

STATEWIDE BIENNIAL Maintenance Operations Research Report 2005 - 2007

Office of Maintenance and Security
Research Section



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I. ACKNOWLEDGMENT

Special thanks to the Area Maintenance Engineers, their staff and all maintenance personnel for their support, involvement and contribution to the Maintenance Operations Research Program. Without the excitement and willingness of operators and Districts to actively work on the projects, the Maintenance Operations Research/New Technology Research Equipment Committee (MOR/NTREC) program wouldn't be where it is today. The program would not succeed without a District champion and project originator from the field.

I would also like to thank the Office of Maintenance and Security for supporting and believing in advance, cutting edge technologies. I like to thank the Staff of Maintenance Operations Research unit and all those who have helped in making this Biennial Report possible from writing project reports, submitting photographs and promoting the program. Special thanks to Paula Gustafson for creating the cover of the biennial report.

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II. 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 (Mn/DOT) endorsement of the product or material discussed unless there is a specific Mn/DOT recommendation to that effect. No attempt was made to identify which product or material had registered trade mark associated with it.

III. MOR/NTREC PROGRAM

Program Goals And Objectives:

The goal of MOR/NTREC Program is to maintain an active and visible research effort that involves all Mn/DOT maintenance areas. The program addresses all elements of maintenance operations including snow and ice control technology, roads and bridge maintenance, roadside maintenance, maintenance management, general maintenance, work zone safety, electrical maintenance, as well as technology transfer. It seeks to develop the most effective maintenance procedures, materials and equipment and to build on research conducted or supported by other agencies, other states, Federal Highway Administration (FHWA), Local Road Research Board (LRRB), Transportation Research Board (TRB), academia, other countries and private industry.

The MOR/NTREC Program focus is on “on the road” or applied research. It takes developed methods, materials, products or prototypes out on the road and field-tests them in an array of environments, varying weather conditions, assorted traffic volumes and more. An emphasis is placed on innovation and encourages the submission of project proposals from all levels of Mn/DOT maintenance personnel. Truck station personnel, university persons with Mn/DOT sponsors, Lab and Materials personnel, and the Maintenance Research Staff have all sponsored or submitted proposals for projects.

The objective is to share research results statewide and to promote the implementation of successful projects.

Program Background:

In 1990, Mn/DOT Area Maintenance Engineers (AME) realized the value of researching new technologies and committed \$750,000 annually from the statewide maintenance operations budget to maintenance operations research. A full-time Maintenance Operations Research Engineer position was created to direct the program. This position was first filled in May, 1992. The Maintenance Operations Research Engineer (MORE) works closely with the New Technology Research and Equipment Committee (NTREC), AMEs, Superintendents, Supervisors, Mn/DOT’s Research Services Section (RSS) and other Mn/DOT offices. The NTREC oversees the research program and meet twice a year. This group is made up of approximately twenty members who represent many factions in the Minnesota Department of Transportation. Having such an operating unit within Mn/DOT that funds and administers its own research initiative is considered unique nationally and internationally. During the past several years, funding and downsizing has impacted the program resulting in a reduction in dollars available and resources.

MOR/NTREC Project Funding:

The 2006 and 2007 fiscal year budget committed to MOR/NTREC program through Mn/DOT was \$425,000 per year which included three full time positions salaries. The project budget for 2006 and 2007 was 155,000.00 per year. The program involves large research projects which may have funding approved for over two or more fiscal years. Research proposals with funding requests less than \$12,000.00 are called MOR and Maintenance Operations Research Engineer (MORE) has authority to fund MOR projects. Research proposals with funding requests of more than \$12,000 are considered for approval by New Technologies Research Equipment Committee (NTREC). NTREC meets twice a year to consider project proposals submitted to MORE. The following are the number of projects and dollars associated with them per topics and per districts for projects approved during fiscal years 2006 and 2007. See Figure 1 for graphic of district map.

Topics	# Projects	Dollars
Winter Maintenance	18	\$82,378.00
Winter Material	0	\$0.00
Road and Bridge Maintenance	7	\$71,754.61
Safety, Traffic Control and Work Zone Safety	3	\$49,073.50
Roadside Maintenance	12	\$124,012.50
Equipment and Tools	9	\$61,794.50

Districts	# Projects	Dollars
1 Duluth	2	\$27,474.000
2 Bemidji	2	\$6,695.00
3 Brainerd	2	\$23,000.00
4 Detroit Lakes	4	\$48,350.00
6 Rochester	12	\$96,386.50
7 Mankato	12	\$110,660.61
8 Willmar	1	\$10,000.00
Metro	9	\$45,956.00
Co	5	\$20,491.00

Research Criteria:

A set of criteria was developed with assistance from NTREC program. It is used to ensure that the proposals submitted meet the goals and the purpose of the program. The criteria subjects are as follows:

1. Funding and Matching Resources
2. Potential Return/Benefits
3. Safety
4. Statewide Implementation
5. Innovation

This criteria is further detailed in the NTREC Manual of Procedures and may change to meet the needs of the program.

Research Implementation:

The purpose of research implementation is to ensure that the results of successful Maintenance Research Projects get implemented into the field operations, to enhance the technology transfer program within Mn/DOT maintenance and to optimize the return on the investment made in research through a structured implementation program. The Maintenance Operations Implementation fund is 25% of the project portion of the annual budget. The implementation fund was 25% of \$155,000.00 for FY 2006 and FY2007. Activities that are eligible for partial or full funding include: equipment, districts labor, materials, training and technical assistance.

Summer of 2007, one of MOR funded projects were implemented state wide. The project, "Epoxy Crack Filling - Using the PCH GMP-025 Lil Pro," ran from May to October 2006. Mn/DOT's Metro District Bridge Office used the device to fill cracks on bridge decks with a fast-setting epoxy. MOR provided \$10,000 for the Metro project and funded seven more for other seven districts.

Table 1 is the list of recommended projects for potential implementation with statewide application and Table 2 is the list with limited applications. The program budget is limited and only a hand full of projects will be reviewed and recommended by the NTREC. Table 1 and 2 are a list of research projects identified for possible implementation by the corresponding district or by maintenance research staff. It is each district's maintenance management responsibility to take any of the projects to the next level. The maintenance research section staff would assist the districts in any way they can in this process.

Table 1 - Recommended projects for potential implementation with statewide application

Project	District
LiteSys Intellect CMS	D1
Pro Press Crimping Tool	D1
Shoulder Reclaimer	D1
Portable Wheel Stud Remover	D2
Gooseneck Lamps	D3
Cold Planner	D4
Roo Guard Barrier	D6E
Skid Steer Rubber Tracks	D6E
Solar Traffic Lights	D6E
Boom Mounted Snow Blower	D6W
Clear Fast	D6W
Loeering Track System	D6W
Snap-On HD35 Fluid Changer	D6W
Tree Puller	D6W
Wolf Disc	D6W
York Front Mounted Rotary Broom	D6W
Dye Injection	D7
Pack a Cone	D7
Pre-Wet Tanker	D7
Rubber Tire Roller	D7
Safety Work Platform	D7
Skid Loader Backhoe	D7
Slap Me Wipers	Metro

Table 2 - Recommended projects for potential implementation with limited application

Project	District
Bypass Scaffold	D1
Joma Blades	D3
Wireless Mobile Lift	D3
Auger Bucket	D6W
Stainless Steel Water Tank	D6W
Stump Grinder	D6W
York Front Mounted Rotary Broom	D6W
Electric Heated Pickup Box	D8
Hydraulic Wing Push Arm	D8
Rotary Mower	D8

