2018-2019

Office of Maintenance

Statewide Maintenance Operations Research Report

Your Destination...Our Priority

DISCLAIMER

Trade names are used on occasions in this report to better identify the type or use of a product or material involved in field research. However, use of these names in no way implies Minnesota Department of Transportation's (MnDOT) endorsement of the product or material discussed unless there is a specific MnDOT recommendation to that effect. No attempt was made to identify which product or material had registered trade mark associated with it.

ACKNOWLEDGMENTS

The Maintenance Operations Research program is able to make a significant impact on the efficiency, safety, and cost of state maintenance operations. Many thanks to the Area Maintenance Engineers and District champions for their enthusiastic involvement. We sincerely appreciate these contributions, as well as the strong support of MnDOT's Office of Maintenance in advancing technology implementation.

Thanks very much to all who contributed content to this biennial report, including writing summaries, submitting photographs and compiling data.

For more information, please visit:

Minnesota Department of Transportation:
http://www.dot.state.mn.us/

MnDOT Office of Maintenance Research Unit:
http://www.dot.state.mn.us/maintenance/research.html

MnDOT Research Services Section:
http://www.dot.state.mn.us/research/index.html

MnDOT Library:
http://www.dot.state.mn.us/library/

Office of Maintenance

Statewide Maintenance Operations Research Report

2018- 2019

Prepared by CTC & Associates LLC

July 2019

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Road and Roadside Maintenance

District/Office:
Metro

Contact:
Bill Augello
651-234-7906

Project Cost:
$1,600

Start Date:
June 2017

Completion Date:
April 2018

Vendor:
stihlusa.com

Battery Chainsaw

Completed

Project Description: Due to the long bar length of large chainsaws, kickbacks can occur when the tip of the guide bar hits another object or gets pinched on either side. Kickbacks, or the reversal of the chainsaw motion, poses greater risks for injuries. The district will test smaller, battery operated chainsaws that are lightweight and provide better control.

Purpose: Battery-powered chainsaws save time and money by eliminating the need for fuel and refueling during jobs. Smaller chainsaws are ideal for light cutting and are safer to use than large chainsaws.

Test Procedure: The district will test four battery-powered chainsaws for one year. The smaller chainsaws will be used to do light cutting of bushes and overgrowth around guardrails and cables. The district will evaluate the occurrences of kickbacks from using a smaller chainsaw, and will assess the difference in costs on maintenance expenses between the larger chainsaws versus the smaller chainsaws.

Conclusions: Because the battery chainsaws were lighter, the crews were able to cut bushes and small trees with ease. Better control of the chainsaw also resulted in less kickbacks, thereby increasing safety for the crew. The battery chainsaw was very convenient to use because gas was not needed and there was little to no prep time before taking the equipment out to use.

Recommendations: The battery chainsaw is recommended for sign crews or supervisors. It is a great piece of equipment that is ready to grab-and-go without the hassle of filling it with gas.

☑ Statewide ☑ District-wide ☐ Not recommended

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Road and Roadside Maintenance

District/Office:
Metro/Maple Grove

Contact:
Bill Augello
651-234-7906

Project Cost:
$2,500

Start Date:
June 2017

Completion Date:
April 2018

Vendor:
mscdirect.com

Battery Powered Light Stand

Completed Research

Project Description: Nighttime road repair work requires portable lighting to be hauled from location to location with a power source. Lightweight battery-powered light stands provide high-intensity light sources that are easy to transport.

Purpose: Tripod-mounted LED work lights from Rocket emit 3,000 lumens of brightness and are powered by lithium-ion batteries. The high intensity long-lasting lights are portable and easy to set up while providing a safer work environment for the crews.

Test Procedure: Crews used this product during a maintenance season as light sources on drainage system inspection and repair projects. They evaluated the units for portability, durability, battery strength and light intensity.

Conclusions: The battery-powered light stands were quick and easy to set up, carry and transport and proved to be brighter and more durable than older units. The lights were also easy to charge with batteries that were interchangeable with other power tools, and the battery power lasted throughout the night shifts.

Recommendations: Less expensive, more portable, more durable and long lasting, these LED light stands offer value and performance for nighttime road work. The units were popular with crews.

☑ Statewide ☑ District-wide ☐ Not recommended

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Road and Bridge Maintenance

District/Office:
6W/Albert Lea

Contact:
Brad Peterson
507-379-3414

Project Cost:
$9,050

Start Date:
June 2015

Completion Date:
April 2018

Vendor:
tiger-mowers.com

Bi-Directional Shoulder Reclaimer

Completed Research

Project Description: Road shoulder problems can quickly undermine the road foundation. The shoulder reclaimer is a claw attachment that is used to fill in ruts and smooth the shoulder. The unit currently in use is mounted on the right side of the tractor and can only be used on that side. The Tiger Claw model is positioned in the middle of the tractor for transport and can be used on either side.

