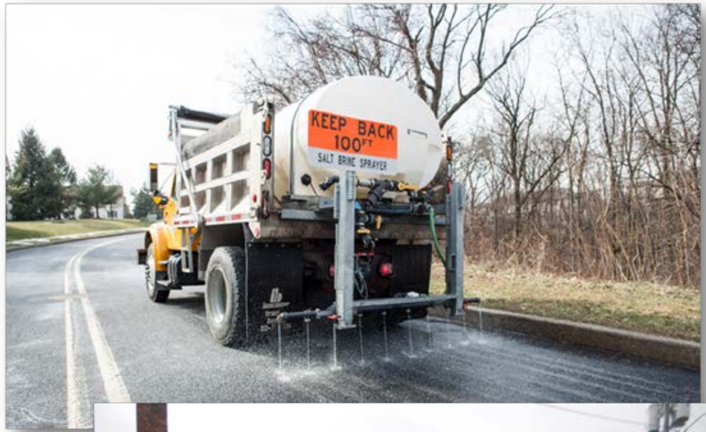
## HOW SALT WORKS

- To melt ice you need to lower its freezing point.
- Adding salt to form a brine lowers the freezing point of water and when applied on already frozen roadways (deicing) it melt the ice.
- The rate at which melting occurs is dependent on the temperature.
- Salt loses its effectiveness (has difficulty going into a brine solution) when temperatures fall below 15° F.
- Applications below 15° F, even at increased rates, will not result in significant snow or ice melting

# KEY FACTS ABOUT SALT

## HOW SALT WORKS

- To melt ice you need to lower its freezing point.
- When salt is applied before a freeze sets in (anti-icing) it helps prevent liquid water from becoming ice.
- This is why drivers will often see salt trucks out and about before the roads start to freeze.
- It is critical to know the current and expected air temperature and pavement temperature.




# GETTING STARTED WITH LIQUIDS

## HOW ROAD SALT WORKS – THE SALT INSTITUTE

# KEY FACTS ABOUT SALT

## WHAT HAPPENS TO SALT IN THE ENVIRONMENT

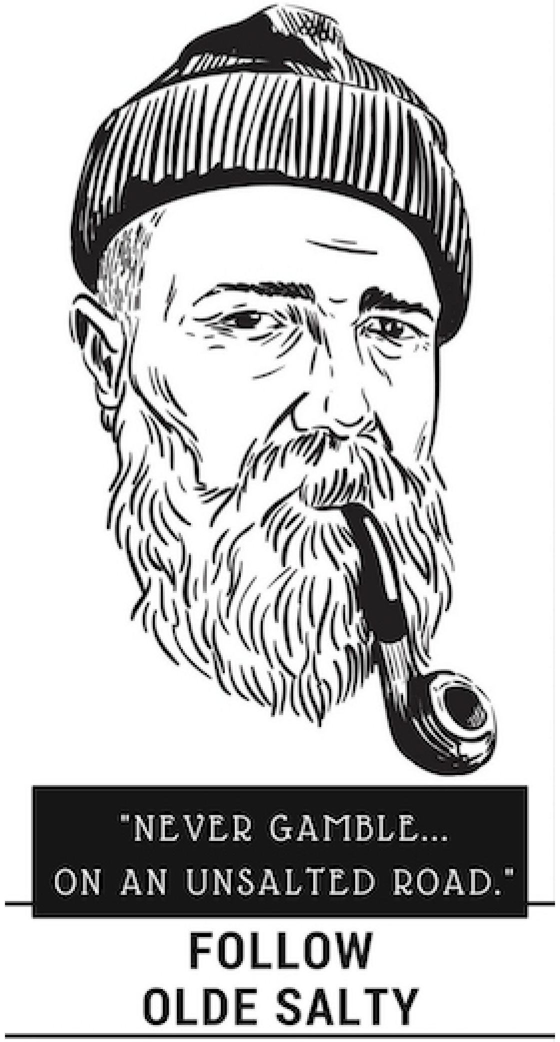
- The applied salt dissolves into 40 percent sodium ions (Na+) and 60 percent chloride ions (Cl-) in the melting snow and ice
- **Chloride(Cl-):** Chloride is highly soluble, very mobile, and its density allows for it to settle to the bottom of a waterbody.
- There is no natural process by which chlorides are broken down, metabolized or taken up by vegetation.
- **Sodium (Na+):** Contamination of sodium in drinking water is a concern for individuals restricted to low-sodium diets due to hypertension (high blood pressure).

# GETTING STARTED WITH LIQUIDS

## GRANULAR ROAD SALT

Used by most road agencies across the globe

- Salt was first used in the 1930s for snow and ice control, but it wasn't until the 1960s that salt became widely adopted by snowfighters as one of the major weapons to keep winter roads safe
- Road salt first appeared when New Hampshire began to experiment with granular sodium chloride in 1938. By the winter of 1941-1942, the state began using salt on local roads and highways.
- Sand was the most common treatment for ice and snow




http://www.saltinstitute.org/2018/01/26/clear-winter-roads-works-doesnt/

# ROAD SALT MANAGEMENT

## HOW HAVE WE APPLIED SALT?

- 1950's – 1980's
- Chain driven off the rear wheel.
- Dropped material directly behind vehicle.
- Material dispensed relative to the speed of the vehicle.