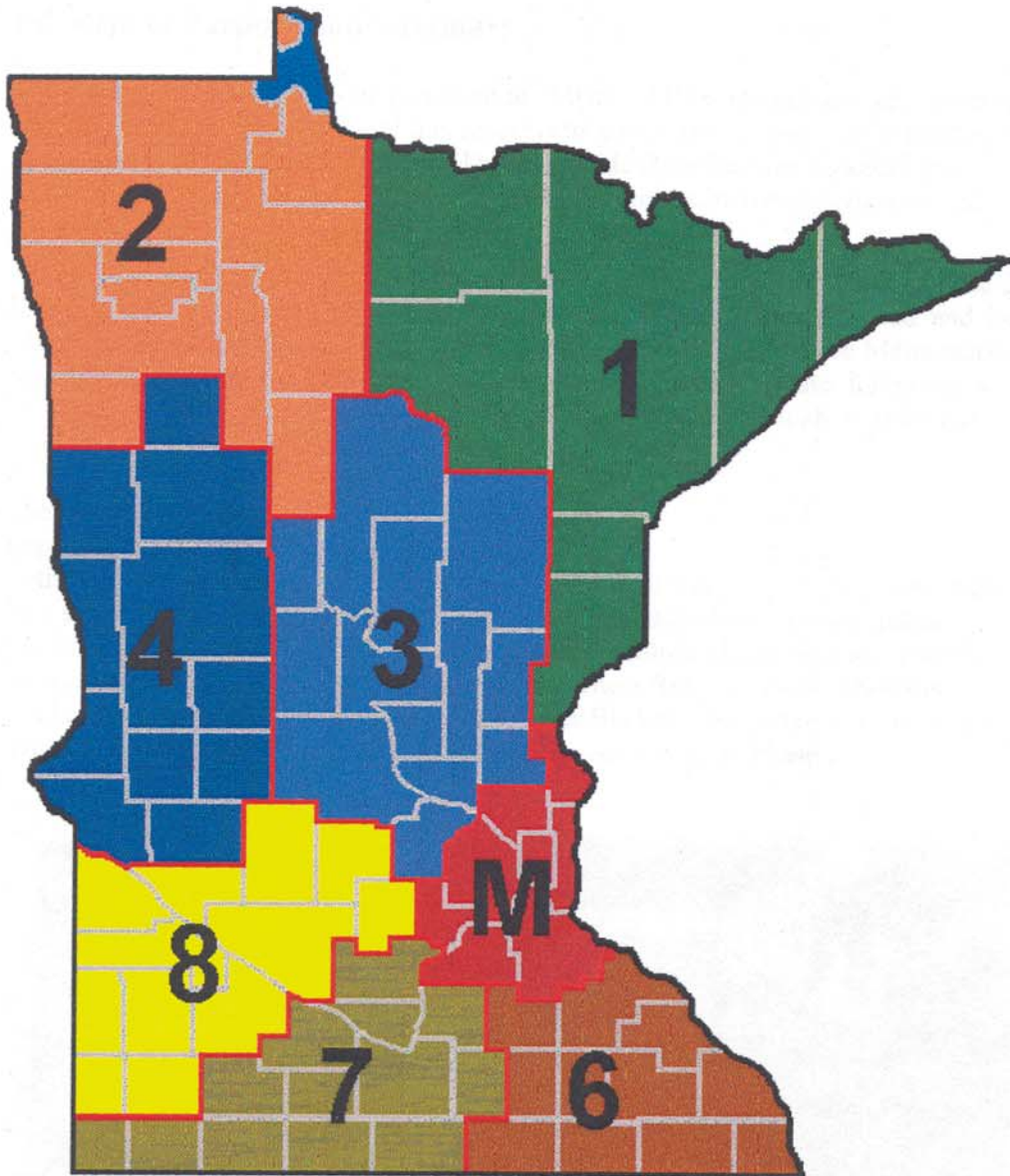


Figure 1 - Minnesota Department of Transportation Districts

- | | |
|--|--|
| 1 Duluth | 6 Rochester |
| 2 Bemidji | 7 Mankato |
| 3 Brainerd | 8 Willmar |
| 4 Detroit Lakes | Metro |

IV. REPORT PURPOSE AND SUMMARY

The purpose of this report is to document the MOR/NTREC project activities from July 2005 to June 2007. The intent of this report is to give a general overview with the project contact listed for further information. This Statewide Biennial Maintenance Operations Research Report is intended to be a useful resource for maintenance personnel and others who are interested in maintenance research.

This report consists of completed and on-going projects from July 2005 to June 2007. Projects are in the areas of Winter Maintenance, Winter Material, Road and Bridge Maintenance, Safety, Traffic Control and Work Zone Safety, Roadside Maintenance and Equipment and Tools. Individual projects are summarized in the following section. Identical projects have been summarized as one project although it may have been conducted in more than one district.

The following address is maintenance website:

<http://www.dot.state.mn.us/maint/research.html>

In the website, you can find the proposal form, the final report form, the project summary data sheet, monthly bulletins and the most recent biennial reports. Maintenance is planning to add videos to the website that can be downloaded and viewed. The following projects have video available upon request: Skid Steer Rubber Tracks, Shoulder Reclaimer, Boom Mounted Snow Blower, Auger Bucket, 3 Point Jetter, Cone Setter Truck Mounted, Apache Bullseye 6 Laser and Trash Harvester Phase 2.



V. MAINTENANCE RESEARCH PROJECTS COMPLETED 2005-2007

A. Winter Maintenance

1. HOT WASH CLEANING UNIT

District/Office: 3A/Baxter

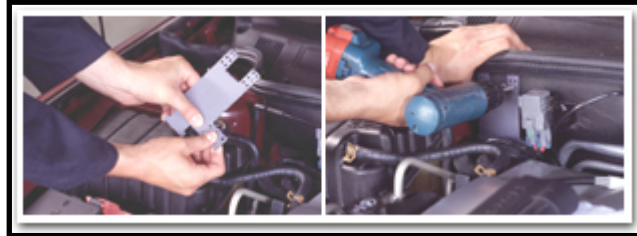
Project Contact: Jim Anderson
218/828-5729

Project Cost: \$2,400.00

MOR Fund \$2,400.00

Starting Date: September 2005

Completion Date: May 2006



Project Descriptions:

When snow and ice builds up on the windshields of our plow trucks the operators have to stop and get out to clean off the frozen mass. District 3 would like to install hot wash cleaning units on plow trucks to test and evaluate the hot wash cleaning unit.

Purpose:

The purpose of this project is to see if these units help keep snow plow operators windshields clear of snow and ice; this will make visibility better leading to a safer and more productive operation.

Test Procedure:

District 3 installed these units on 19 plow trucks and in one car. Then the operators will monitor the snow and ice build up on the windshield and wipers during snow and ice events.

Conclusions:

The units took 3-4 hours to install. They are user friendly and are easy to operate. The results were favorable in the plow trucks. The units worked well in aiding to manage the ice build up on the windshields and wipers. The winter of 2005-2006 did not have the extreme temperature conditions that some winters produce; however, the snow and ice conditions were enough to put the units to the test. The unit that was installed on a car did not receive a good review. It worked well in helping to remove frost in the morning but not so well in preventing the ice build up on the wipers during heavy snow fall conditions.

Recommendations:

The recommendation is to further test the units in other districts.

Implementation:

The district recommends these for their plow trucks but would like to get more test results prior to possible state wide implementation.

2. SLAP ME WIPERS

District/Office: Metro/North Branch

Project Contact: Alan Lightfoot
651/237-0479

Project Cost: \$4,000.00

MOR Fund: \$4,000.00

Starting Date: Winter of 04-05

Completion Date: April 2006



Project Descriptions:

During snow and ice operations it can be extremely difficult to keep freezing precipitation from building up on the wiper blades. This causes impaired vision and presents a dangerous situation. Cleaning off the snow and ice can also be dangerous for the operator since it usually requires hanging from the side of the truck while standing on unsafe footing areas.

Purpose:

This is a new product that uses air pressure to raise the wiper away from the windshield and “slap it” back in place. The effect of this motion is intended to break off and dislodge the snow and ice without causing damage to the windshield.

Test Procedure:

Five sets of these wipers will be installed and used throughout the winter season of 2004-2005. Operators will monitor their effectiveness in clearing the frozen precipitation.

Conclusions:

This is a very good product that increases safety for the driver as well as the motoring public by maintaining good visibility during very difficult conditions. The wiper system reduces the frustration of the driver by removing the freezing precipitation and not having to climb out on the truck and do it manually. This reduces the risk of personal injury from slipping and falling off the truck. The only problem encountered was an air ram failure in which parts were received in 2 days after the request was turned in.

Recommendations:

This would work anywhere snow and ice build-up is encountered on the windsheilds of Mn/DOT trucks. The product is easy to install and requires minimal maintenance.

Implementation:

This project has good reviews from the district and has been added to the list of projects for potential statewide implementation.

3. CLEAR FAST/HOT SHOT COMPARISON

District/Office: 6W/Owatonna

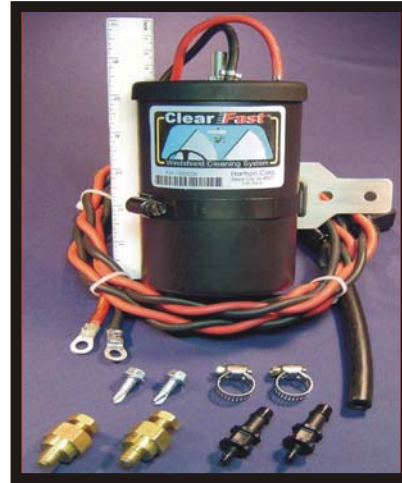
Project Contact: Terry Schmitt
507/263-2323

Project Cost: \$1,000.00

MOR Fund: \$1,000.00

Starting Date: June 2006

Completion Date: April 2007



Project Descriptions:

For the Clear Fast Windshield Wash Heating System and the Hot Shot system - the units have an electronic control system that controls the power applied to the heating element which ensures a safe operation. The heating element/reservoir holds 150 ML of fluid and heats the fluid to 120 degrees F.

Purpose:

This product will keep the windshield free of snow and ice build up making the job of the operator safer. This product will also make operators work more efficient by not having to stop and clean off their windshield.

Test Procedure:

An hourly usage report will be kept to record the effectiveness of the units in the various conditions encountered during one complete winter with two different but same heating systems.

Conclusions:

Hot Shot and Clear Fast performed well. They both keep the windshields and wipers clear of ice. The Hot Shot use more windshield fluid when in the pulsating mode than the Clear Fast. Another difference is that the Hot Shot had to be turned on to be used while the Clear Fast was on all the time.

Recommendations:

The Clear Fast unit is recommended because it doesn't have to be turned on. It uses less windshield washer fluid, less time is needed to stop and refill with fluid and the Clear Fast unit is easier to install.

Implementation:

This project has good reviews from the district and has been added to the list of projects for potential statewide implementation.

4. JOMA BLADES

District/Office: 3B/St.Cloud
Project Contact: Terry Newgard
320/983-6789
Project Cost: \$6,000.00
MOR Fund: \$4,000.00
Starting Date: May 2004
Completion Date: December 2006



Project Descriptions:

The use of these rubber coated cutting edges will improve dramatically the wear life, reduced vibration and noise, reduce driver fatigue and create a cleaner road surface (wheel ruts). Cleaner road surfaces mean less chemical usage and possibly decreasing the wear on pavement markings.

Purpose:

Newly improved Joma 6000 high-speed snowplow blades will be used to improve snowplow operation and cutting edge life.

