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Material Spreader Use in Winter Maintenance Operations: A Survey of State Practice

Prepared for
Clear Roads Pooled Fund Study

Prepared by
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WisDOT Research & Library Unit
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Request for Report

One of the keys to an effective winter maintenance operation is the deployment of material spreaders that consistently place material where it is desired without significant operator intervention. The Clear Roads winter maintenance pooled fund was interested in learning more about the best practices identified by snowy states in using and adapting material spreaders and related equipment. As the lead state for the Clear Roads pooled fund, Wisconsin DOT asked us to document the state of the practice for the use of material spreaders in winter maintenance operations.

Summary

We asked SNOW-ICE listserv members and Wisconsin county highway commissioners and patrol superintendents to complete an online survey about their agencies' use of material spreaders. The survey consisted of the following questions:

1. What type of material spreader is used in your agency's winter maintenance operations?
2. Please indicate the make, model and number of units in service for each type of material spreader used by your agency.
3. Various delivery mechanisms are used to get material from the spreader to the pavement. Please indicate the number of units in service for each type of material delivery mechanism used by your agency.
4. Please rate the effectiveness of each type of delivery mechanism in placing material where it is desired.
5. Have you encountered any problems or challenges with the material spreaders used by your agency? Please describe.
6. Please provide details on any of your answers, or additional comments.

The survey received 52 responses, with 19 state DOTs, 23 counties, three cities, two townships, one village, one university and two Canadian agencies responding to the survey; one state DOT provided two responses. (See **Survey Results** on page 3 of this report.)

Key findings from the survey follow. Percentages are based on the number of agency responses to each question.

Material Spreader Types and Brands

- More than half of the agencies (55 percent) use more than one type of material spreader.

- Almost two-thirds of the agencies (65 percent) use tailgate spreaders. Of these agencies:
  - More than one-quarter (27 percent) use tailgate spreaders exclusively.
  - Almost half (45 percent) use tailgate spreader models sold by Monroe Truck Equipment Inc., and the same percentage (45 percent) use tailgate spreader models sold by Swenson Spreader Company. The next most commonly used tailgate spreader models are sold by Henderson Manufacturing Inc. (21 percent).

- Almost three-quarters of the agencies (73 percent) use V-box spreaders. Of these agencies:
  - Almost one-third (32 percent) use V-box spreaders exclusively.
  - Almost half (46 percent) use V-box spreader models sold by Swenson Spreader Company. The next most commonly used V-box spreader models are sold by Monroe Truck Equipment Inc. (41 percent) and Henderson Manufacturing Inc. (32 percent).

- Agencies report using other spreader types, including front discharge (West Des Moines, Iowa, and St. Croix County, Wis.), side discharge (New Brunswick, Canada), and slip-in and chassis-mount spreaders (Michigan DOT).

Material Spreader Units in Service

- Not all respondents indicated the number of units in service for each spreader type. For those agencies indicating specific numbers of units by brand:
  - Almost half (44 percent) of the tailgate spreader units in service are sold by Monroe Truck Equipment; the Flink Company brand accounts for another 44 percent of the total number of tailgate units in service that could be categorized by brand.
  - More than half (52 percent) of the V-box spreader units in service are sold by Swenson Spreader Company; the Monroe Truck Equipment brand accounts for another 21 percent of the total number of V-box units in service that could be categorized by brand. The Henderson Manufacturing and Flink Company brands represent 15 percent and 9 percent, respectively.

Delivery Mechanisms

- Two-thirds of the agencies (67 percent) use more than one type of delivery mechanism to get material from the spreader to the pavement.

- Almost all of the agencies (98 percent) use spinners. Other delivery mechanisms used by respondents include dual spinners (45 percent), homemade chutes (39 percent), zero velocity spreaders (39 percent) and modified spinners (31 percent).

- Nearly one-third of respondents (31 percent) reported the use of a delivery mechanism not listed above. Delivery mechanisms reported in the “Other” category include a slurry grinder, manufacturer-supplied chutes, a homemade rear spinner and “Y” chutes with center drop spinners.

- 84 percent of the total number of delivery mechanism units in service are spinners. At 6 percent, dual spinners represent the next highest percentage of the total units in service.

- Respondents were asked to rate the effectiveness of each type of delivery mechanism. Following is an ordered list of delivery mechanisms included in the survey that reflects the rating average for each delivery mechanism (5 = extremely effective; 1 = not at all effective). The higher the rating, the more effective the delivery mechanism was rated by respondents. Some mechanisms received more ratings than others.

Delivery Mechanism	Rating Avg.
Other	5.00
Zero velocity spreaders	4.64
Dual spinners	4.29
Spinners	3.89
Modified spinners	3.73
Homemade chutes	3.71

- While delivery mechanisms classified in the "Other" category represent 3 percent of the total number of units in service, all agencies reporting the use of alternative delivery mechanisms rated them as extremely effective.

- Zero velocity spreaders, which represent only 1 percent of the total number of units in service, were rated second-highest of the delivery mechanisms. The most prevalent delivery mechanism in service—spinners—rated similarly to the two lowest-rated delivery mechanisms.