Purpose: The district expects that using the bi-directional shoulder repair claw will save time, money, manpower and material because it drives with the flow of traffic, even on left shoulders. This is in contrast to the current unit, which must go against traffic, taking part of a lane on the left side. This bi-directional feature should also reduce injuries and accidents.

Test Procedure: The district evaluated the claw for eighteen months, working on both sides of the road. Operators tested the center-mounted feature for driveability on the road, as well as performance on both shoulders of the road.

Conclusions: Road crews were able to reclaim both shoulders on the highways without any problems and recycle existing materials. The reclaimer folded to the rear of the tractor making it more compact so that it did not protrude into the roadway. The hydraulic transport feature helped with efficiency and safety.

Recommendations: The bi-directional reclaimer is recommended for shoulder work on four-lane roadways to save costs in materials and increase safety for road crews and the traveling public.

☑ Statewide ☐ District-wide ☐ Not recommended

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Road and Roadside Maintenance

District/Office:
7/Mapleton

Contact:
Bryan Lillie
507-524-4698

Project Cost:
$3,200

Start Date:
April 2015

Completion Date:
July 2016

Vendor:
concordroadequipment.com

Chip Spreader

Completed Research

Project Description: Chip seals require crews to apply a layer of asphaltic coating on a prepared pavement, followed by spreading small, high-friction aggregate to cover the new pavement surface. Chip spreading machines sometimes fail to evenly spread the high-friction surface rock.

Purpose: Secondary chip spreaders are used to quickly fill in poorly covered areas before the underlying asphaltic material sets. Mounted on a truck, this spreader offers strong quality control.

Test Procedure: Crews used this spreader on various seal coating projects. The chip spreader followed behind the crew's standard chipper to catch uncovered areas, and was used as a back-up when the chipper was out of service.

Conclusions: Mounting the unit on trucks required more work than expected but could be easily removed. The unit worked well in areas the standard chipper missed, and worked well as a backup system when other chippers broke down. It may be a little lightweight for extensive use.

Recommendations: For areas that do a lot of chipping, this chip spreader provides strong backup and quality control. It also suits areas that work on small chip-seal projects.

☑ Statewide ☑ District-wide ☐ Not recommended

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Road and Roadside Maintenance

District/Office:
2/Thief River Falls

Contact:
Leif Spears
813-810-6105

Project Cost:
$1,550

Start Date:
August 2017

Completion Date:
March 2018

Vendor:
eartec.com

Eartec Headsets

Completed Research

Project Description: Communication between crew members out in the field is important for efficient productivity and safety. Current handheld devices require the use of a hand which limits the physical ability of a crew member while performing certain tasks.

Purpose: Eartec hands-free headsets allows crew members to efficiently communicate tasks that needs to be completed on the field and increases safety by quickly informing each other of any impending road dangers. In addition, the hands-free feature allows crew members to perform physical tasks more efficiently and safely.

Test Procedure: The district evaluated the headsets at different job sites and in various weather conditions. They were used by staff during snow removal operations, ditching projects, road maintenance projects and paving projects.

Conclusions: The headsets' hands-free and simultaneous talking features increased safety by allowing crew members to quickly communicate any impending dangers without the need to use hand signals. Productivity, on-the-job training and employee morale also improved due to constant communication among staff while out in the field. The headsets also worked well in freezing temperatures.

Recommendations: The EARTEC headsets are recommended for statewide use. Depending on the amount of usage, the batteries did not last beyond five hours. The district recommends using high performance batteries with the headsets.

☑ Statewide ☑ District-wide ☐ Not recommended

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Snow and Ice

District/Office:
8/Hutchinson, Marshall

Contact:
Craig Gertsema
507-537-2059

Project Cost:
$5,880

Start Date:
May 2017

Completion Date:
May 2018

Vendor:
evolutionedges.com

Evolution Edges Poly-Carbide VST Cutting Edges

Completed Research

Project Description: Cutting edges on snowplow blades require more frequent replacement than other snowplow parts. Thicker and stiffer blades with a one-piece design should require fewer removals and installations and be more durable and cost-effective.

Purpose: This project funded two sets of front plows with wings for use in the Hutchinson and Marshall areas of District 8. Heavier and more expensive, the blades should perform well and last longer.

Test Procedure: Operators installed the edges and used them over one winter maintenance season. They also compared plow performance, installation and removal, and durability to the other cutting edges they use.

Conclusions: The Evolution Edges cutting edges were easier and quicker to install due to the one-piece design, but significantly heavier, reducing the installation/removal benefit. Though the vendor was very responsive, the blades were not more durable than the standard product, and were louder and less effective at clearing snowy surfaces.