Test Procedure:

The test procedure in this project was to place a micro switch on the plow lift mechanism and a micro switch on the side of the driver's seat. With this system the ignition switch had to be on, the driver's seat depressed and the plow lowered in order for the circuit to be closed. An hour meter was placed in line to record the hours the cutting edges were being used. This eliminated the operator from recording how much time that the cutting edges were lowered and in use.

Conclusions:

Because these cutting edges are easier to replace, they give better performance. They are more efficient by not having to replace cutting edges as often. These cutting edges are more cost efficient, they save replacement time, less wear on equipment and reduced driver fatigue.

Recommendations:

It is recommended that the Joma 6000 cutting edges could be used on all bituminous snowplow routes with good results but not recommended on concrete surfaces because of the premature wear out factor.

Implementation:

The district recommends the Joma cutting edges for use asphalt roads but not on concrete surfaces. Because of the nature of our roads this project has limited applications; therefore, it has been placed on the limited application list.

5. STAINLESS STEEL WATER TANK

District/Office: 6W/Owatonna

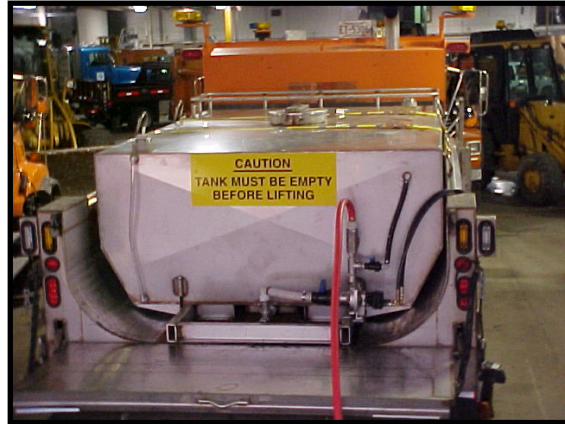
Project Contact: Ron Heim
507/334-4495

Project Cost: \$10,179.04

NTREC Fund: \$10,179.04

Starting Date: May 2005

Completion Date: May 2006



Project Descriptions:

During this project District 6 will develop a stainless steel tank to fit inside of our new stainless steel truck boxes. The flat bottom tanks don't fit since boxes are elliptical now. Plastic elliptical tanks that fit in the boxes have small capacity to have a productive job. District 6 hooked a pump to this tank with the new style Dickey John Control Point. We were able to do so with a flow meter hooked into the control point sander auger system. The system is capable of spreading a constant liquid flow that is ground speed orientated.

Purpose:

This is a custom formed tank that would fit into the new class 33 trucks with stainless steel box. It would be all stainless so it will not rust. The District would like to hook it to the new Control Point sander controls in order to keep track of gallon usage.

Test Procedure:

The tank and pump will be installed in a 2004 Class 33 with an elliptical box. We will fill the tank to various levels and drive the truck under normal conditions and evaluate the stability of the truck.

Conclusions:

The tank performed well. There is very little sloshing effect at any level of capacity. It is well balanced so it doesn't feel top heavy when cornering. The Control Point works great with the pump and spray system. The only problem was siphoning material from the spray ball after the pump is turn off.

Recommendations:

The District highly recommended these tanks for all elliptical boxes. The capacity is greater and you also have a lower center of gravity.

Implementation:

This project has been recommended by the district but has limited applications; therefore, it has been placed on the limited application list.

6. BOOM MOUNTED SNOW BLOWER

District/Office: 6W/Owatonna

Project Contact: Brian Bustad
507/433-0554

Project Cost: \$33,949.20

MOR Fund: \$6,327.00

Starting Date: April 2006

Completion Date: March 2007



Project Descriptions:

The snow blower is used to clean intersections by going around corners to remove snow build up. It is safer to use the boom mounted snow blower versus the rear mounted blower. When using the rear mounted blower stabs are made all of the way around the corner putting the tractor in the intersection where the operator could get hit by on coming traffic.

Purpose:

This project evaluates the ability to clean intersections site distances safely and efficiently without disrupting or slowing down the traffic.

Test Procedure:

The time to clean an intersection will be measured and compared to the rear mounted method. Traffic safety is increased by not disrupting the normal flow of traffic using the boom mounted blower.

Conclusions:

The three operators were impressed on how the blower worked in compacted or fluffy snow. They were also impressed on how much power the blower has. The snow blower completed the task quicker than the conventional methods. The snow blower worked great around intersections clearing wind rowed snow build up. Also, the snow blower was safer for the employees and the traveling public.

Recommendations:

The only recommendation is to have an adjustable chute reflector so that the snow can be deflected either up or down. This would be a useful tool for areas it can be attached to a boom normally used for a mowing slopes.

Implementation:

This project has good reviews from the district and has been added to the list of projects for potential statewide implementation.

7. BRINE MAKER INJECTION

District/Office: 6E/Rochester

Project Contact: Dave Redig
507/285-7361

Project Cost: \$24,000.00

MOR Fund: \$12,000.00

Starting Date: December 2004

Completion Date: December 2005



Project Descriptions:

This is a self cleaning/automatic salinity control brine maker/injection system. This machine uses a downward flow instead of the typical upward flow. This machine is said to produce cleaner, higher concentration brine leading to cleaner storage tanks with less sediment. It is also computer controlled for accuracy; therefore, monitoring this system is not needed. The injection system from Dultzmeier Industries introduces the liquid “Spike” into our salt brine to lower the freezing point.

Purpose:

This continuous flow system is capable of making 5000 gallons of brine per hour. This unit does not require constant monitoring; therefore, employees can carry on with daily activities.

Test Procedure:

The brine maker will be tested to see if 1) it is as easy to clean and maintain as the manufacturer claims, 2) if the computerized system will be capable to maintain the proper salinity while mixing large volumes of brine and 3) if the injection will be capable of producing a consistent “Spike” as needed for lower temperature applications?

Conclusions:

Brine production was increased 10 fold with this unit. It is a machine that is capable of managing itself once its turned on. If the machine senses any problems such as no salt or an electric valve malfunction the unit will shut itself off and display an error code of the problem at hand.

Recommendations:

The unit is evaluated on a scale of 1 to 10: 4 on customer service, 10 on capabilities of brine production, 2 on a user friendly operator’s manual.

Implementation:

The district recommends this project and at this time there are many variations of this machine within Mn/DOT so we have not considered this particular one for implementation.

8. DYE INJECTION

District/Office: 7/Mankato
Project Contact: Rich Vogelsang
507/524-3132
Project Cost: \$1,810.00
MOR Fund: \$1,810.00
Starting Date: December 2005
Completion Date: April 2006



Project Descriptions:

Dye will be added to snow and ice chemicals to test if it is more visible to other snow and ice personnel. This will potentially save material from being plowed off the road by other plow trucks and more visible to the general public.

Purpose:

This dye could be cost effective on a few accounts: 1) less salt getting plowed into the ditch, 2) the dye may attract heat from light to speed up the melting process and 3) it will be more visible to the general public and patrol so they will be able to see it on the road rather than calling us to come and reapply.

Test Procedure:

Dyed versus non-dyed brine was applied during snow and ice operations to evaluate visibility of salt applications to interstate and non-interstate roads from two separate truck stations. Dye was metered at different rates to determine visibility to the public and other plow operators.

Conclusions:

The conclusions are the visibility of chemicals (salt) was better in snowy conditions during daylight operations and the color green was difficult to see during night operations.

Recommendations:

More testing is needed to find out the application rates of the dye into the brine line in order to produce the best visibility of applied chemicals.

Implementation:

This product has a lot of benefits and at this time Mn/DOT is exploring implementation options.

9. PRE-WET TANKER

District/Office: 7/Mankato

Project Contact: Randy Glaser
507/389-2848

Project Cost: \$12,000.00
MOR Fund: \$12,000.00

Starting Date: August 2003

Completion Date: January 2006



Project Descriptions:

A 58 HP diesel pump will be mounted on our 5700 gallon water tanker that is pulled by a semi tractor. District 7 will apply our salt brine (Calcium Chloride) combination through a spray bar at speeds up to 55 mph. District 7 will be using this for pre wetting or in certain conditions during events where liquid applications will work and mechanical applications will not. Depending on the application rate the district will be able to cover up to 285 miles. Based on tests results cost savings on material alone is estimated to be approximately \$8.00 per mile.

Purpose:

District 7 will be able to anti /de-ice major routes faster and more economically. They will have the ability to cover 285 miles with out refilling.

Test Procedure:

This evaluation is done to see if salt for pre wetting could be applied on our major routes at predetermined rates at high speed of 55-60 mph and still achieve the target goals.

Conclusions:

We believe that because of the amount of pre-treating that we can do just prior to an event it greatly speeds up the removal of snow after an event. After modifying our tanker and seeing the results of high speed application we are in the process of setting up another tanker for our district to do the same thing, I believe that other districts are setting up their tankers also.

Recommendations:

Every district should look at the feasibility of setting up a tanker. Any road that is not subject to a lot of wind is a good road for pretreatment, the more we treat the more we add additional routes and we are still able to get them treated in a timely manner prior to an event.

Implementation:

This project has good reviews from the district and has been added to the list of projects for potential statewide implementation.

10. DUAL CARBIDE UNDERBODY EDGES

District/Office: 7/Window

Project Contact: Dave Schettler
507/ 831-1224

Project Cost: \$4,200.00

MOR Fund: \$4,200.00

Start Date: August 2002

Completion Date: May 2006



Project Descriptions:

There are many different carbide cutting edges available that make claims to last longer and be more cost efficient than the standard carbide edge Mn/DOT currently uses. Some have different style carbide inserts, some have dual carbide inserts and there are others depending on the manufacturer. It is very difficult to determine if the new style edges really are better or more efficient.