Challenges in Working with Material Spreaders

- More than half of the agencies (53 percent) reported challenges in connection with the material spreaders in service. Challenges noted by respondents include:
  - Bearing failure and hydraulic motor/gearbox failure.
  - Clogging, clumping or refreezing of material in the chute.
  - Corrosion; stainless steel spreader bodies are now specified.
  - Difficulty making the transition from spinner to chute in installations lacking a remote-controlled gate.
  - Frozen spinners and augers.
  - Repeated adjustments or breakage of conveyor chains.
  - Snow accumulating on the back of the truck, plugging the opening to the delivery system.

Survey Results

The full text of each survey response is provided below. For reference, we have included an abbreviated version of each question before the response; for the full question text, please see the Summary on page 1 of this report.

Colorado

Contact: Phillip Anderle, Colorado Department of Transportation, phillip.anderle@dot.state.co.us.

1. **Type of spreader used:** V-box.
2. **Spreader Type** — **Make and Model (Number of Units in Service)**
   V-box — Various makes and models (900)
3. **Delivery Mechanism** — **Number of Units**
   Spinners — All CDOT vehicles are to have this set-up for solid materials.
4. **Delivery Mechanism** — **Rating**
   Spinners — 4
5. **Have you encountered any problems or challenges?** If not properly maintained, or if there is a problem with the material, we have had some problems with the feeder chains.
6. **Details or comments:** Since 1999 we have only purchased Monroe and Henderson sanders, to the tune of about 250 units. Prior to 1999 we have a little of everything available.

Illinois (McHenry County)
Contact: Ed Markison, McHenry County Division of Transportation, ecmarkison@co.mchenry.il.us.

1. **Type of spreader used:** Tailgate; V-box.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	Monroe
V-box	Monroe

3.

Delivery Mechanism	Number of Units
Spinners	28

4.

Delivery Mechanism	Rating
Spinners	4

5. **Have you encountered any problems or challenges?** Direct-drive hydraulic motors are more difficult to calibrate with automated systems versus gearbox-driven hydraulic motors.
6. **Details or comments:** All of our prewetting takes place inside the spreader rather than at the spinner for better uniform coverage of the salt.

Illinois (Village of Wilmette)
Contact: Ken Kennedy, Village of Wilmette, Illinois, kennedyk@wilmette.com.

1. **Type of spreader used:** V-box.
2.

Spreader Type	Make and Model (Number of Units in Service)
V-box	Monroe Truck Equipment model # MSV120-84-50/304

3.

Delivery Mechanism	Number of Units
Spinners	9

4.

Delivery Mechanism	Rating
Spinners	4

5. **Have you encountered any problems or challenges?** Slight difficulty with the placement of material. It would be desirable to place material to the left of the truck (closer to the crown of the road).
6. **Details or comments:** N/A

Indiana
Contact: Kirk Carpenter, Indiana Department of Transportation, kcarpenter@indot.in.gov.

1. **Type of spreader used:** V-box.
2.

Spreader Type	Make and Model (Number of Units in Service)
V-box	Swenson (1,150)

3.

Delivery Mechanism	Number of Units
Spinners	1,115
Modified spinners	15
Zero velocity spreaders	20

4.

Delivery Mechanism	Rating
Spinners	4
Modified spinners	4

5. **Have you encountered any problems or challenges?** Drive chains break; bearing failure and hydraulic motor/gearbox failure.
6. **Details or comments:** [No response.]

Iowa
Contact: Brad Osborne, Iowa Department of Transportation, bradley.osborne@dot.iowa.gov.

1. **Type of spreader used:** Tailgate; V-box.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	Monroe Truck Equipment (895)
V-box	Monroe Truck Equipment (5)

3.

Delivery Mechanism	Number of Units
Spinners	650
Dual spinners	100
Homemade chutes	100
Zero velocity spreaders	50

4.

Delivery Mechanism	Rating
Spinners	3
Dual spinners	4
Homemade chutes	2
Zero velocity spreaders	5

5. **Have you encountered any problems or challenges?** Zero velocity spinners prone to plugging.
6. **Details or comments:** [No response.]

Iowa (City of Dubuque)
Contact: John Klostermann, City of Dubuque, jkloster@cityofdubuque.org.

1. **Type of spreader used:** We use combination boxes on most equipment with either a mid-mounted spinner or a rear discharge spinner.
2.

Spreader Type	Make and Model (Number of Units in Service)
V-box	Henderson FSH 9x50 304 (2); Henderson FSP 409 (2)
Other	Henderson MUNIbody (11)

3.

Delivery Mechanism	Number of Units
Spinners	16

4.

Delivery Mechanism	Rating
Spinners	5

5. **Have you encountered any problems or challenges?** None. These boxes require standard maintenance only.
6. **Details or comments:** It's been my experience that equipment failures in most cases are not with the box or spinner. It is usually with other things like hydraulic or controller issues.

Iowa (City of West Des Moines)
Contact: Bret Hodne, Public Works Superintendent, City of West Des Moines, bret.hodne@wdm-ia.com.

1. **Type of spreader used:** Tailgate; front discharge; Monroe RDS (underbody) rear/front discharge.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	Monroe (2)
Other	Heil Sidewinder, Monroe RDS (15)

3.

Delivery Mechanism	Number of Units
Spinners	15
Other (Slurry Grinder - Monroe)	[No response.]

4. **Delivery Mechanism** | **Rating**

Spinners	5
Other (Slurry Grinder - Monroe)	5

5. **Have you encountered any problems or challenges?** Yes. Refreeze of the material on the material chute.
6. **Details or comments:** [No response.]

Kansas
Contact: Troy Whitworth, Kansas Department of Transportation, troy@ksdot.org.