# ROAD SALT MANAGEMENT

## HOW HAVE WE APPLIED SALT?

1980's

- Advent of hydraulic driven, hydraulic controlled spreader units
- Allowed operators to dispense more material
- Speed of truck no longer a factor


# ROAD SALT MANAGEMENT

## HOW HAVE WE APPLIED SALT?

1980’s – 1990’s

- The hydraulic components used allowed for maximum application rates.
- Combined with the introduction of the auger, application rates of 6500+ lbs. per lane mile were achieved
- We saw the evolution of unregulated hydraulic systems and transition to from sand to salt at the same time

# ROAD SALT MANAGEMENT

## HOW HAVE WE APPLIED SALT?

Late 1990's

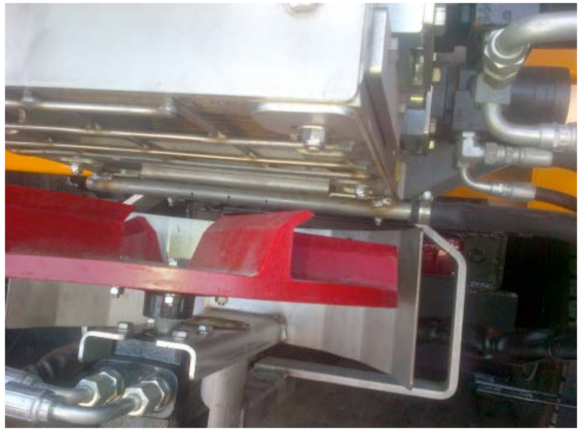
- Introduction of load sensing hydraulic systems and electronic spreader controls.
- Ground speed sensors allowed for consistent application rates.
- Can set min / max application rates.
- Can store salt usage data.


# ROAD SALT MANAGEMENT

## HOW HAVE WE APPLIED SALT?

Today

- Introduction of semi-automated and automated systems
- Introduction of liquid "pre-wetting" and "anti-icing" systems
- Focus on the "Right Amount" of salt for conditions
- Reduce loss to bounce and scatter and over application of material

# ROAD SALT MANAGEMENT

## HOW HAVE WE APPLIED SALT?

Tomorrow "Automation of Deicing Systems"

Levels of Automation *(According to a study by the Clear Roads Technical Advisory Committee, Developing a Totally Automated Spreading System Guides #1, #2 & #3)*

- Level Zero: No Automation.

  The operator makes all adjustments in real time.

- Level One: Sensor Driven Automation.

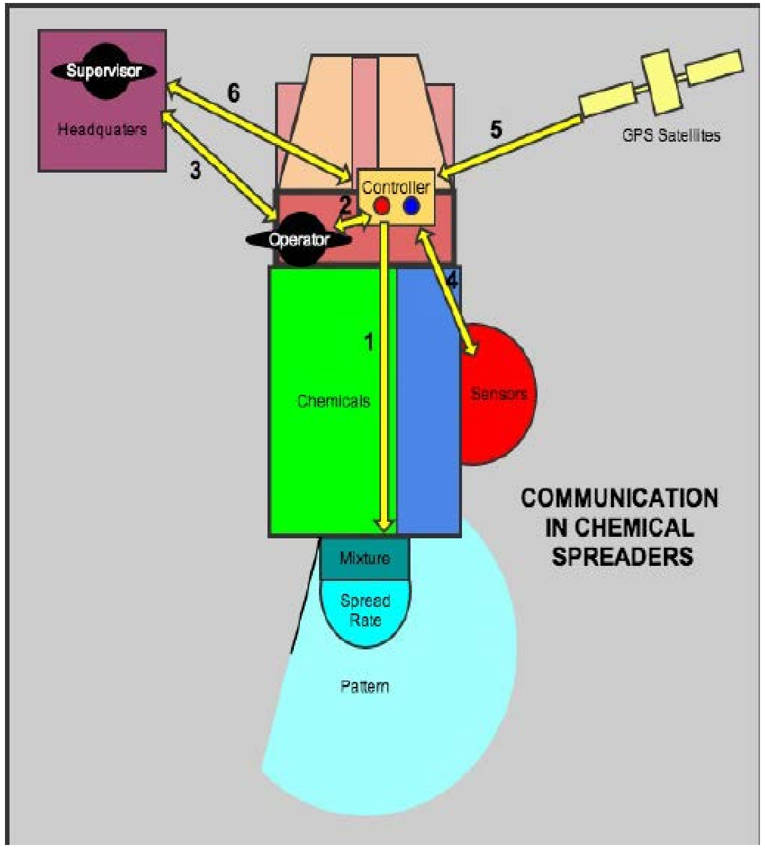
  The most common are closed-loop, ground-speed systems.

- Level Two: Position Driven Automation.

  Typically the route is driven before the storm and the GPS is recorded along with the spreader settings, then the route can be replayed as it is driven in the storm.

- Level Three: Remote Control Automation.

  This is not a commonly available product but there has been some research. Weather, traffic and emergency information can be used to adjust spreader variables from headquarters.

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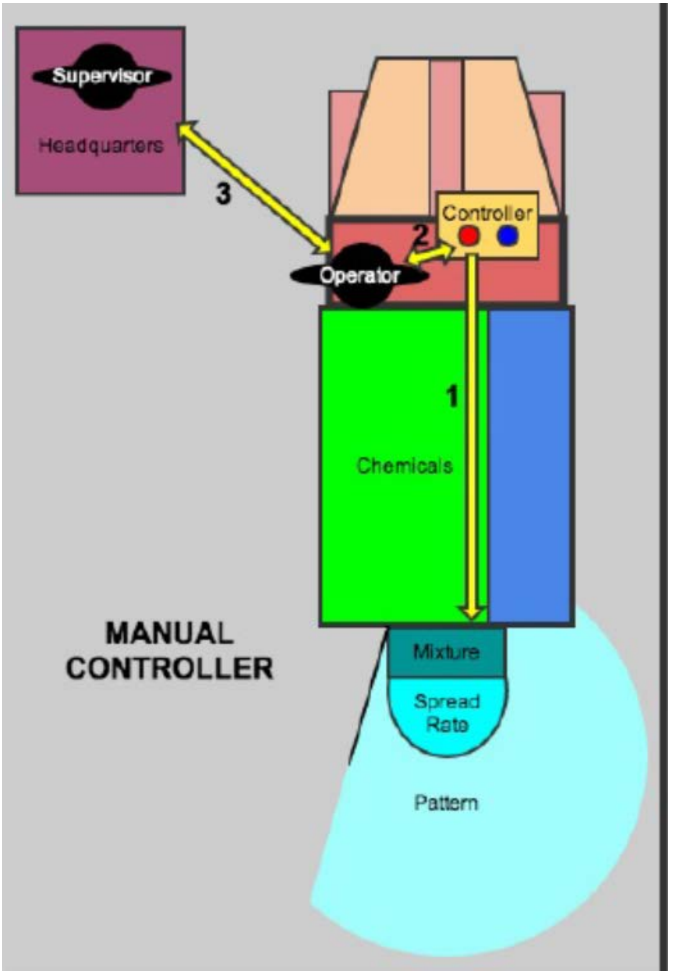