Recommendations: Due to plowing performance, edge wear and increased noise, operators do not recommend that other snow and ice control crews use these cutting edges.

☐ Statewide ☐ District-wide ☑ Not recommended

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Road and Roadside Maintenance

District/Office:
6E/Stewartville

Contact:
Jim Hurley
507-333-4413

Project Cost:
$4,200

Start Date:
July 2016

Completion Date:
May 2018

Vendor:
evolutionwheel.com

Evolution Wheels

Completed Research

Project Description: Ribbed all-steel wheels were mounted on forestry equipment to resist tearing that was being experienced by rubber tires or logging tracks when driving over abrasive debris while grinding trees.

Purpose: Maintenance personnel retrofitted tractors, side loaders, skidsteers and other such equipment with the Evolution Wheels to evaluate whether they performed adequately.

Test Procedure: Crews used the Evolution Wheels in brushwork and drainage work, testing the product in conditions that damage standard wheels and tires and that present traction challenges. The steel wheels were removed and attached to different equipment to test versatility and installation.

Conclusions: In stump grinding and brush clearing, the Evolution Wheels performed exceptionally well, offering tight turning ratios and resisting damage. Installation was no more difficult than with traditional wheels. On very soft ground, the wheels would at times dig out turf and cause the machinery to get stuck. On frozen turfs, the wheels don't always gain traction and simply spin on the surface.

Recommendations: Evolution Wheels may not suit winter conditions or boggy settings, but they work very well in rough terrain and wooded areas in which tires and rims on other wheels can get damaged. They are recommended for brushwork.

☑ Statewide ☑ District-wide ☐ Not recommended

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Road and Bridge Maintenance

District/Office:
7/Mankato

Contact:
Cole Albrecht
507-665-2681

Project Cost:
$57,000

Start Date:
May 2017

Completion Date:
July 2018

Vendor:
fibrecretept.com

Fibrecrete

Completed

Project Description: Crack sealing of concrete pavement can be time consuming and costly. Traditional repairs are prone to failure due to the stiffness of the cement-based sealant. The district is seeking an alternative material that seals cracks as well as cement but which is more durable and lasts longer.

Purpose: Fibrecrete is a flexible concrete repair sealant that is applied hot. Because of its flexibility, the material is strong enough to handle heavy traffic and changing temperatures. Its durability makes it an ideal long-term solution for road maintenance projects. The use of Fibrecrete instead of stiffer crack sealants can save time and money by eliminating the frequent need to repave and repair roads.

Test Procedure: The district used Fibrecrete to seal cracked concrete pavements at multiple locations. District staff applied it on various crack sizes and evaluated its effectiveness for durability and longevity.

Conclusions: The Fibrecrete performed well. Only a small crew is needed to apply Fibrecrete, which saves on labor costs. Even though Fibrecrete is more expensive than traditional patching materials, less frequent maintenance will be required if the Fibrecrete performs as expected.

Recommendations: The use of Fibrecrete can reduce maintenance costs and labor. It is recommended for statewide use.

☑ Statewide ☑ District-wide ☐ Not recommended

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Snow and Ice

District/Office:
3A/Wadena, Long Prairie

Contact:
Brandon Benning
218-640-2501

Project Cost:
$1,324

Start Date:
August 2017

Completion Date:
June 2018

Vendor:
jwspeaker.com

Heated LED Headlights

Completed Research

Project Description: Standard snowplow headlights are not always bright enough for drivers to see roadway striping, presenting safety challenges and contributing to operator fatigue. Brighter headlights with heating systems to reduce the impact of ice on the lights may improve nighttime vision for operators and improve plowing operations.

Purpose: Heated LED headlights are designed with a thermally conductive grid system that can quickly de-ice the lens. Combined with LED technology, these headlights will provide better lighting in harsh winter conditions, increasing safety for snowplow drivers.

Test Procedure: Crews replaced snowplow headlights with the LED units and evaluated performance of lighting and lens de-icing functions over one winter season.

Conclusions: LED lights were brighter and improved driver visibility at night and in poor weather. While the lenses iced over in heavy snow, they remained effective in most winter conditions. The heated LED headlight base frames had to be customized for the district snowplow trucks.

Recommendations: Heated LED headlights improved snowplow operator vision at night, enhancing driver safety and facilitating snowplowing efforts.

☑ Statewide ☑ District-wide ☐ Not recommended

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Road and Roadside Maintenance

District/Office:
6W/Red Wing

Contact:
Greg Peters
507-263-2323

Project Cost:
$15,100

Start Date:
June 2014

Completion Date:
January 2018

Vendor:
marshalltreesaw.com

Marshall Tree Saw

Completed Research

Project Description: Removing small trees from rights of way, ditches and other roadside terrain can be time-consuming and difficult. Chain saw work, especially during inclement weather, can be a dangerous use of manpower. A boom-mounted saw attachment for heavy equipment may offer a solution.