1. **Type of spreader used:** V-box.
2. **Spreader Type** | **Make and Model (Number of Units in Service)**

V-box	Henderson (300); Monroe (150); Swenson (150)

3. **Delivery Mechanism** | **Number of Units**

Spinners	600

4. **Delivery Mechanism** | **Rating**

Spinners	4

5. **Have you encountered any problems or challenges?** With the spinner, depending on the vehicle speed and the spinner speed, chemical can be bounced off the road. There have been times that the chute will clog up with wet salt or chunks of salt or salt sand. The conveyors have chains that need to be adjusted frequently when running large amounts of material through them.
6. **Details or comments:** [No response.]

Kentucky
Contact: Rick Durham, Kentucky Transportation Cabinet, Rick.Durham@ky.gov.

1. **Type of spreader used:** Tailgate; V-box.
2. **Spreader Type** | **Make and Model (Number of Units in Service)**

Tailgate	Flink; Monroe; Swenson
V-box	Flink; Swenson

3. **Delivery Mechanism** | **Number of Units**

Spinners	Total fleet

4. **Delivery Mechanism** | **Rating**

Spinners	5

5. **Have you encountered any problems or challenges?** Breakage of conveyor chain.
6. **Details or comments:** [No response.]

Maine
Contact: Brian Burne, Maine Department of Transportation, brian.burne@maine.gov.

1. **Type of spreader used:** V-box; forward dump, integrated chain body.
2. **Spreader Type** | **Make and Model (Number of Units in Service)**

V-box	Schmidt (4); Swenson (180 +/-)
Forward dump, integrated chain body	225+/-

3. **Delivery Mechanism** | **Number of Units**

Spinners	280+/-
Modified spinners	10
Homemade chutes	110 +/-
Zero velocity spreaders	3

4. **Delivery Mechanism** | **Rating**

Spinners	3
Modified spinners	5
Homemade chutes	3
Zero velocity spreaders	3

5. **Have you encountered any problems or challenges?** Typical bed chain issues; finding balance between chutes and spinners.
6. **Details or comments:** [No response.]

Massachusetts
Contact: Paul Brown, Massachusetts Department of Transportation, Paul.Brown@state.ma.us.

1. **Type of spreader used:** V-box. We have 90% of our spreading equipment contracted to private contractors.
2. **Spreader Type** | **Make and Model (Number of Units in Service)**

V-box	Viking

3. **Delivery Mechanism** | **Number of Units**

Spinners	125 (state); 800 (private)
Dual spinners	Less than 50

4. **Delivery Mechanism** | **Rating**

Spinners	4
Dual spinners	5

5. **Have you encountered any problems or challenges?** Private entities are always difficult to control; the issue is with personnel not mechanical.
6. **Details or comments:** [No response.]

Michigan
Contact: Scott Johnson, Michigan Department of Transportation, Johnsonsc@michigan.gov.

1. **Type of spreader used:** V-box; slip in and chassis-mount.
2. **Spreader Type** | **Make and Model (Number of Units in Service)**

V-box	Monroe (350)

3. **Delivery Mechanism** | **Number of Units**

MDOT uses a combination of chutes, spinners and zero velocity.

4. **Delivery Mechanism** | **Rating**

Spinners	3
Modified spinners	3
Homemade chutes	4
Zero velocity spreaders	5

5. **Have you encountered any problems or challenges?** Snow accumulating on the back of trucks and plugging the opening to the delivery system is an ongoing problem.
6. **Details or comments:** Zero velocity spreaders used along with prewetting works very well.

Michigan (City of Wixom)
Contact: Mark Clancey, City of Wixom Department of Public Works, mclancey@ci.wixom.mi.us.

1. **Type of spreader used:** Tailgate; V-box.
2. **Spreader Type** | **Make and Model (Number of Units in Service)**

Tailgate	Sterling trucks with computer-controlled spinners (2)
V-box	Sterling trucks with Monroe computer-controlled spinners (3)

3. **Delivery Mechanism** — **Number of Units**
   - Spinners: 5
4. **Delivery Mechanism** — **Rating**
   - Spinners: 4
5. **Have you encountered any problems or challenges?** [No response.]
6. **Details or comments:** All five trucks capable of applying salt brine while salting.

Minnesota

Contact: Joe Huneke, Minnesota Department of Transportation, joseph.huneke@dot.state.mn.us.

1. **Type of spreader used:** Tailgate; mostly tailgate but some zero velocity.
2. **Spreader Type** — **Make and Model (Number of Units in Service)**
   - Tailgate: Swenson, Henderson (816)
   - V-box: Swenson, Henderson (5)
   - Other: Epoke (1)
3. **Delivery Mechanism** — **Number of Units**
   - Spinners: 107
   - Modified spinners: 200
   - Dual spinners: 400
   - Homemade chutes: 100
   - Zero velocity spreaders: 15
4. **Delivery Mechanism** — **Rating**
   - Spinners: 1
   - Modified spinners: 2
   - Dual spinners: 2
   - Homemade chutes: 4
   - Zero velocity spreaders: 5
5. **Have you encountered any problems or challenges?** When using spinners material tends to bounce and scatter quite a bit. The use of chutes and zero velocity has reduced this greatly.
6. **Details or comments:** [No response.]

Missouri

Contact: Tim Jackson, Missouri Department of Transportation, timothy.jackson@modot.mo.gov.