Purpose:

Several different types of carbide edges will be selected and tested same time. They will be used for underbody plowing on routes that have very similar road surface materials and will be located close together to hopefully produce the same basic weather conditions.

Test Procedure:

Although it will not be possible to determine an exact length of time for wear, the estimated miles and hours used for plowing will be monitored and recorded.

Conclusions:

After the first season of use the edges are holding up well. None of them have had to be replaced.

Recommendations:

This project will continue until enough information has been collected to make a decision about the longevity of these blades.

Implementation:

This project is showing good early results but will be reevaluated to help determine the worthiness of statewide implementation.

11. HYDRAULIC WING PUSH ARM

District/Office: 8 /Willmar-Marshall

Project Contact: Craig Gertsema
507/537-3643

Project Cost: \$3,000.00

MOR Fund: \$3,000.00

Starting Date: February 2004

Completion Date: June 2006



Project Descriptions:

The length of the push arm can be extended by using hydraulic (shock absorber) type push arms, without jeopardizing the equipment itself. These would be self-contained units like a shock absorber style with no outside accumulator or adjustments. District 8 would like to purchase as many of these as possible, to try them in different areas and on different trucks to make sure they function in more than one area before recommending or not recommending after the project.

Purpose:

Currently, district 8 is using a 51 inch push arm on the wings of their trucks. With the roads getting wider and the trucks getting more power, one should be able to extend these arms out to at least be able to cover the entire lane and part of the shoulder in one pass. The current push arms will cause damage to our wings or trucks.

Test Procedure:

This project will test and evaluate the hydraulic wing push arm to find, 1) is it a better tool to use in the battle of clearing the road from snow and ice? 2) Does it function properly without much “jumping” action? 3) Does it cause any damage to the equipment that it is attached to? 4) Is it as easy to handle as our standard push arm?

Conclusions:

Overall, this is a good product that potentially could save a lot of money. Of course this is subjective as it would have to prevent damage that may or may not occur in the life of the truck. But bending a frame on a truck when this type of push arms are not used would be an expensive fix. One negative about the arm is the fact that it is heavier than a standard arm. It is not easy to take on and off. This is something that would fit greatly in an area that has a lot of curb and gutter or other structures that have a tendency to get hit by the wing and jars the truck or shears the bolt in the wing arm.

Recommendations:

District 8 recommends this in certain areas where there are numerous hazards that may impact the wing and/or the truck. Potentially, it could reduce costly repairs on trucks.

IMPLEMENTATION:

This project has been recommended by the district but has limited applications.

12. GRANULAR SPREADER EPOKE SIROUS

District/Office: Metro/Maple Grove

Project Contact: Norm Ashfeld
651/234-7907

Project Cost: \$60,000.00

NTREC Fund: \$25,000.00

Starting Date: June 2004

Completion Date: April 2007



Project Descriptions:

The Epoke Sirous Ganular Spreader will explore a single new piece of equipment that promises to greatly reduce the application of granular de-icing material.

Purpose:

This piece of equipment is ground speed oriented with on board pre-wetting and anti-icing.

Test Procedure:

This project will compare the Epoke Spreader to the current sanders and watch material usage, material placement and other capabilities it might have.

Conclusions:

Numerous problems between were experienced with the hydraulics on the Epoke and the truck. The Epoke was also set up in metric so it was hard for the employees to be sure that they were doing the proper calculations to make sure they were putting down the right amount of salt.

Recommendations:

This piece of equipment is not user friendly. Due to too much down time with the sander and its controls, resulting in one less truck was on the road during snow and ice.

Implementation:

This piece of equipment is not recommended by the district; therefore, it will not be recommended for statewide implementation.

13. ECCO WING LIGHTS

District/Office: Metro
Project Contact: Sue Lorentz
651/755-0309
Project Cost: \$0.00
MOR Fund: Vendor Supplied
Starting Date: January 2006
Completion Date: May 2007



Project Descriptions:

These lights will be installed on the wings of our plow trucks and evaluated to determine their effectiveness and whether or not they reduce the number of accidents involving the general public.

Purpose:

This product will help overall visibility of the location of the wing to the general public. They will help to insure the safety of our operators by reducing the number of car vs. wing accidents.

Test Procedure:

The test is to evaluate whether or not the EL wing lights prevent the wings from being hit by on coming vehicles. Also the dependability and how much maintenance is required for continued operation of the lights will be evaluated.

Conclusions:

The EL wing lights are less visible during inclement weather conditions. A Field Test comparison between the EL wing panel and an LED wing light was conducted. Due to these results, it is recommended that no further Mn/DOT expenditures be placed on EL lighting for plow trucks for the purpose of improving visibility during inclement weather. In the event that significant improvements of EL lighting is made outside of Mn/DOT, it may be investigated on a case by case basis to determine if there is enough significance to pursue any further research in that area.

Recommendations:

The EL lights are not as visible as the LED lights that were also tested on the wings.

Implementation:

This project did not receive good reviews from the district; therefore, it will not be recommended for statewide implementation.

14. EL TAIL LIGHT STRIP

District/Office: Central Office

Project Contact: Ryan Otte
651/366-3585

Project Cost: \$489.56

MOR Fund: \$489.56

Starting Date: December 2005

Completion Date: April 2006



Project Descriptions:

This light will be placed on the back of one of the maintenance snow plow trucks and then tested for visibility during snow and ice operations.

Purpose:

Electroluminescent (EL) lighting has been the subject of several Mn/DOT research projects during the past few years in an effort to improve visibility of plow trucks during inclement weather.

Test Procedure:

These lights will be tested for their effectiveness and ability to withstand winter conditions during our snow and ice operations.

Conclusions:

The EL Lights didn't improve visibility of an object in blowing snow, fog or other severe driving conditions encountered during maintenance operations.

Recommendations:

No further evaluations of EL lighting is recommended.

Implementation:

This project has received poor reviews from the district; therefore, it will not be proposed for statewide implementation.

B. Winter Material

1. GEOMELT

District/Office: 6E/Rochester

Project Contact: Robert Langanki
507/285-7402

Project Cost: \$5,000.00

MOR Fund: \$5,000.00

Starting Date: February 2007

Completion Date: April 2007



Project Descriptions:

Geomelt is a product derived from the sugar beet industry. When used by itself or with a blend of salt brine it should significantly drop the freezing point compared to brine alone. Its cohesive characteristics are supposed to out perform brine with greater melting properties for longer periods of time.

Purpose:

This product will increase adhesive characteristics of the dry form of deicing materials at temperatures below 0 and still have the same deicing advantages that brine has at temperatures above the 0 degree range. This will be an attempt to use plain salt brine on a divided roadway in one direction and geomelt in the other.

Test Procedure:

Test samples will be produced and placed in sample containers and put in a freezer and observed for the freezing point. Approximately 200 gallons of geomelt was also applied to the parking lot at the Rochester Headquarters facility and monitored before applying on a public roadway.

Conclusions:

The positive aspects are the Geomelt does drop the freezing point of salt brine significantly. We were still able to melt ice in desirable amounts down to 15 degree below zero. Geomelt has a higher degree of adhesiveness than brine alone mixed with the deicing material. The negative aspect of Geomelt is that it has high foaming properties. When the concentrate was added to brine in the storage tank production process, a drop tube has to be installed to minimize foaming. The product also had a high degree of adhesion to vehicles, footwear, carpet and concrete floor. It had to be cleaned due to its staining properties.

Recommendations:

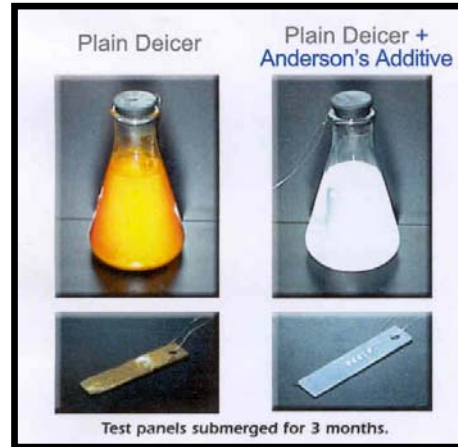
Geomelt is a useable product but its negative aspects out weigh the positive ones. Other products such as magnesium chloride have proven results with less maintenance. The cost and maintenance outweigh the benefits.

Implementation:

This project has not been given good reviews by the district so it will not be recommended for statewide implementation.

2. ANDERSONS ADDITIVE

District/Office: 7/Mankato
Project Contact: Randy Glaser
507/389-2848
Project Cost: \$5,000.00
MOR Fund: \$5,000.00
Starting Date: Spring 2005
Completion Date: January 2006



Project Descriptions:

Salt brine is still the most inexpensive liquid chemical for snow and ice control. However, it does have several negative qualities. The Eutectic temperature is minus six degrees fahrenheit and it can be quite corrosive to ferrous and non-ferrous metals alike.

Purpose:

The purpose of this project is to utilize a chemical mixing system (funded by MOR) to custom blending salt brine in order to reduce its corrosive properties and to lower its working temperature.

Test Procedure:

Salt brine will be blended with an inhibited calcium chloride to lower its working temperature. It will also be blended with Anderson's Chemical using the chemical mixing system to reduce its corrosiveness and to enhance the melting anti-icing properties.

Conclusions:

There are several variables that effected this test. One was to make sure that Anderson's product was the only one used on both test bridges. The field test that we were able to do showed little difference between the Anderson's and non Anderson's area.

Recommendations:

The recommendation is that this product not used until a further controlled study is preformed. The other recommendation is to control the variables that effect the field test for further research.