Purpose: Maintenance personnel in Red Wing tested the Marshall Tree Saw, a boom-mounted chainsaw attachment for skidsteers and tractor equipment. The saw can be used to cut, clear, move and stack trees and brush without the use of bulldozers or other equipment that can damage land.

Test Procedure: Maintenance personnel in Red Wing used the tree saw attachment through the seasons. They attached and removed the unit, and used it in situations where they previously used chain saws and needed multiple crew members to haul out trees by hand.

Conclusions: The Marshall Tree Saw allowed the crew to cut a lot of trees in a very short time, providing savings in time, in labor, and safety hazard exposure. Installation requires attachment with two hoses and an oil drip catcher, and the saw can be adjusted before installation to allow for immediate use.

Recommendations: The district recommends the Marshall Tree Saw for medium and light brushwork and tree clearing. The saw does not cut very large trees, but otherwise suits brushwork year-round.

☑ Statewide ☑ District-wide ☐ Not recommended

x

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Traffic Operations and Maintenance

District/Office:
Metro/Golden Valley Traffic Services

Contact:
Jeff Streeter
651-366-5191

Project Cost:
$3,500

Start Date:
August 2017

Completion Date:
August 2018

Vendor:
mscdirect.com

Proto Tethering Equipment

Completed

Project Description: When crews work overhead, workers occasionally drop tools such as drills or rivet guns valued from $200 to $1,600. Tethering systems allow construction workers to secure equipment to their bodies or nearby stationary devices to keep dropped tools from falling out of reach and damaging equipment and passersby, and to keep tripping hazards off work surfaces.

Purpose: Tethering equipment will make Golden Valley Traffic Services OSHA compliant, which it currently is not with respect to aspects of field safety. It will improve worker and road user safety by reducing the impact of dropping tools, saving money in equipment replacement, lost labor costs and potential injury to road users.

Test Procedure: Golden Valley Traffic Services purchased and evaluated the 180 Proto SkyHook tethering system items for one year. Supervisors recorded and analyzed the number of tool-dropping incidents and impact of tethering on dropped tool damage and determined its impact on equipment expenses.

Conclusions: The Proto tethering system could be used on most tools and was effective in preventing tools from dropping. The system was also easy to use. The district will continue looking for a tethering solution for the tools that did not fit with this system.

Recommendations: The district recommends the Proto tethering system to the bridge and tree crews in addition to other groups who need a tethering system.

☑ Statewide ☑ District-wide ☐ Not recommended

SL3 Snowplow LED Headlights

Completed Research

Project Description: Light from standard snowplow headlights can sometimes appear dim in poor conditions and lead to driver fatigue from the strain of trying to identify pavement striping and potential roadway hazards. High-powered LED headlights improve field of vision for operators and facilitate plowing operations.

Purpose: SL3 LED headlights provide a high intensity light that allows drivers to see at a greater distance, especially in harsh winter conditions. Better visibility allows drivers to plow quickly and safely.

Test Procedure: Crews replaced halogen headlights with the LED units and evaluated performance of lighting and lens de-icing functions over one winter season. The units' impact on operator fatigue was also evaluated.

Conclusions: LED lights extended operator field of vision, improving recognition of pavement striping and potential hazards like wildlife, traffic and objects, even in snowy conditions. While the lens' de-icing feature worked well, the headlights provided adequate lighting even with iced lenses. Drivers reported a reduction in fatigue and headaches.

Recommendations: The district recommends that all snowplow trucks should be retrofitted with SL3 LED headlights to improve snowplow operator safety and reduce on-the-job fatigue.

☑ Statewide ☑ District-wide ☐ Not recommended

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Snow and Ice

District/Office:
2/Thief River Falls, Crookston

Contact:
Leif Spears
813-810-6105

Project Cost:
$3,870

Start Date:
August 2017

Completion Date:
March 2018

Vendor:
bossplow.com

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Snow and Ice

District/Office:
7/Districtwide

Contact:
Jed Falgren
507-720-8707

Project Cost:
$9,890

Start Date:
January 15

Completion Date:
April 2018

Vendor:
ameritrak.biz

Snowplow Up/Down Sensors

Completed Research

Project Description: Up/down snowplow sensors allow snowplow operators and managers to track mileage of use and wear on plows and cuttingedges, one of the most commonly replaced snowplow parts. Sensor data can be used to determine the most effective cutting edges for various types of plow and pavement types.