1. **Type of spreader used:** Tailgate; V-box.
2. **Spreader Type** — **Make and Model (Number of Units in Service)**
   - Tailgate: Flink (31); Fontaine (1); Gledhill (2); Good Roads (1); Hi-Way (3); Meyer (3); Monroe (3); Otis (42); Swenson (34); Western (1)
   - V-box: Flink (387); Good Roads (19); Henderson (5); Hi-Way (5); Knapheide (2); Meyer (1); Monroe (256); Otis (105); Swenson (685); Viking-Cives (2); Western (17); N/A (3)
3. **Delivery Mechanism** — **Number of Units**
   - Spinners: 1,563
   - Zero velocity spreaders: 45
4. **Delivery Mechanism** — **Rating**
   - Spinners: 3
   - Zero velocity spreaders: 5
5. **Have you encountered any problems or challenges?** No wholesale problems encountered with any make of spreader.
6. **Details or comments:** The tailgate spreaders we use are under-tailgate spreaders.

New Brunswick, Canada
Contact: Dave Macfarlane, New Brunswick Department of Transportation, Dave.Macfarlane@gnb.ca.

1. **Type of spreader used:** Side discharge, all-season combination box (inner liner).
2.

Spreader Type	Make and Model (Number of Units in Service)
Other	Box manufacturer provides spreader; DICKEY-john controller.

3.

Delivery Mechanism	Number of Units
Spinners	Approx. 400
Homemade chutes	Approx. 100
Other (manufacturer-supplied chutes)	Approx. 200

4.

Delivery Mechanism	Rating
Spinners	4
Homemade chutes	5

5. **Have you encountered any problems or challenges?** Sometimes spreaders can clog; difficult making transition from spinner to chute other than in installations that have remote-controlled gate.
6. **Details or comments:** Trucks with chutes also have spinners. Choice between spinner and chute depends on application situation and material. Sanding requires spinner, as does salting at intersections or wherever a wide coverage is required. Controlling truck application speed is critical in realizing capability of both spinners and chutes, although chutes do allow a higher application speed.

New Jersey (Township of Hamilton)
Contact: Richard M. Balgowan, Township of Hamilton, rbalgowan@hamiltonnj.com.

1. **Type of spreader used:** Tailgate; V-box.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	Swenson, model 10835790 (20)
V-box	Swenson, don't know the model (3)
Other	Brine application tanks: Dultmeir, model DU1A054-S (7)

3.

Delivery Mechanism	Number of Units
Spinners	30
Other (brine application tanks)	7

4.

Delivery Mechanism	Rating
Spinners	4
Other (brine application tanks)	5

   Comment: We utilize seven brine application tanks to apply liquid salt to our roads as an anti-icing pretreatment.
5. **Have you encountered any problems or challenges?** Augers occasionally get jammed with debris. Spinners have been installed by staff incorrectly at times (put on so that they spin backwards), etc. We have recently (last year) changed connections so that putting the spinner on incorrectly is now impossible. We have also put a piece of PVC pipe on the spinner bar so that the spinner is located in the correct location on the truck. We have made it virtually impossible to install a spinner incorrectly.
6. **Details or comments:** [No response.]

New York
Contact: Lou Cardinale, New York State Department of Transportation, lcardinale@dot.state.ny.us.

1. **Type of spreader used:** V-box; combination body.
2.

Spreader Type	Make and Model (Number of Units in Service)
V-box	Monroe (2); Air-Flo (1)
Other	Viking-Cives (1); Henderson (1)

3.

Delivery Mechanism	Number of Units
Spinners	5

4.

Delivery Mechanism	Rating
Spinners	4

5. **Have you encountered any problems or challenges?** Grates require employees to climb on top to clear; chutes clog.
6. **Details or comments:** My location is assigned five trucks.

North Dakota
Contact: Shane Freitag, North Dakota Department of Transportation, shfreita@nd.gov.

1. **Type of spreader used:** Tailgate; V-box.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	Monroe, Swenson, Henderson (136)
Other	Monroe and Henderson live bottom dump spreaders (206)

3.

Delivery Mechanism	Number of Units
Spinners	344

4.

Delivery Mechanism	Rating
Spinners	4

5. **Have you encountered any problems or challenges?** Tailgate units can be hard to regulate pure salt effectively.
6. **Details or comments:** [No response.]

Ohio
Contact: John Thorpe, Ohio Department of Transportation, john.thorpe@dot.state.oh.us.

1. **Type of spreader used:** Tailgate; V-box; all liquid spreaders are homemade, direct application and zero velocity.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	Pengwyn; Monroe
V-box	Monroe; Swenson

3.

Delivery Mechanism	Number of Units
Spinners	250
Dual spinners	20
Homemade chutes	10
Zero velocity spreaders	25

4.

Delivery Mechanism	Rating
Spinners	5
Modified spinners	4
Dual spinners	4
Homemade chutes	3
Zero velocity spreaders	4
Other (all liquid)	5

5. **Have you encountered any problems or challenges?** Clumping at the spreader, especially with use of liquid in severe cold.
6. **Details or comments:** [No response.]

Ontario, Canada
Contact: Mike Houle, Ontario Ministry of Transportation, mike.houle@ontario.ca.

1. **Type of spreader used:** V-box.
2.

Spreader Type	Make and Model (Number of Units in Service)
V-box	Holland, Frink (approx. 550)
Other	Epoke (approx. 200)

3.