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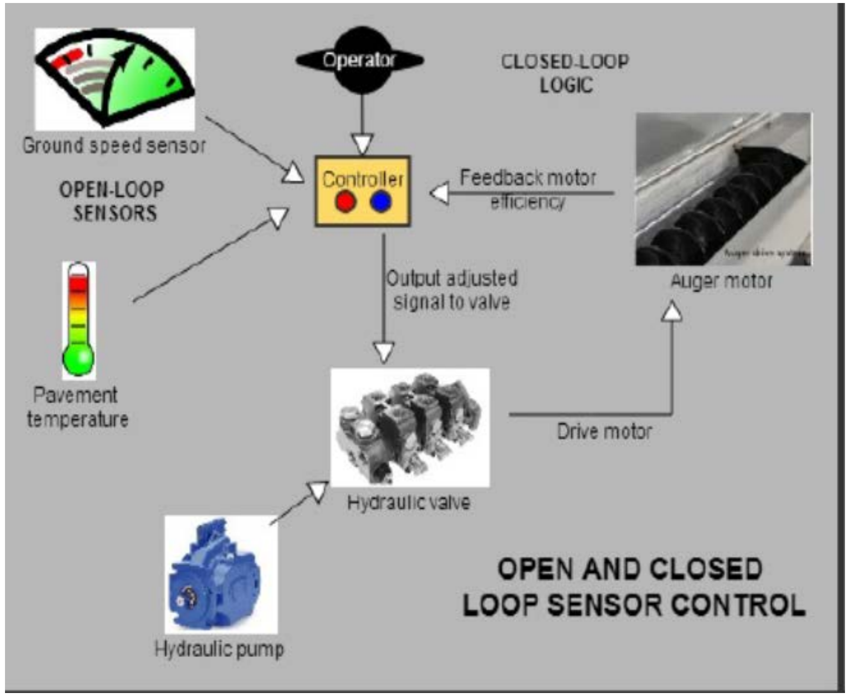


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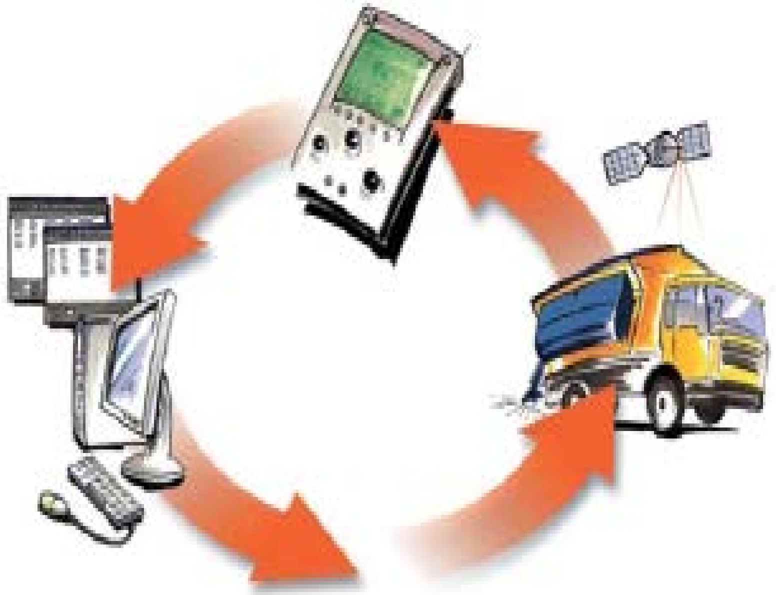

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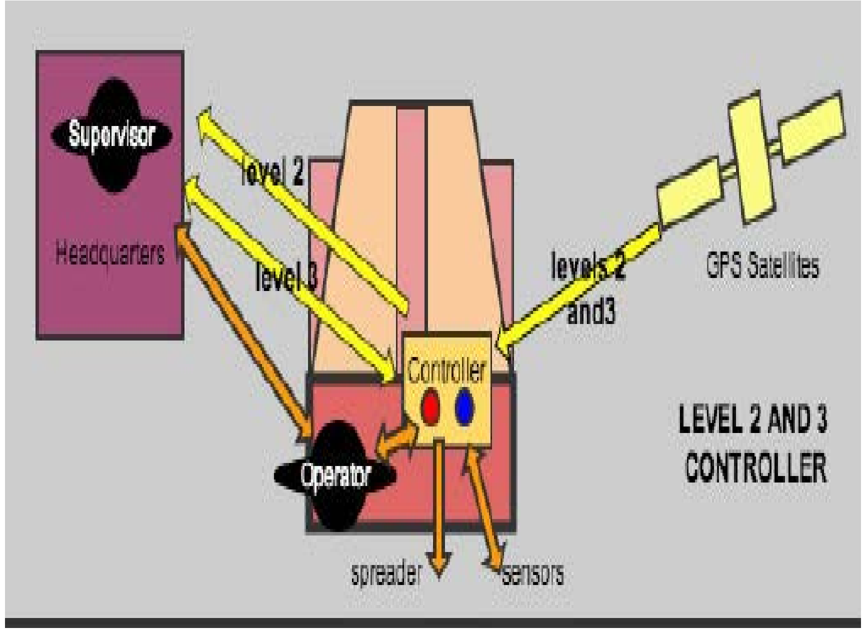


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# ROAD SALT MANAGEMENT

## HOW HAVE WE APPLIED SALT?

Tomorrow “Automation of Deicing Systems”

In November, in Northwest Indiana,

Purdue University and APWA Indiana Chapter will hold an equipment demonstration and discussion on the use of Automated Brine Systems.


# SPREADER CALIBRATION

"A WOODSMAN WAS ONCE ASKED, "WHAT WOULD YOU DO IF YOU HAD JUST FIVE MINUTES TO CHOP DOWN A TREE?" HE ANSWERED, "I WOULD SPEND THE FIRST TWO AND A HALF MINUTES SHARPENING MY AXE."