Purpose: This project supported the purchase and evaluation of ten up/down sensors for use with snowplow cutting edges districtwide. This helped district management evaluate specific cutting edges for performance and cost-effectiveness.

Test Procedure: Maintenance equipment shop personnel installed sensors on ten trucks in about eight hours. Sensors were activated by the snowplow hydraulic systems; data was collected and evaluated by snow and ice removal maintenance management.

Conclusions: These sensors helped evaluate the effectiveness of specific snowplow cutting edges in terms of snow removal performance for specific roadway types, and in terms of durability. The vendor provided high-quality support.

Recommendations: Proposal authors recommend that other MnDOT districts employ up/down sensors for similar evaluation of cutting edges. District 7 will continue to monitor results on cutting edge performance and share information with other districts.

☑ Statewide ☑ District-wide ☐ Not recommended

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Winter Maintenance

District/Office:
3B

Contact:
Nate Moshier
320-282-3473

Project Cost:
$95,000

Start Date:
August 2018

Vendor:
allu.net

ALLU Screening Bucket

Research in Progress

Project Description: Salt spreaders for winter maintenance require relatively small salt pieces; larger chunks of salt clog spreaders and increase the time needed to apply chemicals to the roadway. The current process at the district to reduce salt to appropriately sized pieces is to lay out the salt with a loader and then drive over it.

Purpose: An ALLU screening bucket is purpose-built to break down coarse material though a screen of mechanized teeth. It can be used to break down salt chunks with a significant time savings compared with MnDOT's current method. Its non-clogging feature and ability to produce three different fragment sizes further increases its potential benefit for use with deicing salt for winter roads.

Test Procedure: The district will evaluate the effectiveness of the ALLU screening bucket to break down larger salt chunks. Staff will also use the screener for other applications, such as pulverizing milled pavement and screening black dirt.

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Road and Roadside Maintenance

District/Office:
6E/Winona

Contact:
Jon Beeman
507-205-6407

Project Cost:
$8,000

Start Date:
October 2017

Vendor:
bobcatofthecouleeregion.com

Bobcat Flail Cutter Attachment

Research in Progress

Project Description: When crews mow center medians, they partially block the left traffic lane with their tractor mower, requiring additional personnel and a crash attenuator. Use of the flail cutter attachment on a smaller Bobcat allows it to be off the driving lane, removing workers from the flow of traffic. The bulky mowers struggle to navigate around antenna towers and in remote mowing areas. This mowing attachment will work with smaller Bobcats in the district fleet, removing workers from the flow of traffic.

Purpose: The flail cutter attachment can be used with existing Bobcats in the district fleet for median mowing but also for more easily navigating around antenna towers and other confined areas. This allows the use of tractor mowers in work areas more suited to their larger size.

Test Procedure: Maintenance crews will use the flail cutter attachment with fleet Bobcats, mowing in medians and confined areas and tracking the time, manpower and fuel consumption differences between using a tractor mower and using Bobcat with flail cutter attachment. Crash information will also be recorded for comparison to past mowing seasons.

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Road and Roadside Maintenance

District/Office:
6W/Albert Lea

Contact:
Brad Peterson
507-379-3414

Project Cost:
$15,000

Start Date:
October 2017

Vendor:
sancoequipment.com

Bobcat Vibratory Smooth and Padded Drum Rollers

Research in Progress

Project Description: Culvert repair requires a range of heavy equipment, including tools for compacting soil effectively to ensure culvert stability and performance. Maintenance crews can use these new rollers as attachments to a single vehicle to respond promptly and efficiently to urgent and routine stormwater management needs.

Purpose: Smooth and padded vibratory rollers allow efficient and effective grading and compaction of soils supporting and insulating culverts in District 6. The bobcat rollers will save maintenance crews time, fuel and equipment expenses currently driven by the need to borrow and haul extra equipment from Freeborn County shops, and by having to use multiple vehicles for soil work instead of one with multiple attachments.

Test Procedure: Over a one-year period, the shop supervisor and equipment operators will use the bobcat rollers for culvert repairs and maintenance work. They will track time and fuel spent on equipment use, including hauling to and from job sites. Potential savings in time and fuel expenditure will be tracked.

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Snow and Ice

District/Office:
7/Mankato

Contact:
Scott Melzer
507-304-6224

Project Cost:
$69,000

Start Date:
November 2018

Vendor:
towmaster.com

Brine Spreader and Trailer

Research in Progress

Project Description: Recent MnDOT research demonstrated that the effectiveness of anti-icing material is increased by the passage of truck traffic. This suggests that an anti-icing application can be augmented by the action of a heavy trailer attached to the spreading vehicle.