Implementation:

The results are inconclusive and are not being pursued at this time. PNS was awarded a contract to coordinate and test the cost effectiveness of corrossions inhibitors

C. Road and Bridge Maintenance

1. BYPASS SCAFFOLD

District/Office: 1/Virginia

Project Contact: Gary Elmquist
218/389-7798

Project Cost: \$6,000.00

MOR Fund: \$6,000.00

Starting Date: May 2005

Completion Date: May 2006



Project Descriptions:

The Bridge Crew in D1B can move a suspended work platform beyond an obstruction (i.e. bridge floor beam) easily and safely while performing inspections and repairs. Moving the scaffold used to take several hours of hard work.

Purpose:

With this scaffold it will allow our bridge crews to safely and freely move around obstacles while inspecting and performing repairs on bridges.

Test Procedure:

The safety and the maneuverability of the bridge workers will be monitored and determined whether or not the scaffold serves as an asset.

Conclusions:

The conclusions are that by using the by pass scaffold, bridge workers were able to maneuver around obstacles and get to areas not normally reached without the scaffold.

Recommendations:

This scaffold is an area specific asset to the work crew. Although scaffold is not always applicable, it defiantly has its benefits.

Implementation:

This project has been recommended by the district but has limited applications; therefore, it has been placed on the limited application list.

2. COLD PLANER

District/Office: 4/ Detroit Lakes

Project Contact: Dennis Redig
218-847-1575

Project Cost: \$21,010.00

NTERC Fund: \$10,000.00

Starting Date: April 2006

Completion Date: August 2006



Project Descriptions:

Using a 40" wide cold planer mounted on a skid steer loader, a wider, smoother cut can be made in one pass of traverse tented areas instead of multiple passes with a narrower cold planner which leaves the planed area uneven because depth of each cut pass is hard to control with a narrow planer wheel.

Purpose:

The purpose of this project is to test, evaluate and compare the road surface smoothness and number of passes of this cold planer vs. a narrower planer.

Test Procedure:

This project will be evaluated by judging the smoothness of the road surface by making the single pass vs. multiple passes with a narrow planer wheel. The project also evaluated the time saving by having to make one pass vs. multi passes.

Conclusions:

The results for cold planing tented areas and bumps were excellent. The final ride after planing was very good and improved the ride of the road. Many good comments were received from Mn/DOT staff and general public. Time to plane a area was cut by about 75% and smoothness of cuts were far superior to using a 16" plane head. Operators commented that it was easy to learn how to operate and felt it was far better than any other method used in the past to plane bumps. In most instances operations were done without the need for setting up the lane closures for traffic control.

Recommendations:

It works very well and produces a very good final product for smooth road maintenance. It is another tool to use on a skid steer loader to make the skid steer more versatile. District 4 will recommend it for other districts.

Implementation:

This project has good reviews from the district and has been added to the list of projects for potential statewide implementation.

3. YORK FRONT MOUNTED ROTARY BROOM

District/Office: 6W/Owatonna

Project Contact: Andrew Kubista
651/366-3560

Project Cost: \$4,240.00

NTREC Fund: \$4,240.00

Starting Date: August 2004

Completion Date: June 2006



Project Descriptions:

The **Front Mounted Rotary Broom** is a 3-point hitch mount; 1000-rpm PTO operated (entirely new design that has never been done before) broom with a dust controlling sprinkling system that will mount on a John Deere 7410 tractor that has a front mounted 3-point hitch and a front 1000-rpm PTO.

PURPOSE:

The Albert Lea maintenance crew will use the unit in various locations and conditions in the Sub area to determine the effectiveness and abilities of the unit.

Test Procedure:

1) The performance of the unit while sweeping in various types of weather and material conditions. 2) A “head-to-head” comparison against a self propelled rotary broom. 3) The ease of operation and the switching from one type of work (pull behind mower) to another (sweeping) and back again.

Conclusions:

Operators gave favorable responses to both brooms. They like the broom out front for visibility. The Broce broom left wheel tracks in mud when they had to drive off the pavement to clean points of the intersections. They brought a “MB” brand front mount PTO driven broom. Due to the fact we had no dealers in the area for “York” to service and warranty the unit we wanted to buy. There is some concern as to how long the U-joints will last on the PTO shaft since there seems to be a sharp angle when broom is down. They also mounted a snow blower on the front, which worked really well.

Recommendations:

It was a good investment to purchase the attachment versus buying a complete self-propelled broom.

Implementation:

This project has been recommended by the district but has limited applications; therefore, it has been placed on the limited application list.

4. MOA BRIDGE SHARK

District/Office: 7/Mankato

Project Contact: Larry Cooper
507/389-6959

Project Cost: \$50,000.00

NTREC Fund: \$50,000 .00

Starting Date: August 2004

Completion Date: February 2005



Project Descriptions:

The original project (funded by NTREC) had the bridge shark attached to the pier by a pipe and wheeled cart/carriage that had the 5' bridge shark riding up and down with the river level. Because of the high volume and size of debris the current system failed. The designer has since improved upon his debris shark. It is now mounted on a piling that is placed in front of bridge piers and the shark is 10' in height and more durable. The designer is committed to making his product work for the department.

Purpose:

The Bridge Shark is designed to prevent the build up of debris floating down stream by allowing it to roll to either side of the pier and continue down stream.

Test Procedure:

This product will be evaluated to see if it will keep timber debris from building up on bridge piers contributing to scour damage at the footings and pilings. District 7 attached 4 debris shark/sweepers to two District bridges noted for collection of timber debris piles. Bridge 40001 on T.H. 19 in Henderson, always has large debris build-ups in high waters. On bridge 07011 on T.H. 14 in Mankato, where accessibility to reach the debris pile with equipment is limited.

Conclusions:

The present system might not be capable to handle the flow and debris sizes. Further testing is recommended to test high level water capabilities. The present debris sweeper/shark system is not satisfactory; the bridge maintenance crew had to do in field modifications to mount the units.

Recommendations:

If successful it would be a very beneficial tool for keeping debris build-up away bridge piers through out the state.

Implementation:

This project is still being researched and will be proposed for statewide implementation pending the results.

5. ELECTRIC HEATED PICKUP BOX

District/Office: 8/Willmar

Project Contact: Larry Redepenning
320/231-5195

Project Cost: \$2,134.08

MOR Fund: \$2,134.08

Starting Date: March 2005

Completion Date: March 2006



Project Descriptions:

An electrically heated asphalt box will be mounted in the back of a pickup truck to test if it makes our winter pothole filling procedures more productive and less strenuous on the employees.

Purpose:

This project will test and evaluate if the winter mix is “user friendly” during the winter months and if the warm mix will adhere to potholes better and last longer.

Test Procedure:

The unit was filled with winter patching mix and plugged into an outlet to heat overnight inside the building. By morning the mix was warm enough to fill holes with. When out on the road the system was plugged into the power inverter on the truck which kept the mix warm through out the day.

Conclusions:

The system worked very well. It made the asphalt easier to handle and it saved the district money because a heated trailer was not needed.

Recommendations:

The unit works well for small patching applications due to the size of the heated box.

Implementation:

This project has been recommended by the district but has limited applications; therefore, it has been placed on the limited application list.

6. EPOXY CRACK FILLING USING THE PCH GMP-025 LIL PRO

District/Office: Metro/Bridge

Project Contact: Dale Dombroske
763-785-5664

Project Cost: \$10,000.00

MOR Fund: \$10,000.00

Starting Date: May 2006

Completion Date: October 2006



Project Descriptions:

Using the PCH GMP-025 LIL PRO to fill cracks on bridge decks with a fast setting epoxy. This machine also mixes the epoxy for you meaning little clean up.

Purpose:

The purpose of this project is the Lil Pro eliminates the need to mix the A and B epoxy by hand. With the Lil Pro the mixing is done by the machine as it is being placed in the cracks.

Test Procedure:

This project will compare the results of applying the epoxy with the old method of using small squirt bottles to the new method of applying the epoxy with the new AST Lil Pro .025. Also the use of an accelerated epoxy will be tested which could only apply with the Lil Pro due to the quicker set up time.

Conclusions:

The Lil Pro allowed us to place freshly mixed product into the cracks. The bridge crew was able to use a quicker setting epoxy, using this there was little or no mess, no waste of epoxy and very easy to apply. The application of the epoxy can be done standing up. There was no epoxy mess on anyone's clothing or hands unless they stepped in it.

Recommendations:

This is highly recommended for every crew that needs to apply epoxy should have at least one of the Lil Pros. On long bridge decks the use of more than one Lil Pro would increase the cost savings even more.

Implementation:

This Project has been implemented state wide. Each district will receive one.

D. Safety, Traffic Control and Work Zone Safety

1. LITESYS INTELLECOM CMS

District/Office: 1/Virginia

Project Contact: Tim Sheehy
218/742-1075

Project Cost: \$25,000.00

MOR Fund: \$25,000.00

Starting Date: October 2005

Completion Date: September 2006



Project Descriptions:

District 1 would like to install and evaluate the use of the Full Matrix message board in actual field operations. Included operations would be: anti-icing, lane closures, routine sweeping and flushing and in emergency situations.

Purpose:

To deploy and evaluate a Full Matrix LED Vehicle Mounted Sign on ANTI-Icing unit in the Virginia Sub-Area and on a Class 251 work unit on the interstate in Duluth.

Test Procedure:

Evaluation would focus on the new CMS communication in our work activities and in work zones. This would result in fewer near misses and better education of our customers. District 1 would use current staff to help evaluate the signs and ensure that they meet or exceed required specifications and safety requirements.