*AN EXPERIENCED WOODSMAN*

# SPREADER CALIBRATION

General Approach to Calibration

No matter what kind of controller you will be calibrating there are several general concepts that are helpful. These concepts are based on lessons learned of experienced calibrators

Safety

1. Spinner dials to zero/off before starting
2. Always notify all persons outside truck before running auger/spinner
3. Heads-up when outside truck

Take it slow

1. Especially when going through screens on the controller
2. Usually goes smoothly when we go through steps carefully and not too quickly

# SPREADER CALIBRATION

General Approach to Calibration

Record constants as you calibrate

1. Helps mechanics when troubleshooting is required Very easy to do (not very many constants to record)

Simulate operating conditions during calibration

1. Fully warm up truck hydraulics
2. Keep auger loaded/primed during tests
3. Get truck RPM's up at key test points (i.e. running auger/spinner/...)

Automatic controllers self-calibrate

1. You may have to be concerned with calibrating different rates (100, 200, 300,etc).
2. Most newer controller will automatically calibrate for any/all rates.

# SPREADER CALIBRATION

## CONTROLLER CLASSIFICATIONS FOR CALIBRATION

- **Automatic controllers** automatically adjust the application rate so that it always applies the same amount of material to the road no matter the truck speed. When the vehicle changes speed, the controller automatically adjusts the auger rotation speed so that application rate is maintained.
- **Manual sander controllers** spin the auger at one set fixed speed. The material flow rate from the auger is fixed. At higher speeds less material is applied to the road, at slower speeds more material is applied. Typically manual sanders have about ten different fixed auger speeds that can be selected.

# SPREADER CALIBRATION

## OPEN-LOOP AND CLOSED-LOOP CONTROLLERS

**Open-loop systems** adjust the auger control valve to a predetermined setting that is a function of truck speed.

**Closed-loop controllers** also have a rear auger sensor that allows them to monitor the actual rate of the auger. These controllers adjust the control valve until the correct auger speed is achieved.

- The closed-loop controller is able to dynamically adjust the auger speed if/when the predetermined setting is not providing the correct auger rotation speed. Equipment wear, variable operating temperatures, and aging of equipment can impact the application rate.
- The closed-loop system provides the advantage of being able to adjust the controller to accommodate for those conditions.

# SPREADER CALIBRATION

## CALIBRATION OF CLOSED-LOOP CONTROLLERS

Before starting identify the calibration procedure that is specified by the controller manufacturer, you will need to have the controller procedure available from the manufacturer.

1. Recommended amount of dry solid material loaded?
2. Recommended amount of liquid chemical loaded?
3. Correct gate opening for hopper-box or V-box spreader?
4. Truck-bed in correct elevated position for tailgate spreader?
5. Auger of tailgate spreader fully charged?
6. Can the hydraulic oil temperature be held at the correct level?
7. Can the truck's engine RPM be held at the correct level?
8. All solid and liquid material discharge systems ready for engagement?
9. All controller features properly set?
10. All collection devices ready to receive material discharge amounts?

# SPREADER CALIBRATION

## CALIBRATION OF CLOSED-LOOP CONTROLLERS

1. Remove the spinner assembly from the truck but keep the hydraulic hoses connected.
2. Warm the truck's hydraulic oil to the specified operational temperature.
3. Discharge a small amount of solid and liquid chemical to make sure that the spreader's distribution mechanism is fully charged. Discard these amounts.
4. Select the calibration mode function on the controller for closed-loop operation.
5. Select the appropriate truck calibration speed.
6. Set the truck's engine RPM to the correct level specified by the manufacturer.
7. Discharge and capture the appropriate amount of solid and liquid chemical.
8. Abort the calibration test(s) if a discontinuity in flow of either solid or liquid material discharge is observed.
9. Measure the amounts of solid and liquid chemical discharged satisfactorily.
10. Enter the values of the measured discharged amounts into the controller.
11. Properly exit the calibration mode on the controller following the manufacturer's instructions.

# SPREADER CALIBRATION

## CALIBRATION OF OPEN-LOOP CONTROLLERS

Before starting identify the calibration procedure that is specified by the controller manufacturer, you will need to have the controller procedure available from the manufacturer.

1. Recommended amount of dry solid material loaded?
2. Recommended amount of liquid chemical loaded?
3. Correct gate opening for hopper-box or V-box spreader?
4. Truck-bed in correct elevated position for tailgate spreader?
5. Auger of tailgate spreader fully charged?
6. Can the hydraulic oil temperature be held at the correct level?
7. Can the truck's engine RPM be held at the correct level?
8. All solid and liquid material discharge systems ready for engagement?
9. All controller features properly set?
10. All collection devices ready to receive material discharge amounts?

# SPREADER CALIBRATION

## CALIBRATION OF OPEN-LOOP CONTROLLERS

**Open-loop systems** adjust the auger control valve to a predetermined setting that is a function of truck speed.

1. Remove the spinner assembly from the truck, but keep the hydraulic hoses connected
2. If a speed simulator is not available, block the front wheels and elevate the rear wheels off the ground.
3. Warm the truck's hydraulic oil to the specified operational temperature.
4. Select the calibration mode function on the controller for open-loop operation.
5. Select the appropriate truck calibration speed.
6. Set the truck's engine RPM to the correct level specified by the manufacturer.
7. Select the solid discharge setting and the pre-wetting rate (if available) on the controller according to the manufacturer's specifications.
8. Discharge and capture the appropriate amount of solid and liquid chemical for either a constant number of revolutions of an auger/conveyor shaft or for a specified time interval
9. Abort the calibration test(s) if a discontinuity in flow of either solid or liquid material discharge is observed
10. Measure the amounts of solid and liquid chemical discharged satisfactorily.
11. Repeat Steps 8 through 11 for either the required number of times or for the next setting on the solid discharge knob.
12. Calculate either an average pounds/revolution (lbs/rev) amounts using successive discharge knob settings.