Purpose: To achieve a truck pass effect right after anti-ice application, crews will strategically attach spreaders to the trailers. A spray bar can also be added to cover three-lane roadways. The setup can be used for multiple purposes in different seasons: spreading anti-icing brine during the winter and spreading herbicide in the summer.

Test Procedure: Operators and a supervisor will evaluate use of the equipment in two winter seasons and one summer season. The review will focus on the effectiveness of brine application and the feasibility of also using the system for spraying herbicide during the summer season.

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Road and Roadside Maintenance

District/Office:
2/Districtwide

Contact:
Tony Bowe
218-755-6567

Project Cost:
$94,000

Start Date:
August 2018

Vendor:
erskineattachments.com

Erskine Ditch Caddy and Flex Wing Mowers

Research in Progress

Project Description: Steep, wet or rough slopes alongside roadways can put mowing tractors in precarious positions, leading equipment to tip or slide or even roll over. Offset mower attachments on awkward slopes sometimes put tractors on highway shoulders moving dangerously against the flow of traffic. Caddies and well-designed mower attachments can take tractors out of treacherous positions.

Purpose: The Erskine Ditch Caddy and Erskine Flex Wing Mower attachments are designed to reach precarious sections of roadway slopes. With this equipment, operators can shift wing mower positions and even raise them into a vertical position, allowing them to mow around signs and other barriers. The tractor's flexibility and wide range of motion keeps it leveled and moving safely with the flow of traffic.

Test Procedure: District staff will use the attachments for one year, comparing them with traditional offset mowing attachments on their operating costs and injury and accident rates.

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Traffic Operations and Maintenance

District/Office:
6W/Owatonna

Contact:
Adam Miller
507-446-5508

Project Cost:
$2,400

Start Date:
February 2018

Vendor:
flaggermate.com

Flaggermate Sign Poles

Research in Progress

Project Description: Lighted signs for flaggers improve visibility, a critical component of work zone safety. They also lack durability. Crews attach heavy, battery-operated units to wooden handles, PVC tubes or steel rods, powering sign faces with fragile lights on the edge. Lightweight, high-powered Flaggermate poles integrate LED flashers into a two-piece pole that breaks down for easy storage.

Purpose: Lighted Flaggermate poles, affixed with existing stop/slow sign panels, offer a uniform format that can replace the non-uniform lighted signs currently in use. Poles weigh four pounds and use a standard charger to repower their 80-hour lithium-ion batteries. Sign faces can be easily removed and replaced, and Flaggermate's two-piece, aluminum design allows for easy transport and assembly.

Test Procedure: District staff will share four sets of poles. They will use and examine the product for one year in work zones requiring start/stop flagging, and will prioritize use in rainy, low-visibility situations, as well as in emergency callouts for nighttime maintenance work.

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Road and Roadside Maintenance

District/Office:
6E/Dresbach

Contact:
Don Bollman
507-643-6310

Project Cost:
$86,250

Start Date:
August 2017

Vendor:
titanmachinery.com

Forestry Mulcher

Research in Progress

Project Description: Trees infected by the emerald ash borer beetle and the pine borer beetle must be mulched on site to prevent spreading the invasive species. Many of these affected trees are located on slopes or above roadways and rail corridors, making it challenging for the crews to perform the task.

Purpose: The forestry mulcher attachment allows on-site mulching of damaged or infected trees, eliminating the need for crew members to perform the potentially hazardous task. The forestry mulcher can save costs by requiring less labor to perform on-site mulching. Improving crew safety has the added benefit of fewer workers' compensation claims.

Test Procedure: Equipment operators and supervisors will evaluate the performance of the forestry mulcher attachment and its impact on crew safety for two years. They will also determine if the use of the forestry mulcher is more effective in cost and speed compared with current procedures used to remove trees in difficult locations.

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Traffic Operations and Maintenance

District/Office:
Metro/Golden Valley Traffic Services

Contact:
Kevin Swecker
651-366-5206

Project Cost:
$2,700

Start Date:
August 2018

Vendor:
shop.gopro.com/cameras

GoPro 360 Video Camera

Research in Progress

Project Description: Motorists frequently encroach on work zones for traffic control and pavement marking crews. This behavior endangers crew members and the traveling public. Traffic services crews use cameras to track such activity, adjust work zones and encourage public safety and enforcement of work zone driving rules.

Purpose: This project funds the purchase of three 360-degree cameras and accessories, replacing the uni-directional cameras currently used in lane closures by traffic control personnel. Expanded imagery will provide more information for safe practices by crews and motorists, reducing equipment damage and worker injury, and improving public awareness.

Test Procedure: For twelve months, traffic services will mount the cameras daily on vehicles and equipment used by crews involved in pavement striping, bridge inspections, tree and brush removal, resurfacing and more. Supervisors will monitor video to improve practices and enforce driving regulations.