Conclusions:

This lightboard is a very useful tool and should be used in all of our Maintenance Operations. It is small and compact and the legibility of the sign is outstanding. This sign would improve safety for all of our work vehicles that it is on.

Recommendations:

This sign would work great in all of our maintenance operations and will provide safety for both Mn/DOT personnel and the traveling public.

Implementation:

This project has good reviews from the district and has been added to the list of projects for potential statewide implementation.

2. MOLD BOARD LIGHTS

District/Office: 2/Crookston
Project Contact: Clifford Schultz
218/277-7960
Project Cost: \$5,373.50
MOR Fund: \$5,373.50
Starting Date: December 2005
Completion Date: June 2006



Project Descriptions:

Special lights and mounts will be installed on the moldboards of three graders and five plow trucks both on the leading edge of plow and some on the wings/trailing edges. This is a unique design by an inventor and never before tried on vehicles.

Purpose:

Visibility for on-coming motorists will be increased of the approaching plow truck. These lights/mounts are being evaluated for design and the ability to withstand extreme weather and othe conditions.

Test Procedure:

The only practical method devised was to visually observe motorist reaction to the light during actual working conditions. Professional grader operators witnessing traffic movements during snow and ice operations is the method used to determine if approaching traffic had the the tendency to move over further in advance when encroaching the work area of the grader. Durability of the lights was determined by the number of repairs and their ability to stay lit during the trial period.

Conclusions:

The testing was successful. Approaching traffic appeared to have the tendency to move over much further in advance when encroaching the work area of the grader. Durability of the lights was good after initial repairs were made by the vender. No accidents or "close calls" occurred during the entire snow and ice season. Although the hours of the actual evaluation were limited to snow and ice control only; it can be concluded that the mold board lights worked as intended, improving visibility of the leading edge of the plow mold board.

Recommendations:

It was felt that although these lights improved safety, a lower cost light may be applicable and perform just as well.

Implementation:

This project was given a good review but due to the cost of the lights it was not proposed for implementation.

3. SCORPION TRUCK ATTENUATOR

District/Office: 6E/Rochester
Project Contact: Dave Redig
507/285-7361
Project Cost: \$30,000.00
NTREC Fund: \$30,000.00
Starting Date: December 2005
Completion Date: December 2006



Project Descriptions:

District 6 feels that the following projects would be a great improvement in both traffic control and personal safety of our employees.

Purpose:

This project will serve as another safety measure for the work crews on the highway.

Test Procedure:

The "Scorpion TL-2" has a tubular design which according to the manufacturers information should reduce the wind resistance and drag and increase visibility to the rear as well as improve fuel mileage. The "Voice Activation" was intended to be a hands free option for the operators of the Changeable Message Sign. The operators did not feel comfortable not knowing if the message was delivered to the message board and were reluctant to use it. The 12 brick Changeable Message Sign by ADDCO was used often and has several problems. The unit, when working, was very visible with a clearly discernable message.

Conclusions:

It has not been involved in a crash, so the manufacturers promotional materials which claim to be easy to repair and less expensive than the cartridge style can't be verified. The test can verify its ease of use, better visibility to the rear and is more operator friendly. The "Voice Activation" unit was not given a haul and was hardly tested before it was activated. If the operators are not comfortable with it, it's not a product which will be used and is not something we should invest our funds on. The "12 Brick Modular Message Sign System" had a ton of problems with its reliability. The sign visibility to the rear and sides is very good and probably due to the fact that it is LED. The plug in style bricks are unreliable and as a result created a lot of problems which were not relieved until the bricks were hard wired.

Recommendations:

The recommendations are to accept the "Scorpion TL-2" crash attenuator as a viable product for use in maintenance operations and not use the 12 Brick Message System until their connectivity problems are rectified.

Implementation:

This product received mixed reviews and it has not been proposed for statewide implementation.

4. SOLAR TRAFFIC LIGHTS

District/Office: 6E/Bridge

Project Contact: Larry Waletzki
507/453-2908

Project Cost: \$27,500.00

NTREC Fund: \$27,500.00

Starting Date: Spring 2005

Completion Date: January 2006



Project Descriptions:

Although the idea of portable traffic control for bridge work is not new, over the past several years technology has changed dramatically. Past rental units have showed that the units are hardwired together and others used radio as a communications device which also proved unsatisfactory because of interference and reliability issues.

Purpose:

The purpose of this project is to evaluate the latest solar/battery powered portable traffic lighting for bridge work and maintenance. These units are wireless and improvements in radio communications should make them more reliable. They are able to be set up as far away as one mile from each other and also have the ability to expand to four units.

Test Procedure:

This solar powered light will be used and evaluated during actual field working conditions. They tested for ease of set up and use, reduction in manpower and reliability. The expense of owning will be compared to the cost associated with renting as has been done in the past. They will also be compared to the costs of a flagging operation.

Conclusions:

The performance of both machines was very pleasing. The set up is quick and easy to complete. The field personnel were comfortable in the operation and able to follow the simple instructions without issues for the setup and operations of the units. The programming was also straight and easy to follow. These facts led to the comfort aspect of the unit operation when changes were necessary to the traffic patterns to maintain a safe flow.

Recommendations:

When using the Solar Traffic lights in a work zone, the traveling public by experience pays greater attention to the light system. Drivers also seem to respect the lights very well.

Implementation:

This project has good reviews from the district and has been added to the list of projects for potential statewide implementation.

5. PACK A CONE

District/Office: 7/Window

Project Contact: Kelvin Smith
507/389-2946

Project Cost: \$375.00

MOR Fund: \$375.00

Starting Date: January 2005

Completion Date: October 2005



Project Descriptions:

Cones are needed for creation of work zones during equipment breakdowns that require extended periods of time. Traffic cone storage in a field mechanic truck is limited. The collapsible design of these has greater appeal than a rack of traffic cones. Pack-A-Cone collapses to 2 inches and extends to a 16" traffic cone. These also contain a lighted flasher powered by AA batteries increasing the visibility in traffic.

Purpose:

Work zones must be created for any extend periods of time for emergency road side repairs. Cones require significant amounts of space to store for these emergencies. These cones collapse for compact storage.

Test Procedure:

The opportunity to evaluate the Pack-A-Cone in traffic around an emergency road side equipment repair may not arise very soon. This request allows 3 cones to be placed in Sub-area supervisors units in addition to two field mechanic units. The operators will need to visually evaluate traffic reactions to determine performance and safety benefits. We also intend to use these for work zones in temporary low traffic areas for added employee protection. Any major work zone creation would continue to follow the work zone safety manual. Simple implementation may also deter risk taking by employees instead of establishing a safe work zone.

Conclusions:

Worked very well and are easy to set up and are highly visible. These cones also took up less space in the mechanics truck creating less clutter.

Recommendations:

These cones are highly recommended for field mechanics and maintenance personnel that need to set up fast and do not have a large area for cone storage.

Implementation:

This project has good reviews from the district and has been added to the list of projects for potential statewide implementation.

6. ECCO REAR VISION

District/Office: 7 and CO
Project Contact: Ryan Otte
651/366-3585
Project Cost: \$1,175.00
NTREC Fund: \$1,175.00
Starting Date: June 2005
Completion Date: June 2006



Project Descriptions:

This is a new technology camera system that features a wireless camera to monitor systems that are easily moved to different locations via a magnetic device.

Purpose:

The cameras are mounted on the back of 33, 35 and other maintenance vehicles to assist the operators in backing.

Test Procedure:

This test will include trucks with and without cameras for a side by side evaluation. The operators will also be given a questionnaire to fill out at the end of the test asking their overall opinion of the cameras and if they were a distraction or an asset when backing.

Conclusions:

Backing accidents are the most common type of accident within MN/DOT. In class 33 and 35 trucks it is very difficult to see directly behind the vehical. Using the rear vision cameras greatly improved visibility and there were no backing accidents when they were in place.

Recommendations:

Rear visibility for backing safety is the primary reason for these monitors; however, most operators found them useful for other driving conditions as well. Some liked to check the materials coming out of their sander for proper application patterns and spinner rates. Others expressed that the cameras were useful for early warning of a potential rear end collision caused by another vehicle.

Implementation:

This project is highly recommended by the district and is highly recommended for implementation. In time some form of camera will become a standard on all of our trucks.

7. LIGHTED SLOW MOVING VEHICLE (SMV) SIGNS

District/Office: Metro

Project Contact: Gene Lorentz
651/234-7934

Project Cost: \$4,000.00

MOR Fund: \$4,000.00

Starting Date: Spring 2004

Completion Date: Spring 2005



Project Descriptions:

Currently all of Mn/DOT's slow moving vehicle signs (SMV) meet or exceed state and federal requirements. New technology in the use of electro-luminescence lighting has opened a new door for possibly improving the visibility of our slow moving equipment during low light and dark working conditions.

Purpose:

The electro-luminescence lighted signs will be evaluated for their enhanced visibility characteristics on slow moving vehicles and equipment.

Test Procedure:

Ten SMV signs will be installed on rollers, skid steers and loaders that are used frequently by the night crews in the Metro District. Operators will monitor their visibility and compare them to the standard SMV signs. They will also be evaluated for their durability under actual working conditions.

Conclusions:

The majority of the employees said that the signs made the vehicle more visible compared to the standard reflective slow moving vehicle signs. Some employees explained that the strobe, reflective sign, and tape were adequate. There were a few complaints about the wiring not holding up to the vibration and weather elements. The mechanics were aware of some problems, and they said that the wiring was too light and fragile.

Recommendations:

Suggestions for improvement were heavier wiring and steel backed signs.

Implementation:

This product needs wiring improvements and needs to be built sturdier before it will be considered for state wide implementation.