# SPREADER CALIBRATION

## CALIBRATION OF OPEN-LOOP CONTROLLERS

### Calibration Verification Test Form

**Location:** ____________________________ **Spreader Type? Hopper-box or Tailgate** **Gate Opening:** ____

**Spreader Controller:** ____________________ **Firmware Version:** ______

**Date:** ____________________________ **Truck No.:** ____________ **Model:** ____________ **Year:** ___________

| Item | Settings for Verification Tests | | | | Solid Discharge | | | | Liquid Discharge | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Set Application Rate (lbs/mile) | Set Prewetting Rate (gal/ton) | Set Simulated Truck Speed (mph) | Test Time (sec) | Test Solid Discharge (lbs) | Controller Recorded Solid Discharge (lbs) | Theoretical Solid Discharge (lbs) | Acceptable Discharge Range Amount (lbs) | Test Liquid Discharge (gal) | Controller Recorded Liquid Discharge (gal) | Theoretical Liquid Discharge (gal) | Acceptable Discharge Range Amount (gal) |
| 1 | 200 | 10 | 25 | 73 | | | 101.4 | | | | 0.507 | |
| 2 | 200 | 10 | 25 | 73 | | | 101.4 | | | | 0.507 | |
| 3 | 200 | 10 | 25 | 73 | | | 101.4 | | | | 0.507 | |
| Average | | | | | | | | 97.3 to 105.5 | | | | 0.49 to 0.53 |
| 1 | 300 | 10 | 25 | 49 | | | 102.1 | | | | 0.510 | |
| 2 | 300 | 10 | 25 | 49 | | | 102.1 | | | | 0.510 | |
| 3 | 300 | 10 | 25 | 49 | | | 102.1 | | | | 0.510 | |
| Average | | | | | | | | 98.0 to 106.2 | | | | 0.49 to 0.53 |
| 1 | 500 | 15 | 20 | 36 | | | 100.0 | | | | 0.75 | |
| 2 | 500 | 15 | 20 | 36 | | | 100.0 | | | | 0.75 | |
| 3 | 500 | 15 | 20 | 36 | | | 100.0 | | | | 0.75 | |
| Average | | | | | | | | 96.0 to 104.0 | | | | 0.72 to 0.78 |
| 1 | 600 | 15 | 20 | 30 | | | 100.0 | | | | 0.75 | |
| 2 | 600 | 15 | 20 | 30 | | | 100.0 | | | | 0.75 | |
| 3 | 600 | 15 | 20 | 30 | | | 100.0 | | | | 0.75 | |
| Average | | | | | | | | 96.0 to104.0 | | | | 0.72 to 0.78 |

# SPREADER CALIBRATION

## CALIBRATION OF MANUAL CONTROLLERS

Calibration is simply calculating the pounds per mile discharged for each control setting at various travel speeds by first counting the number of auger or conveyor shaft revolutions per minute, measuring the weight of salt discharged in one revolution, then multiply the two to obtain discharge per minute, and finally multiplying the discharge per minute by the time it takes to travel 1 mile. Most spreaders have multiple gate openings; so you must calibrate for specific gate openings.

1. Remove, by-pass or turn off spinner
2. Warm truck's hydraulic oil to normal operating temperature with spreader system running
3. Put partial load of salt on truck
4. Mark shaft end of auger or conveyor
5. Dump salt on auger
6. Rev truck engine to operating RPM
7. Count number of shaft revolutions per minute at each spreader control setting, record
8. Collect salt discharged for one revolution, weigh it and deduct the weight of the container. (For greater accuracy, collect salt for several revolutions and divide by that number of revolutions to get the weight for one revolution.)
9. Multiply Column A by Column B to get Column C; then multiply Column C by the number of minutes to travel one mile ( ) at various truck speeds to get pounds Discharged per mile.*

# SPREADER CALIBRATION

## CALIBRATION OF MANUAL CONTROLLERS

| Calibration Chart | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Agency: | | | | | | | | | | | | | |
| Location: | | | | | | | | | | | | | |
| Truck Number: | | | | | | | Spreader Number: | | | | | | |
| Date: | | | | | | | By: | | | | | | |
| Hopper Gate Opening (Inches): | | | | Pounds Discharged Per Mile | | | | | | | | | |
| | A | B | C | Minutes to Travel One Mile | | | | | | | | | |
| Control Setting | Shaft RPM (Loaded) | Discharge Per Revolution (Pounds)* | Discharge Rate (lb/min) | 5 mph x 12.00 | 10 mph x 6.00 | 15 mph x 4.00 | 20 mph x 3.00 | 25 mph x 2.40 | 30 mph x 2.00 | 35 mph x 1.71 | 40 mph x 1.50 | 45 mph x 1.33 | |
| 1 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 2 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 3 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 4 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 5 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 6 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 8 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 9 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 10 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

** This weight remains constant*

# SPINNER CALIBRATION

NO ONE WHO EVER BOUGHT A DRILL WANTED A DRILL. THEY WANTED A HOLE. IT'S THE TASK THAT MATTERS.

*PERRY MARSHALL*

# SPREADER CALIBRATION

## CALIBRATION OF SPINNER ASSEMBLY

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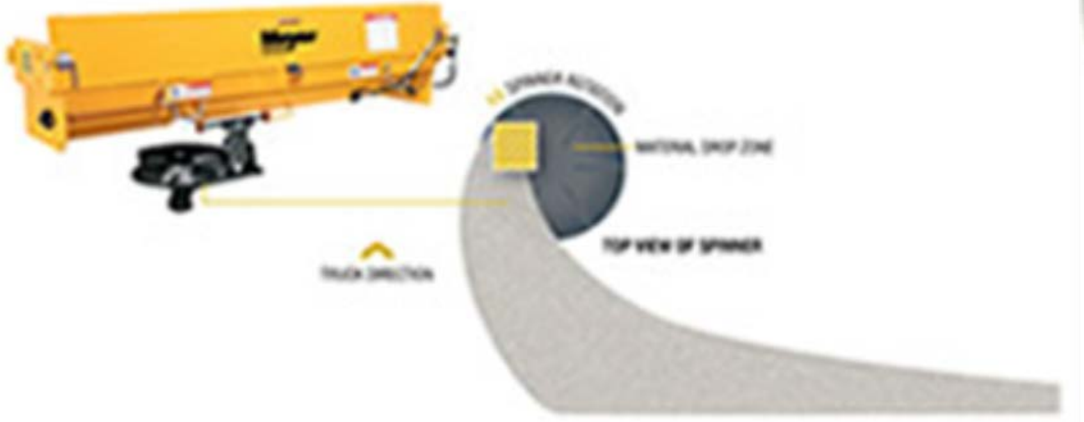
## CALIBRATION OF SPINNER ASSEMBLY