Delivery Mechanism	Number of Units
Spinners	300
Dual spinners	250
Other (rear discharge)	200

4.

Delivery Mechanism	Rating
Spinners	5
Dual spinners	5
Other (rear discharge)	No rating; somewhat effective on certain roads

5. **Have you encountered any problems or challenges?** Sometimes get clogged when using prewetted salt.
6. **Details or comments:** [No response.]

Pennsylvania
Contact: Daniel Dibble, Pennsylvania Department of Transportation, ddibble@state.pa.us.

1. **Type of spreader used:** Tailgate; Henderson zero.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	Frink, Flink, Tyler (45)

3.

Delivery Mechanism	Number of Units
Spinners	30
Zero velocity spreaders	15
Other (Henderson zero)	1

4.

Delivery Mechanism	Rating
Spinners	2
Zero velocity spreaders	4
Other (Henderson zero)	5

   Comment: Effectiveness depends on speed of truck. Anything over 40 mph, material retention is significantly reduced with zero velocity units (Tyler) if ideal material is used.
5. **Have you encountered any problems or challenges?** Yes, high-speed (over 40 mph) spreading is basically ineffective.
6. **Details or comments:** [No response.]

Pennsylvania (Springfield Township)
Contact: Don Sirianni, Springfield Township (Montgomery County), Pennsylvania, dsirianni@springfield-township.org.

1. **Type of spreader used:** V-box.
2.

Spreader Type	Make and Model (Number of Units in Service)
V-box	Flink LMC-5 (7); Flink FM-8H (3)

3.

Delivery Mechanism	Number of Units
Spinners	10

4.

Delivery Mechanism	Rating
Spinners	4

5. **Have you encountered any problems or challenges?** Material gets hard in V-box if it is left in it, so we empty box out after every use; have to load each time salt is needed. We have body vibrators on most trucks, which helps shake down material in V-box. We buy all stainless steel boxes—they last a lot longer. Use of LUBRA-SEAL—pre- and post-winter and during season—keeps drag chain in good shape. We also prewet with salt brine; need to clean off spinner during storm as salt sticks to spinner and pattern becomes less effective.
6. **Details or comments:** [No response.]

Princeton University
Contact: Albert Pearson, Princeton University, apearson@princeton.edu.

1. **Type of spreader used:** Tailgate; V-box.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	Henderson tailgate spreader (2)
V-box	Air-Flo spreader (3)
Other	Air-Flo mini spreader (2)

3.

Delivery Mechanism	Number of Units
Spinners	7

4.

Delivery Mechanism	Rating
Spinners	4

5. **Have you encountered any problems or challenges?** Corrosiveness to parts; salt/sand clumps when wet.
6. **Details or comments:** We also use brine tanks with pumps and nozzles.

Tennessee
Contact: Estel Hagewood, Tennessee Department of Transportation, estel.hagewood@state.tn.us.

1. **Type of spreader used:** Tailgate; V-box.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	Flink (900)
V-box	Swenson (50)

3.

Delivery Mechanism	Number of Units
Spinners	950

4.

Delivery Mechanism	Rating
Spinners	4

5. **Have you encountered any problems or challenges?** Eliminated the chain drive and now require direct hydraulic drive on a[ll] tailgate spreaders.
6. **Details or comments:** [No response.]

Utah
Contact: Lynn Bernhard, Utah Department of Transportation, lynnbernhard@utah.gov.

1. **Type of spreader used:** V-box.
2.

Spreader Type	Make and Model (Number of Units in Service)
V-box	Concise spreader (1); Fox 0560-13 (1); Henderson 19 (1); Henderson 8FSM (6); Henderson FSH-UT-13/15 (41); Henderson Hero (3); Henderson HTE1800SST (6); Henderson LAS6000 (1); Kois Stormbu (3); Monroe 1800 (20); Monroe DUZ MOR (1); Monroe MV120-8 (1); Monroe MV12084 (1); Monroe MV16884 (138); Monroe MV-96-84-62 (3); Monroe MV-96-84-62 304 (5); Monroe Spreader (5); Schmidt B6036 (1); Swenson EV 150 (251); Swenson EV10010 (3); Swenson EV10013 (37); Swenson EVS-100 (1); Swenson MDV840H53 (1)

3. **Delivery Mechanism** — **Number of Units**

Spinners	486
Modified spinners	8
Homemade chutes	4
Zero velocity spreaders	6

4. **Delivery Mechanism** — **Rating**

Spinners	4
Modified spinners	4
Homemade chutes	3
Zero velocity spreaders	5

5. **Have you encountered any problems or challenges?** Corrosion; we now specify only stainless steel spreader bodies.
6. **Details or comments:** [No response.]

Virginia
Contact: Don Rainey, Virginia Department of Transportation, d.rainey@vdot.virginia.gov.

1. **Type of spreader used:** V-box.
2. **Spreader Type** — **Make and Model (Number of Units in Service)**

V-box	Henderson FSH10 and FSH14, Swenson EV150 (3,052)

3. **Delivery Mechanism** — **Number of Units**

Spinners	3,052

4. **Delivery Mechanism** — **Rating**

Spinners	4

5. **Have you encountered any problems or challenges?** No major problems, just the typical ones with any mechanical machinery.
6. **Details or comments:** [No response.]