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Road and Roadside Maintenance

District/Office:
2/Bemidji

Contact:
Tony Bowe
218-755-6567

Project Cost:
$17,700

Start Date:
August 2017

Vendor:
greenclimberna.com

Green Climber Remote Control Mower

Research in Progress

Project Description: Roadside maintenance crews often mow in wet areas and on steep banks, situations vulnerable to rutting and to rollovers and other accidents that threaten crew safety. Green Climber mowers feature wide bases, weight-distributing track systems and low centers of gravity much less likely to cause damage or to roll over, and remote-control operation that keeps crews out of harm's way.

Purpose: The Green Climber LV600 will save crews time lost to tractor rollovers, stuck mowers and repairing slopes or ditches. It will reduce accidents and injuries, as well as save money in equipment costs and repair of facilities. It may also save operational time and expense due to its lower profile and efficiency under trees and other objects with limited clearance.

Test Procedure: District 2 will use one unit in its roadside maintenance activities. The LV600 will be evaluated for mowing effectiveness, operational cost and time efficiencies on slopes and wet terrain.

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Bridges and Structures, Inspection and Maintenance

District/Office:
4A

Contact:
Kohl Skalin
218-846-7943

Project Cost:
$70,800

Start Date:
January 2019

Vendor:
rcmspecialties.com

Heated Spray Bar Distributor

Research in Progress

Project Description: Heated emulsions used in asphalt pavement repair can easily clog up spray distributors. This results in costly delays and labor to repair and reset equipment. Heated sprayer distributors prevent clogging and provide continuous operation, saving time and money.

Purpose: The new heated spray distributor employs a heating technology that does not degrade the emulsion, unlike the older heating distributors. Additional features, such as an easy-to-use valve system and portable lighting, allow operators to easily and safely use the new heated spray distributor.

Test Procedure: The project coordinator will track performance of the new heated distributor as it is used across the district. The assessment will include a comparison of volume of emulsion used with the new and old distributor systems. The amount of labor, the availability of equipment and the number of injuries will also be evaluated to determine if there are any improvements in these areas when using the new heated distributor.

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Road and Roadside Maintenance

District/Office:
6W/Albert Lea

Contact:
Brad Peterson
507-379-3414

Project Cost:
$3,133

Start Date:
June 2017

Vendor:
liftgator.com

Lift Gator Lift Gate

Research in Progress

Project Description: Road maintenance crews use trucks to move equipment and supplies to and from job sites and other shops. A new lift gate will reduce hand-lifting and moving heavy items during busy maintenance periods when other lift gates are unavailable.

Purpose: The Albert Lea truck shop will add the Lift Gator XTR lift gate to its facility. The Lift Gator can be easily attached and detached from appropriate truck beds for use in the field. It will reduce the need for crew members to lift large, heavy objects by hand in the shop and in the field, reducing manpower needs, injuries and accidents, and saving project time.

Test Procedure: The truck shop crew will monitor the use of the Lift Gator for one year. Users will evaluate the gate's effectiveness in moving large and heavy equipment and supplies in the shop and in the field, as well as in removing large debris from roadsides.

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Road and Roadside Maintenance

District/Office:
8/Hutchinson

Contact:
Jerry Eggert
320-234-8475

Project Cost:
$46,000

Start Date:
August 2017

Vendor:
minipaver.com

Pavijet MG7 Mini Paver

Research in Progress

Project Description: Paving around certain structures and small areas can be difficult and time consuming. Oftentimes, small paving jobs require manual labor which adds time and costs to a project. Mini pavers can maneuver around tight spaces on smaller worksites such as sidewalks, wheel ruts, edge drop offs, utility trenches and driveways.

Purpose: The Pavijet MG7 is a compact mini paver that is portable and is the only paver able to fill with gravel, sand, stones, cold or hot asphalt and concrete. The mini paver saves time and money by reducing the amount of manual labor required for small paving jobs. Purchasing a mini paver also reduces the need to outsource small paving jobs and saves on rental costs.

Test Procedure: The district will evaluate the performance of the Pavijet MG7 mini paver in certain areas such as wheel rutting around stop signs. They will also monitor cost savings as a result from using less manual labor and reduced project outsourcing.

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Road and Roadside Maintenance

District/Office:
1/Duluth

Contact:
Jim Kielty
218-725-2821

Project Cost:
$56,000

Start Date:
August 2018

Vendor:
rotobec.com

Rotobec Grapple Saw

Research in Progress

Project Description: Windblown and damaged trees present safety hazards to drivers and crews attempting to remove them, especially on slopes, near bridges and structures, and on other difficult roadside terrain.