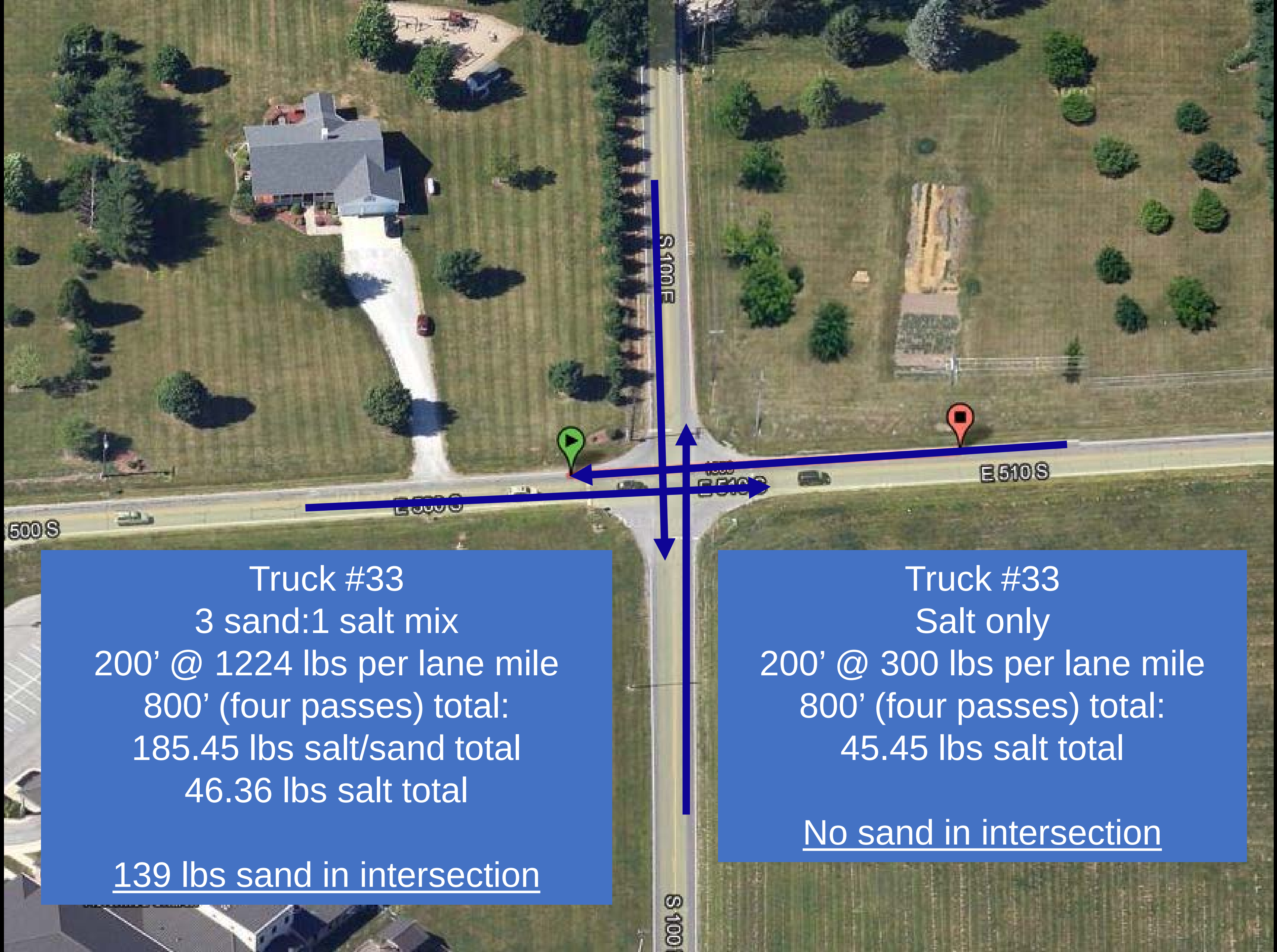


# INDIANA CASE STUDY

NO ONE WHO EVER BOUGHT A DRILL WANTED A DRILL. THEY WANTED A HOLE.

IT'S THE TASK THAT MATTERS.