Washington
Contact: Dale W. Luiten, Maintenance Area Superintendent, Eastern Region, Area 4, Washington State Department of Transportation, Luitend@wsdot.wa.gov.

1. **Type of spreader used:** Tailgate; V-box.
2. **Spreader Type** — **Make and Model (Number of Units in Service)**

Tailgate	Swenson
V-box	Swenson

3. **Delivery Mechanism** — **Number of Units**

Spinners	30

4. **Delivery Mechanism** — **Rating**

Spinners	4

5. **Have you encountered any problems or challenges?** No.
6. **Details or comments:** [No response.]

Washington
Contact: Paul Simonsen, Maintenance Area Superintendent, Southwest Region, Area 2, Washington State Department of Transportation, simonsp@wsdot.wa.gov.

1. **Type of spreader used:** Tailgate; V-box; Frink box.

2. **Spreader Type** | **Make and Model (Number of Units in Service)**

V-box	Henderson (hopper type)
Other	Homemade rear spinner

3. **Delivery Mechanism** | **Number of Units**

Spinners	8
Modified spinners	2
Homemade chutes	1
Other (homemade rear spinner)	2

4. **Delivery Mechanism** | **Rating**

Spinners	3
Modified spinners	4
Homemade chutes	4
Other (homemade rear spinner)	5

5. **Have you encountered any problems or challenges?** Moving all front spinners to rear discharge spinner with solid salt as material of choice.
6. **Details or comments:** [No response.]

Wisconsin

Wisconsin's counties are responsible for winter maintenance activities; responses from 22 of Wisconsin's 72 counties appear below.

Ashland County

Contact: Don Grande, Ashland County Highway Department, don.grande@co.ashland.wi.us.

1. **Type of spreader used:** V-box.
2. **Spreader Type** | **Make and Model (Number of Units in Service)**

V-box	Swenson, Henderson FSH II (22)

3. **Delivery Mechanism** | **Number of Units**

Spinners	5
Modified spinners	14
Homemade chutes	All
Other ("Y" chutes with center drop spinner)	2

4. **Delivery Mechanism** | **Rating**

Spinners	2
Modified spinners	3
Dual spinners	3
Homemade chutes	5
Other ("Y" chutes with center drop spinner)	5

5. **Have you encountered any problems or challenges?** Not with the center spinner mounted "Y" chute.
6. **Details or comments:** We have modified our units to have a left and right drop chute and a center spinner system. They work great and can drop all materials we have available. We also prewet all our product at the spinner.

Burnett County

Contact: Robert Morehouse, Burnett County Highway Department, bmorehouse@burnettcounty.org.

1. **Type of spreader used:** Tailgate.
2. **Spreader Type** | **Make and Model (Number of Units in Service)**

Tailgate	Monroe class 424 (15)

3. **Delivery Mechanism** — **Number of Units**
   Spinners — 15
4. **Delivery Mechanism** — **Rating**
   Spinners — 4
5. **Have you encountered any problems or challenges?** [No response.]
6. **Details or comments:** [No response.]

Clark County
Contact: Don Walker, Clark County Highway Department, don.walker@co.clark.wi.us.

1. **Type of spreader used:** Tailgate.
2. **Spreader Type** — **Make and Model (Number of Units in Service)**
   Tailgate — Monroe 966, Universal TGS 86344
3. **Delivery Mechanism** — **Number of Units**
   Spinners — 25
4. **Delivery Mechanism** — **Rating**
   Spinners — 4
   Dual spinners — 4
5. **Have you encountered any problems or challenges?** No.
6. **Details or comments:** [No response.]

Dodge County
Contact: Brian Field, Dodge County, bfield@co.dodge.wi.us.

1. **Type of spreader used:** Tailgate; V-box.
2. **Spreader Type** — **Make and Model (Number of Units in Service)**
   Tailgate — Swenson, Monroe, Hi-Way (50+)
   V-box — Monroe (5)
3. **Delivery Mechanism** — **Number of Units**
   Spinners (all poly) — 40
   Dual spinners (all poly) — 10
4. **Delivery Mechanism** — **Rating**
   Spinners — 4
   Dual spinners — 4
5. **Have you encountered any problems or challenges?** Raised boxes striking tree limbs, bridges and wires.
6. **Details or comments:** [No response.]

Door County
Contact: John Kolodziej, Door County Highway Department, kolodzie@co.door.wi.us.

1. **Type of spreader used:** V-box.
2. **Spreader Type** — **Make and Model (Number of Units in Service)**
   V-box — Monroe (7); Henderson (4); Swenson (1); Hi-Way (2)
3. **Delivery Mechanism** — **Number of Units**
   Spinners — 14
4. **Delivery Mechanism** — **Rating**
   Spinners — 4

5. **Have you encountered any problems or challenges?** [No response.]
6. **Details or comments:** [No response.]

Fond du Lac County
Contact: Mike Brown, Fond du Lac County Highway Department.

1. **Type of spreader used:** Tailgate.
2. **Spreader Type** | **Make and Model (Number of Units in Service)**
   Tailgate | Monroe computerized prewet
3. **Delivery Mechanism** | **Number of Units**
   Spinners | 30
   Dual spinners | 7
   Zero velocity spreaders | 2
4. **Delivery Mechanism** | **Rating**
   Spinners | 4
   Dual spinners | 4
   Zero velocity spreaders | 5
5. **Have you encountered any problems or challenges?** No.
6. **Details or comments:** [No response.]