Purpose: The Rotobec grapple rake with a built-in saw can move and cut windblown trees and brush. By using this new attachment with existing excavators, crew members can efficiently and safely remove roadside tree debris hazards.

Test Procedure: District crews will use the equipment for one year, and the project manager will evaluate its performance, efficiency and safety value.

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Snow and Ice

District/Office:
7/Mankato

Contact:
Chase Fester
507-822-3086

Project Cost:
$45,000

Start Date:
November 2018

Vendor:
brinextreme.com

Self-Cleaning Brine Generator

Research in Progress

Project Description: District 7's current salt brine generator needs to be cleaned after every 30,000 gallons of brine production due to clogging. The cleaning task requires one-to-two hours of intense labor for up to three workers. Because the generator produces more than 750,000 gallons of brine each season, the 25 or more maintenance cycles can be costly.

Purpose: As an alternative, the BrineXtreme brine production system includes a self-cleaning and triple-screen filtering feature that requires less cleaning maintenance and provide longer production. This will reduce MnDOT's cost and labor requirements. The patent-pending BrineXtreme generator can be used with the district's existing brine generator software.

Test Procedure: The winter maintenance staff will evaluate the performance and effectiveness of the BrineXtreme's self-cleaning technology and any improvements to staff productivity.

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Road and Roadside Maintenance

District/Office:
Metro/Eden Prairie

Contact:
Roosevelt Johnson
651-633-1271

Project Cost:
$1,000

Start Date:
August 2017

Vendor:
beisswengers.com

Self-Propelled Walk Behind Weed Trimmer

Research in Progress

Project Description: Fence and guardrail repair requires road crews to trim and mow greenways on flat and sloped areas alongside roadways to ensure safe and visible access to repair sites by heavy equipment. A walk-behind, self-propelled weed trimmer supports efficient and safe work in roadside environments.

Purpose: The walk behind weed trimmer enables roadside maintenance crews to clear space for heavy equipment and operate safely and efficiently near roadways. In certain conditions, it will free workers from having to carry heavy, hand-held string trimmers through tall grass that may conceal hazards.

Test Procedure: Crews repairing fences and low-tension guardrails will use this equipment for one year and evaluate its usefulness in terms of time saved in repair activities, reduced manpower needs and reduced injuries and accidents.

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Road and Roadside Maintenance

District/Office:
3B/Monticello

Contact:
Dave Van Deusen
651-366-5524

Project Cost:
$22,500

Start Date:
June 2017

Vendor:
uretekusa.com

Uretek Injection Slab Stabilization

Research in Progress

Project Description: As part of the 2017 MnROAD construction program under the National Road Research Alliance**,** researchers identified a section of Interstate 94 in Minnesota that showed damage at concrete pavement joints where loads transfer poorly across 24 slabs in a 600-foot stretch. Joints and the subsurface area require repair before asphalt overlay.

Purpose: Uretek USA will provide materials, equipment and crew to perform slab stabilization using its injectable foam process to fill the voids under the roadway and between slabs. The treatment will help increase the load transfer efficiencies and reduce the deflections between slabs. Because MnDOT will only need to provide traffic control, this can be a cost-effective approach.

Test Procedure: Field testing will provide a record of pavement and subsurface conditions before repair work begins. Following Uretek's work stabilizing slabs and joints, MnDOT will monitor pavement performance for five years, reporting to District 3 and to partner agencies in a pooled fund study.

DEPARTMENT OF TRANSPORTATION

Maintenance Research

Traffic Operations and Maintenance

District/Office:
6W/Owatonna

Contact:
Adam Miller
507-446-5508

Project Cost:
$3,000

Start Date:
February 2018

Vendor:
plasticade.com

Volcano Rubber Based Barricades

Research in Progress

Project Description: Current barricades are mostly steel in construction and often require two people to assemble on site. Susceptible to sliding in the draft of passing semi-trailer trucks, the unwieldy devices require up to eight sandbags to anchor into place. All-plastic break-away barricade systems like the PowerPost Type 3 units are easier to install and remove.

Purpose: New, lightweight Type 3 barricades may replace the current square-tube posted barricades. All-plastic, rustproof and impact-resistant, the barricades include Volcano rubber bases that weigh 43 pounds each, stack easily, and feature molded handles for simple transport. These can be readily assembled on site by a single crewmember.

Test Procedure: District staff are sharing eight of the new barricades. Crews will use these for blocking a lane, closing a lane, closing a road and in other situations requiring barricades.

For more information, please visit:

Minnesota Department of Transportation:
http://www.dot.state.mn.us/

MnDOT Office of Maintenance Research Unit:
http://www.dot.state.mn.us/maintenance/research.html

MnDOT Research Services Section:
http://www.research.dot.state.mn.us/

MnDOT Library:
http://www.dot.state.mn.us/library/