*PERRY MARSHALL*

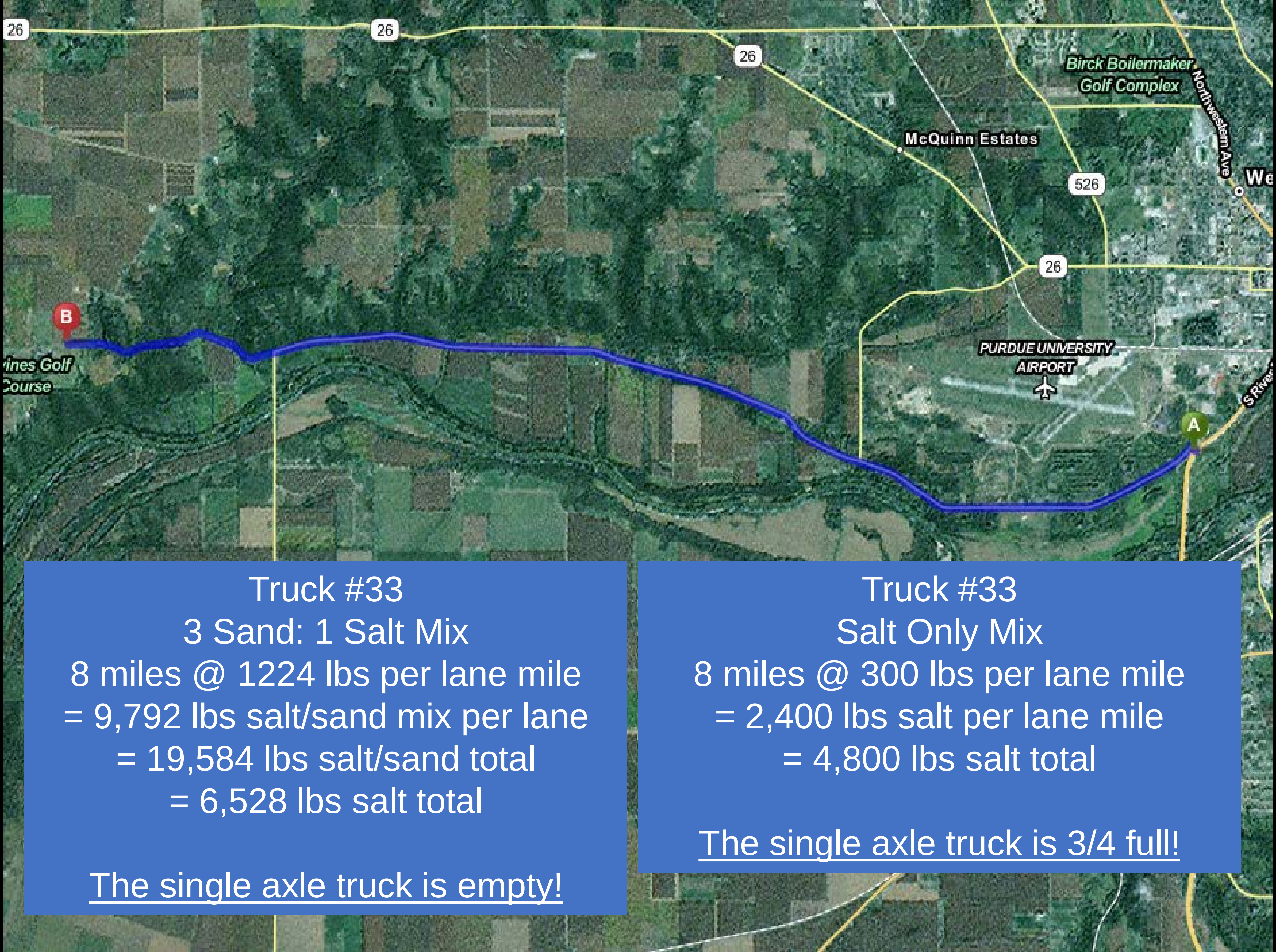



Truck #33
3 sand:1 salt mix
200’ @ 1224 lbs per lane mile
800’ (four passes) total:
185.45 lbs salt/sand total
46.36 lbs salt total

<u>139 lbs sand in intersection</u>

Truck #33
Salt only
200’ @ 300 lbs per lane mile
800’ (four passes) total:
45.45 lbs salt total

<u>No sand in intersection</u>




Truck #33
3 Sand: 1 Salt Mix
8 miles @ 1224 lbs per lane mile
= 9,792 lbs salt/sand mix per lane
= 19,584 lbs salt/sand total
= 6,528 lbs salt total

<u>The single axle truck is empty!</u>

Truck #33
Salt Only Mix
8 miles @ 300 lbs per lane mile
= 2,400 lbs salt per lane mile
= 4,800 lbs salt total

<u>The single axle truck is 3/4 full!</u>

# SALT ONLY APPLICATION

## 2014 -2016 PLAN TO ELIMINATE SAND

- Reduction or elimination of sand or slag on roadway or drainage structures.
- Calibration and accurate recordkeeping can identified faulty equipment and chloride “hot spots”.
- Plan to add newer equipment and methods that will provide more accurate management of chloride usage.
- Reduced volume of spring sweepings for transport and disposal.
- Fewer Fines reduces sweeping dust.

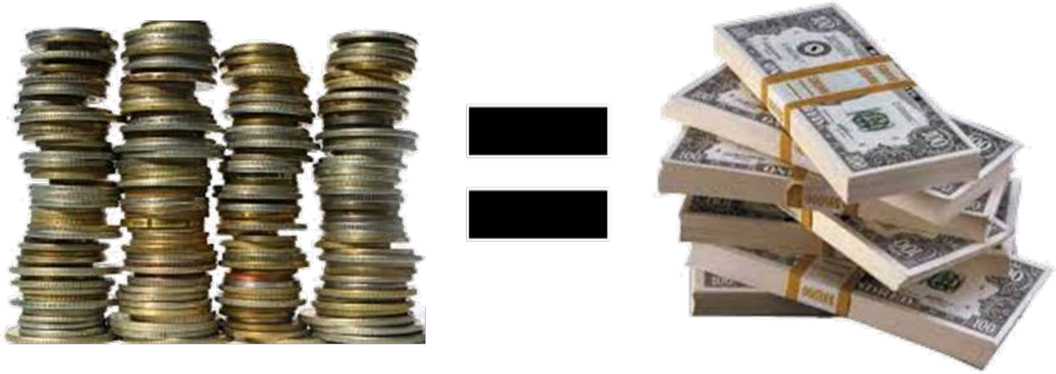
| | Ice Sand (Tons) |
|---|---|
| 2009 | 9,865.26 |
| 2010 | 7,388.00 |
| 2011 | 5,850.65 |
| 2012 | 1,801.48 |
| 2013 | 916.45 |

# SALT ONLY APPLICATION

## FINANCIAL IMPACT

- Reduced or eliminated cost of sand/slag.
- Trucks stay on route longer, more productive.
- Reduce sweeping cost.
- Fuel savings.
- Equipment Wear.
- Identified wasteful equipment.
- Accurate accounting of chloride usage by route, area or township.

| Ice Sand Cost | |
|---|---|
| 2009 | $59,192 |
| 2010 | $44,328 |
| 2011 | $35,104 |
| 2012 | $10,809 |
| 2013 | $5,499 |