Iron County
Contact: John Nelson, Iron County Highway, commissioner@ironcountywi.org.

1. **Type of spreader used:** Tailgate.
2. **Spreader Type** | **Make and Model (Number of Units in Service)**
   Tailgate | Swenson SBD9
3. **Delivery Mechanism** | **Number of Units**
   Spinners | 14
4. **Delivery Mechanism** | **Rating**
   Spinners | 4
5. **Have you encountered any problems or challenges?** [No response.]
6. **Details or comments:** [No response.]

Manitowoc County
Contact: Brian Glaeser, Manitowoc County Highway Department, brianglaeser@co.manitowoc.wi.us.

1. **Type of spreader used:** Tailgate.
2. **Spreader Type** | **Make and Model (Number of Units in Service)**
   Tailgate | 26
3. **Delivery Mechanism** | **Number of Units**
   Spinners | 18
   Dual spinners | 8
4. **Delivery Mechanism** | **Rating**
   Spinners | 4
   Modified spinners | 5
5. **Have you encountered any problems or challenges?** We have not encountered any problems with the spinners or dual spinners.
6. **Details or comments:** [No response.]

Marathon County
Contact: Jeff Koppa, Marathon County Highway Department, Jeff.Koppa@co.marathon.wi.us.

1. **Type of spreader used:** Tailgate; V-box; liquid prewet tailgate tanks and also liquid spray bar applicators with 500 gallon tanks and also 5500 gallon tank unit.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	38
V-box	4
Other	Tailgate prewet (18); 500 gallon (2) and 5500 gallon spray bar (1)

3.

Delivery Mechanism	Number of Units
Spinners	38
Dual spinners	15

4.

Delivery Mechanism	Rating
Spinners	4
Dual spinners	5
Other (tailgate prewet)	5

   Comment: Spray bar application works well to apply a salt brine mixture to trouble areas of the highway and also bridge decks. These areas are the first to get slippery at the beginning of a storm or on a frosty night. We make these applications the day before.
5. **Have you encountered any problems or challenges?** [No response.]
6. **Details or comments:** [No response.]

Marquette County
Contact: Jack Yates, Marquette County Highway, jyates@co.marquette.wi.us.

1. **Type of spreader used:** Tailgate; V-box.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	Monroe
V-box	Monroe

3.

Delivery Mechanism	Number of Units
Spinners	24
Dual spinners	8

4.

Delivery Mechanism	Rating
Spinners	4
Dual spinners	5

5. **Have you encountered any problems or challenges?** A few sensor problems (ground speed).
6. **Details or comments:** Repair sensor or replace.

Milwaukee County
Contact: Charles Smeltzer, Milwaukee County DTPW, csmeltzer@milwcnty.com.

1. **Type of spreader used:** V-box; Air-Flo, Swenson, VariTech Flow/Dump.
2.

Spreader Type	Make and Model (Number of Units in Service)
V-box	Monroe, Swenson (24)
Other	Air-Flo, Swenson, VariTech Flow/Dump (39)

3.

Delivery Mechanism	Number of Units
Spinners	63

4.

Delivery Mechanism	Rating
Spinners	5

5. **Have you encountered any problems or challenges?** Minor adjustments/fabricating guards.
6. **Details or comments:** [No response.]

Oconto County
Contact: Patrick J. Scanlan, Oconto County Highway Department, pat.scanlan@co.oconto.wi.us.

1. **Type of spreader used:** Tailgate.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	Built by county (22); Swenson (5)

3.

Delivery Mechanism	Number of Units
Spinners	20
Dual spinners	7
Homemade chutes	27

4.

Delivery Mechanism	Rating
Spinners	4
Dual spinners	5
Homemade chutes	5

5. **Have you encountered any problems or challenges?** No.
6. **Details or comments:** [No response.]

Outagamie County
Contact: Al Geurts, Highway Commissioner, Outagamie County Highway Department, geurtsaj@co.outagamie.wi.us.

1. **Type of spreader used:** Tailgate.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	Various manufacturers (34)

3.

Delivery Mechanism	Number of Units
Spinners	20
Homemade chutes	4
Zero velocity spreaders	10

4.

Delivery Mechanism	Rating
Spinners	4
Homemade chutes	4
Zero velocity spreaders	5

   Comment: Effectiveness can depend on type of environment (urban versus rural; high-speed versus low-speed).
5. **Have you encountered any problems or challenges?** Yes, plugging; the higher the cost, the higher the maintenance.
6. **Details or comments:** [No response.]

Pepin County
Contact: Steve Schofield, Pepin County Highway Department, pepinhwy@nelson-tel.net.

1. **Type of spreader used:** Tailgate.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	Swenson (10); Good Roads (3)

3. **Delivery Mechanism** — **Number of Units**
   - Spinners — 10
   - Other (roll) — 3
4. **Delivery Mechanism** — **Rating**
   - Spinners — 5
   - Other (roll) — 5
5. **Have you encountered any problems or challenges?** None.
6. **Details or comments:** [No response.]

Polk County
Contact: Emil Norby, Polk County Highway Department, Emil.Norby@co.polk.wi.us.