8. FLAME PROOF VEST

District/Office: Metro
Project Contact: Gene Lorentz
651/234-7934
Project Cost: \$1,000.00
MOR Fund: \$1,000.00
Starting Date: January 2005
Completion Date: April 2005



Project Descriptions:

The Cedar Avenue Truck Station employees tested and evaluated ten hi-visibility flame retardant vests and pants on January 3, 2005. Employees were required to wear hi-visibility vests and pants when working nights. Staff working at the Cedar Avenue Truck Station is a specialty crew specializing in guardrail repair. In the process of repairing guardrail, employees used torches and grinders. The sparks from the torches and grinders frequently burn through the vests and pants they currently wear.

Purpose:

The purpose of the study was to evaluate if the flame retardant clothing lasted longer and was less prone to damage from the sparks.

Test Procedure:

The Cedar Avenue guardrail crew used Flame retardant vests and pants for four months when using torches or grinders. The ten employees filled out a survey at the end of the four months evaluation period.

Conclusions:

From the results of the survey, employees saw less of a problem with the vests being damaged by sparks; in fact, there was less of an issue with the vests burning compared to the pants. Employees said that the single best way to prevent damage to the vests was holding the saw and the torch in a certain manner which kept the vests out of the way of the sparks. Pants were susceptible mainly to damage to the end of the legs because the sparks bounced when hitting the ground. It is impossible for the workers to avoid the sparks hitting the pants.

Recommendations:

Employees reported that the flame retardant pants slightly held up to the sparks better than the regular pants and there were still problems with the flame retardant pants catching fire.

Implementation:

This project did not receive high enough reviews from the district to justify the cost of implementation

E. Roadside Maintenance

1. SHOULDER RECLAIMER

District/Office: 1/Sandstone

Project Contact: Monica Hendrickson
320/245-2324

Project Cost: \$21,975.00

NTREC Fund: \$21,975.00

Starting Date: August 2004

Completion Date: January 2006



Project Descriptions:

Shoulder reclaimer/roller. The reclaimer will be mounted to the grader in the front and use the blade to knock off gravel from the road. The roller will be mounted to the wing to roll shoulder. This operation would be three operations in one and it will save time and money. One person could do the job of three.

Purpose:

The purpose of this piece of equipment would be to do what would normally done by three persons and pieces of equipment to get the same out come with one. When replacing gravel shoulders there is a roller operator rolling the soft material which could potentially lead to a roll over; with the roller mounted on the side of the road grader there is no chance of this happening.

Test Procedure:

The efficiency of using the reclaimer will be evaluated and compared to past methods of repairing shoulders. Cost savings of less equipment, labor and safety will also be evaluated.

Conclusions:

It was found that if the same operator consistantly operates the retriever they became very efficient using the machine. About 6 miles of road a day was repaired during early stages of the test. The results each day were improved upon each hour spent operating. By the end of the test period, the operator had gone from 6 miles a day to 30 centerline miles a day without any breakdowns. One person on the grader and one in a early warner can do the work that seven have done in the past. This is moving along 6-8 times faster than conventional methods.

Recommendations:

The time and money spent reclaiming shoulders the current way will be cut by 2/3 or more by using this new method. The material/labor costs for repairing compared to reclaiming shoulders in most areas will be cut by over 80%.

Implementation:

This project has good reviews from the district and has been added to the list of projects for potential statewide implementation.

2. BEAVER ABATEMENT

District/Office: 3A/Baxter and Brainerd

Project Contact: Tom Wryck
218/927-3316

Project Cost: \$5,000.00

MOR Fund: \$5,000.00

Starting Date: Fall 2004

Completion Date: Spring 2006



Project Descriptions:

Damage caused from beavers is abundant in Minnesota. When streams, ditches and other drainage structures are blocked, waters back up causing washouts, flooding and other erosion problems.

Purpose:

The purpose of this project is to test and evaluate a new method of ridding an area of the nuisance causing animals without harming them.

Test Procedure:

The Infra-red Beaver Abatement Systems will be installed in beaver dam prone areas. These areas will be chosen by their amount of beaver related maintenance work in the past. After installation, the areas will be monitored for beaver activity and specifically, dam building.

Conclusions:

The system did not give the expected results, which was to stop the beaver from building dams in the drainage structures. It did appear to slow them down a little bit.

Recommendations:

We do not recommend this product.

Implementation:

This project received poor results and is not recommended by the district; therefore, it will not be proposed for statewide implementation.

3. ROO GUARD BARRIER

District/Office: 6E/ Rochester

Project Contact: Bob Langanki
507/285-7402

Project Cost: \$12,000.00

MOR Fund: \$12,000.00

Starting Date: October 2002

Completion Date: February 2005



Project Descriptions:

The "Roo Guard" barriers are very similar to the "Triton" barriers used by much of the construction industry. They are 6 1/2 feet in length, 2 feet thick at the bottom and taper upward, 36.5 inches tall and weigh only 65 pounds when empty.

Purpose:

Some of the selling points of the "Roo Guards" is that they can be connected up to a 90 degree angle which makes them a little more user friendly when used to delineate around objects. They are molded so they can be stacked if necessary and they also have a receptacle built into them to accept a pipe to fasten fencing to if wanted for additional security measures on a project.

Test Procedure:

Subjective observation, ease of use, and their effectiveness.

Conclusions:

They have proven to be easy to transport and connect because of their light weight and simple connectivity system. They are easy to fill with up to 70 gallons of water or salt brine and also easy to drain. The district used them on various projects to delineate damaged guard rail and have not suffered any damage due to traffic accidents. They were used extensively this past summer during the numerous presidential campaign visits to block off intersections and crossovers and to move traffic into desired traffic patterns. They have not shown any degradation due to exposure to sunlight, the threads in the bungs have not stripped out and they have not shown sign of leakage. They have not been used ot great extent for emergency situations, but it is comforting to know they are there and ready to go at any time.

Recommendations:

The only consideration and concern is that they are labeled to not be used for Work Zones because the NCHRP 350 testing had not been completed. The district received subsequently receive documentation (attached) from the FHA that testing had been completed and the barriers do meet the bogie tests for the NHS for work zone safety traffic control devices and for static and longitudinal channelization barricades.

Implementation:

This project has good reviews from the district and has been added to the list of projects for potential statewide implementation.

4. SKID STEER RUBBER TRACKS

District/Office: 6E/ Rochester

Project Contact: Bob Langanki
507/285-7402

Project Cost: \$5,200.00

MOR Fund: \$5,200.00

Starting Date: March 2006

Completion Date: December 2006



Project Descriptions:

The “Sol ideal Trackmaster” over the tire rubber track system is different in that it uses rubber tires and wheels but not the ones that came with the machine. Because of the side pressure on the tires, the wheels are built with thicker steel to handle the extra torque and the tires are ten ply for both the tread and sidewall. The tracks are self cleaning and the cleats inside the tracks match the cleats on the tires.

Purpose:

This project will determine if it is cost effective to have the tracks and to test their effectiveness in all types of weather and soil conditions.

Test Procedure:

The district will evaluate how well the tracks clean themselves, how difficult they are to put on and take off, how much they stretch over time also how much wear the tires and the tracks will have.

Conclusions:

These tracks were a very good investment. They worked great in the snow and ice for guardrail repair and in the spring and fall for brush removal. They also had very good traction on unfrozen, soft and wet conditions. It is also very easy to remount the tires for summer roadwork such as milling and paving.

Recommendations:

These rubber tracks are very effective in all applications they were used for. They have great floatation and traction, they also are very easy to install and remove.

Implementation:

This project has good reviews from the district and has been added to the list of projects for potential statewide implementation.

5. STUMP GRINDER

District/Office: 6W/Owatonna

Contact: Ron Heim
507/446-5907

Project Cost: \$4,714.54

MOR Fund: \$4,714.54

Starting Date: August 2004

Completion Date: August 2005



Project Descriptions:

District 6 would like to buy a stump grinder that will mount on the front of a skid steer. This will provide the ability to grind stumps in areas the current stump grinder is unable to reach.

Purpose:

To test the stump grinder to see how well it can grind stumps and how much time it takes to do the job.

Test Procedure:

The stump grinder will be tested on several different sizes of stumps as well as different species of trees. The time it takes to grind them as well as how easy it grinds them will be evaluated.

Conclusions:

After the initial tests the machine went to two different sub areas. The other sub areas were very happy with the stump grinder. With the electric controls in the cab, it is very easy to use. One drawback is the operator does get some wood chips and dust in the cab. The other sub-areas did have their windows on and they said they had no chips in the cab. Anyone who has seen it work was impressed on how quick it was and the good job it did.

Recommendations:

Local tree services are charging \$50.00 to \$100.00 per stump. The district can save that money but one of our big concerns was saving on broken mowers and equipment when running in to stumps in the ditch.

Implementation:

This project has been recommended by the district but has limited applications; therefore, it has been placed on the limited application list.

6. WOLF DISC

District/Office: 6W/Albert Lea
Project Contact: Andrew Kubista
507/446-5907
Project Cost: \$3,770.00
MOR Fund: \$3,770.00
Starting Date: May 2004
Completion Date: January 2006



Project Descriptions:

Damage to roadsides caused from accidents and from vehicles leaving the roadway for other reasons sometimes causes deep tire tracks in the soil. This is common year around but especially when rain or snow softens the top soils. This can impair drainage and also cause damage to maintenance equipment and create a hazard for personnel.

Purpose:

The purpose of this project is to work with and evaluate a disc attachment for a skid steer that promises to breakup and level the ruts. It can also be used for weed control and for preparing the soil for reseeding.