# SALT ONLY APPLICATION

## FINANCIAL IMPACT

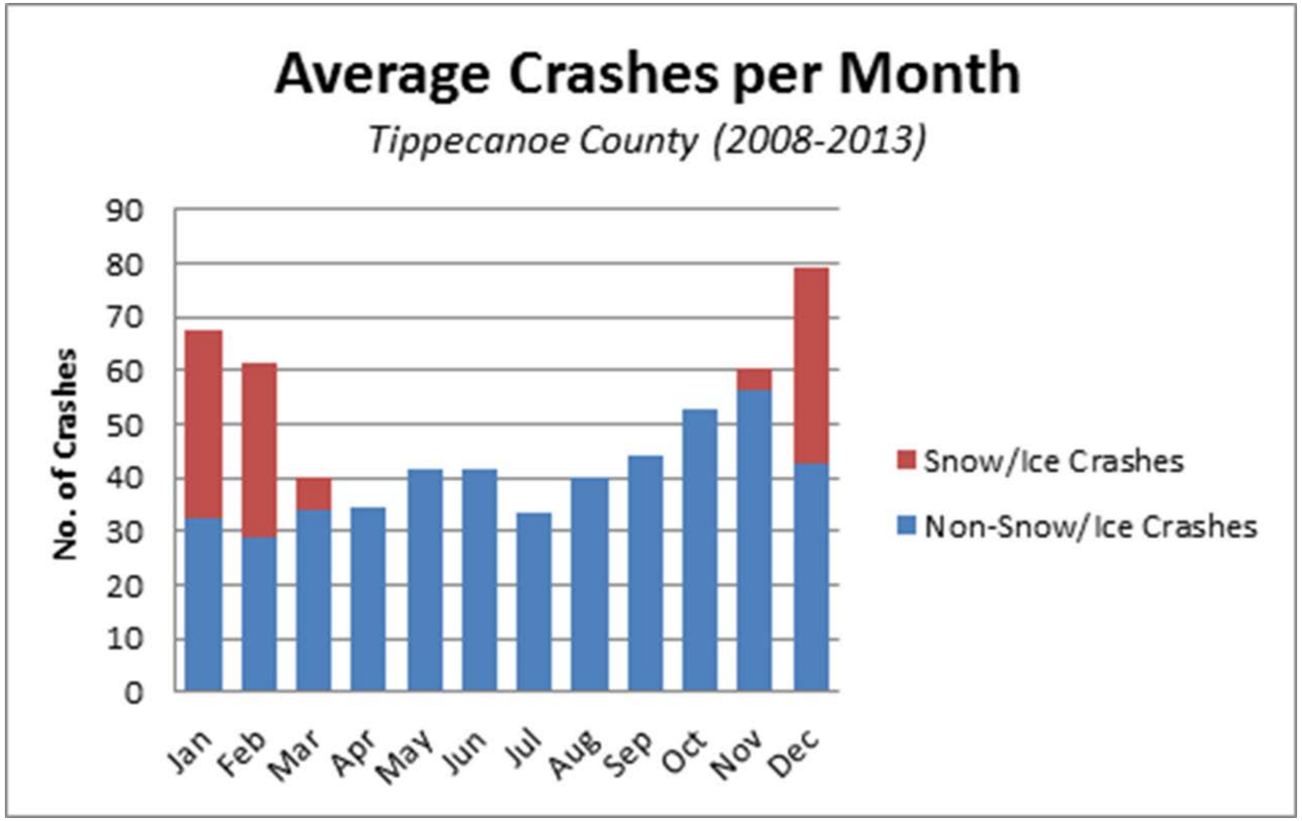
| | Ice Control Sand (tons) |
|---|---|
| 2009 | 9,865.26 |
| 2010 | 7,388.00 |
| 2011 | 5,850.65 |
| 2012 | 1,801.48 |
| 2013 | 916.45 |

| | Salt Totals (Tons) |
|---|---|
| 2009 | 2,009.61 |
| 2010 | 1,897.27 |
| 2011 | 1,439.71 |
| 2012 | 2,003.49 |
| 2013 | |

| | Total Winter OT Hours (Dec – Mar) |
|---|---|
| 2009 | 4,131.10 |
| 2010 | 4,321.34 |
| 2011 | 2,830.70 |
| 2012 | 1,820.75 |
| 2013 | 896.25 |
| | 14,000.14 |

# SALT ONLY APPLICATION

## LEVEL OF SERVICE (L.O.S.)




631 snow/ice crashes (from 1/1/08-5/31/13), which account for 20% of the total crashes.

# SALT ONLY APPLICATION

## LEVEL OF SERVICE (L.O.S.)

- Not spreading less salt – just less waste
- Roads are treated quicker.
- Routes have a better response time.
- Less bonding of ice to pavement.
- In most cases, more chloride per application.
- Curves, intersections and hills are serviced faster, and are clearer longer.
- Less bonding in subs, able to reach bare pavement quicker.
- Less damage to equipment.
- Fewer breakdowns.

# SALT ONLY APPLICATION

## LEVEL OF SERVICE (L.O.S.)

Development Timeline 2015 and beyond

- Modify equipment to eliminate sand – performance of deicing chemicals improves
- Further expand anti icing program
- Further develop deicing/anti-icing materials

# SALT ONLY APPLICATION

## PROBLEMS ENCOUNTERED AND SET BACKS

- Equipment will not respond to controls quick enough
- Equipment not reliable – not sure if calibration is consistent
- Troubleshooting equipment is difficult
- Equipment supplier is no help with calibration
- It’s working and that's good enough!
- Same problems are occurring nationally
- New or old equipment, same issues!

# RESOURCES FOR CALIBRATION

**References**


1. Calibration guide for ground-speed- controlled and manually controlled Material spreaders, February 2009
2. Clear Roads: Developing a Totally Automated Spreading System Guides #1, #2 & #3
3. 2016 Environmental Fact Sheet, New Hampshire Department of Environmental Services
4. Mn/DOT Snowplow Salt and Sander Controller Calibration Guide, December 2009
5. https://www.usgs.gov/centers/nmic/salt-statistics-and-information USGS
6. Http://www.Fhwa.Dot.Gov/reports/mopeap/eapcov.Htm
7. NCHRP report 526, snow and ice control: guidelines for materials and methods, 2004 web site: trb.Org/publications/nchrp/nchrp_rpt_526.Pdf
8. The snow fighters handbook and snow fighters training program, salt institute web site: Http://www.Saltinstitute.Org/snowfighting/index

# THANK YOU!

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