1. **Type of spreader used:** Tailgate; V-box.
2. **Spreader Type** — **Make and Model (Number of Units in Service)**
   - Tailgate — Monroe, Henderson (11)
   - V-box — Monroe, Henderson (11)
3. **Delivery Mechanism** — **Number of Units**
   - Spinners — 20
   - Dual spinners — 2
4. **Delivery Mechanism** — **Rating**
   - Spinners — 5
   - Dual spinners — 5
5. **Have you encountered any problems or challenges?** Each material can have its problems if not used properly. Otherwise, no.
6. **Details or comments:** [No response.]

Shawano County
Contact: Grant Bystol, Shawano County Highway Department, grant.bystol@co.shawano.wi.us.

1. **Type of spreader used:** Tailgate.
2. **Spreader Type** — **Make and Model (Number of Units in Service)**
   - Tailgate — Henderson (7); Swenson (15); Monroe (23)
3. **Delivery Mechanism** — **Number of Units**
   - Spinners — 25
   - Dual spinners — 18
   - Homemade chutes — 2
4. **Delivery Mechanism** — **Rating**
   - Spinners — 3
   - Dual spinners — 4
   - Homemade chutes — 5
5. **Have you encountered any problems or challenges?** [No response.]
6. **Details or comments:** [No response.]

Sheboygan County
Contact: Edgar Karsteadt, Sheboygan County Highway Department, karstewk@co.sheboygan.wi.us.

1. **Type of spreader used:** Tailgate; V-box.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	Swenson S series (17)
V-box	Swenson EV series (26)

3.

Delivery Mechanism	Number of Units
Spinners	42
Dual spinners	1

4.

Delivery Mechanism	Rating
Spinners	4
Dual spinners	5

5. **Have you encountered any problems or challenges?** [No response.]
6. **Details or comments:** [No response.]

St. Croix County
Contact: Jim Harer, St. Croix County Highway Department, jharer@scchwy.org.

1. **Type of spreader used:** Tailgate; V-box; front unload.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	Swenson SBD-9 (30)
V-box	Henderson WSH (1)
Other (front unload)	Henderson TGS (13)

3.

Delivery Mechanism	Number of Units
Spinners	44
Dual spinners	10

4.

Delivery Mechanism	Rating
Spinners	4
Dual spinners	5

5. **Have you encountered any problems or challenges?** Frozen material.
6. **Details or comments:** We had zero velocity and they did not work.

Taylor County
Contact: Jess Sackmann, Taylor County Highway Department, jess.sackmann@co.taylor.wi.us.

1. **Type of spreader used:** Tailgate; V-box.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	Swenson S series (19)
V-box	Swenson (4)

3.

Delivery Mechanism	Number of Units
Spinners	23

4.

Delivery Mechanism	Rating
Spinners	4

5. **Have you encountered any problems or challenges?** The V-box units with side discharge are very high maintenance.
6. **Details or comments:** For our use the tailgate spreaders can't be beat for reliability and durability.

Vernon County
Contact: Jeffrey Fish, Vernon County Highway, jfish@vernoncounty.org.

1. **Type of spreader used:** Tailgate; V-box.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	Henderson (5); Swenson (6)
V-box	Henderson (10)

3.

Delivery Mechanism	Number of Units
Spinners	20

4.

Delivery Mechanism	Rating
Spinners	3
Homemade chutes	3

5. **Have you encountered any problems or challenges?** For spreading salt do not use spinner except at intersection.
6. **Details or comments:** [No response.]

Winnebago County
Contact: Jamey Gosz, Winnebago County Highway, jgosz@co.winnebago.wi.us.

1. **Type of spreader used:** Tailgate; V-box. We run standard 6" spreaders with the exception of one dual. All the V-box spreaders with the exception of one small Henderson pickup truck spreader use an Accu-Place [vertically mounted spinner assembly]. Three of the RDS live bottoms use an Accu-Place; the remaining three use a large center-mount spinner with a directional plate.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	Monroe and Henderson 6"
V-box	Monroe V-box
Other	Monroe RDS live bottom

3.

Delivery Mechanism	Number of Units
Spinners	25
Modified spinners	3
Dual spinners	1
Homemade chutes	4
Zero velocity spreaders	7

4.

Delivery Mechanism	Rating
Spinners	3
Dual spinners	4
Homemade chutes	2
Zero velocity spreaders	5

5. **Have you encountered any problems or challenges?** No.
6. **Details or comments:** [No response.]

Wood County
Contact: Bernard Karaliunas, Wood County Highway, bkaraliunas@co.wood.wi.us.

1. **Type of spreader used:** Tailgate; V-box.
2.

Spreader Type	Make and Model (Number of Units in Service)
Tailgate	15
V-box	3

3. **Delivery Mechanism** — **Number of Units**
   - Spinners — 15
   - Modified spinners — 3
4. **Delivery Mechanism** — **Rating**
   - Spinners — 4
   - Modified spinners — 4
5. **Have you encountered any problems or challenges?** Frozen spinners and also augers.
6. **Details or comments:** [No response.]

Wyoming

Contact: Ken Shultz, Wyoming Department of Transportation, ken.shultz@dot.state.wy.us.

1. **Type of spreader used:** V-box.
2. **Spreader Type** — **Make and Model (Number of Units in Service)**
   - V-box — Henderson (257)
3. **Delivery Mechanism** — **Number of Units**
   - Spinners — 240
   - Modified spinners — 17
4. **Delivery Mechanism** — **Rating**
   - Spinners — 4
   - Modified spinners — 3
5. **Have you encountered any problems or challenges?** Clogging; icing; control of product.
6. **Details or comments:** [No response.]