Test Procedure:

The Wolf Disc will be used in various locations around the district and for a wide variety of roadside soil repairs. Operators will compare the skid steer mounted disc to similar tractor mounted units. The time to load and move the skid steer will be compared to driving a tractor mounted unit to sights.

Conclusions:

The Disc performed beyond expectations in its ability to prepare right of way areas for reseeding after drainage areas were cleaned out or deep tire ruts were filled in and leveled. The ability of the operator to change the disc(s) angles without leaving the cab of the skid steer and being able to use down pressure increased production and resulted in quicker vegetation coverage in the damaged areas.

Recommendations:

The use of the Disc in the preparation of areas to be reseeded will definitely be cost effective to the state and will greatly reduce the time needed to prepare areas to be reseeded.

Implementation:

This project has good reviews from the district and has been added to the list of projects for potential statewide implementation.

7. LOEGERING TRACK SYSTEM

District/Office: 6W/Owatonna

Project Contact: Dean Homan
507/645-8155

Project Cost: \$13,312.50

NTREC Fund: \$13,312.50

Starting Date: December 2005

Completion Date: May 2006



Project Descriptions:

District 6 would like to test and evaluate the Loegering Track system which is a fully adjustable rubber track system that allows operators to change from tiers to tracks in less than a half hour. It also has a complete undercarriage with several bogey wheels to reduce ground pressure so it will float in soft conditions.

Purpose:

Tracks will be used on Northfield's 280-skid steer to see how well they perform during guardrail repair and ditch repair in Owatonna, Austin and Red Wing sub areas. Also the Fecon can be used for brush removal in the ditches and primarily on back slopes and wet areas.

Test Procedure:

This test will determine if it is cost effective to have the tracks on in snowy and winter conditions for guardrail repair, in the spring and fall for use on the Fecon for brush removal in soft and in wet conditions.

Conclusions:

These tracks were a very good investment. They gave operators very good traction on unfrozen, soft and wet conditions. These tracks were easily removed to remount tires for summer roadwork such as milling and paving.

Recommendations:

District 6 felt that these tracks made the currently used skid steer more useful in soft wet conditions allowing operators to move with ease and without making deep ruts in soft ground.

Implementation:

This project has good reviews from the district and has been added to the list of projects for potential statewide implementation.

8. AUGER BUCKET

District/Office: 6W/Owatonna

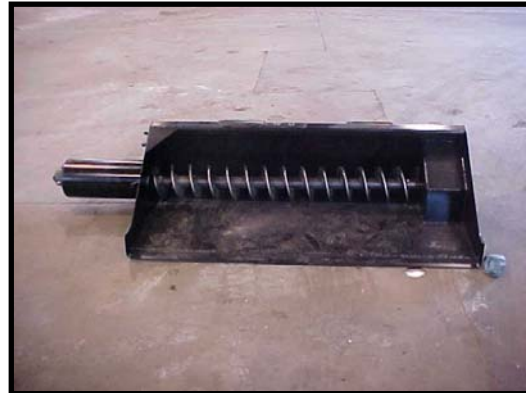
Project Contact: Ken Peterman

Project Cost: \$6,000.00

NTREC Fund: \$6,000.00

Starting Date: September 2006

Completion Date: June 2007



Project Descriptions:

The material can be dumped out of the front of the bucket or can be discharged through the auger on the side.

Purpose:

By using the auger bucket one can accurately place the proper amount of material for each application.

Test Procedure:

The test procedure is to evaluate whether the auger bucket saves time, reduces hand labor or reduces the amount of wasted material such as asphalt, gravel, etc.

Conclusions:

The conclusions are that using the auger bucket is less labor intensive and saves time and material. It also works great for asphalt and shoulder repairs.

Recommendations:

This new piece of equipment made some of the most strenuous jobs we do very simple. There is also less chance of injuries because no shovels or rakes are needed.

Implementation:

This project has been recommended by the district but has limited applications; therefore, it has been placed on the limited application list.

9. SKIDLOADER BACKHOE

District/Office: 6W/Owatonna
Project Contact: Roland Wagner
507/446-5958
Project Cost: \$4,350.00
MOR Fund: \$4,350.00
Starting Date: February 2003
Completion Date: January 2004



Project Descriptions:

Utilizing skid steers for a variety of jobs is becoming more and more common. Many new attachments have made this already versatile piece of equipment even more valuable to maintenance related fields. One of the problems in the past with backhoe attachments for these is the short reach of the unit. With this new extendable feature these problems should be overcome.

Purpose:

This project will test and evaluate a new skid steer backhoe attachment that promises to be comparable to much larger and expensive tractor mounted units. This unit has an 11 foot reach which should allow it to do all of the jobs that are normally done with a tractor backhoe. This will allow operators to better utilize the existing skid steers.

Test Procedure:

This unit will be compared against our tractor backhoe. Ease of use, mobility and job performance will be monitored and evaluated. Operators of each piece of equipment will be interviewed for their comments.

Conclusions:

The 911 backhoe attachment operated very well. The 11 ft reach enabled it to perform the majority of the operations, normally done by a tractor backhoe. Operators stated that it actually out performed the normally used model in very wet conditions and was found to be very maneuverable. Although this will probably not eliminate all current tractor mounted backhoes, it is felt to be a good alternate to at least a portion of the fleet.

Recommendations:

It does make our already versatile skid loaders even better utilized. The cost savings would vary depending on if the skid loader is already owned, if already owned it would be at least \$30,000 per unit.

Implementation:

This project has good reviews from the district and has been added to the list of projects for potential statewide implementation.

10. RUBBER TIRE ROLLER

District/Office: 7/Mankato

Project Contact: Scott Morgan
507/389-6906

Project Cost: \$28,000.00

NTREC Fund: \$21,000.00

Starting Date: January 2006

Completion Date: October 2006



Project Descriptions:

This project will add a rear mounted roller to the road grader to reduce one piece of equipment. Currently another person and piece of equipment has to make an additional pass after blading shoulders. This will reduce the maintenance expense for highways with gravel shoulder.

Purpose:

The compaction of the gravel is crucial to seal the gravel surface both conserving moisture during dry spells and sealing out excess moisture during wet times. The compaction also firms the surface providing a safer surface for drivers.

Test Procedure:

District 7 will be reviewing the rear mounted roller results visually and comparing with the separate rollers previously used. It is not expected to have significantly different results as compared with the separate roller. The benefit of the rear mounted roller is the reduction of passes and equipment to maintain the highway shoulders..

Conclusions:

The roller does a nice job of compacting and is very easy to run. It allows us to work a radius by just raising the roller and backing up. It turned a two person operation into a one person operation, freeing up equipment and personal for other projects.

Recommendations:

This piece of equipment is a nice addition to District 7's fleet. It will in time pay for itself by reducing overall maintenance costs.

Implementation:

This project has good reviews from the district and has been added to the list of projects for potential statewide implementation.

11. ROTARY MOWER

District/Office: 8/Willmar

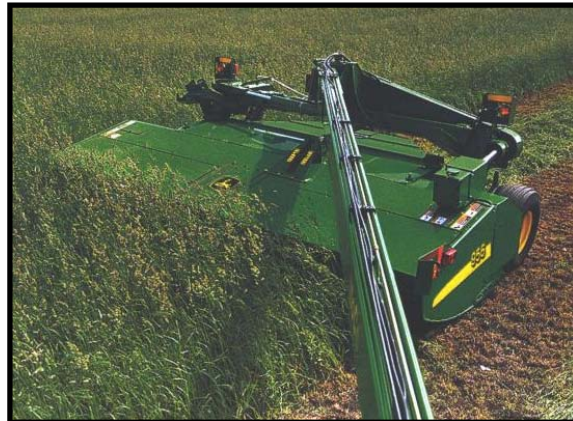
Project Contact: Larry H. Redepenning
320/231-5195

Project Cost: \$19,800.00

MOR Fund: \$10,000.00

Starting Date: January 2006

Completion Date: October 2006



Project Descriptions:

Purchase a disc style mower-type unit with a center pivoting arm allowing the ability to mow to the left, center and right of the tractor. This will provide the ability to mow with the flow of traffic on 4-lane roadways, making it safer. The operator can then position the tractor/mower combination so that the operator will not impede the flow of the traffic or get stuck driving in the bottom of the ditch that is too wet for a tractor.

Purpose:

This project will evaluate mowing operations on 4-lane roadways in a safe manner for both operators and traveling public. This is a hydraulic operated hitch system that can be positioned to mow from either side or directly behind the tractor. Because the material is discharged directly to the rear of the unit and because of the type of mowing heads there is little if any risk of flying debris, rocks or other hazards.

Test Procedure:

This unit will mow at a more efficient speed and will increase productivity versus a rotary or flail type mower which allows you to mow at no greater than 4-6 mph. This mower is rated for 10 mph and also is capable of a slightly wider cut so productivity will be increased. Times will be recorded and compared to previous years for mowing in the same areas.

Conclusions:

With the tractor on the shoulder of the road mowing from either side the operator can steer the mower around stationary obstacles. This allows the tractor to continue moving in a straight line and not have to weave into the traffic lane to avoid signs, guard rail and other objects. This unit has increased safety of our mowing operation on several fronts. Debris thrown out into traffic is non-existent, time driving the tractor in traffic lanes is greatly reduced and the operator is able to drive and mow with the flow of traffic

Recommendations:

This is a versatile mower allowing us to mow going with the flow of traffic leading to an overall safer mowing operation.

Implementation:

This project has been recommended by the district but has limited applications; therefore, it has been placed on the limited application list.

F. Equipment - Tools

1. PRO PRESS CRIMPING TOOL

District/Office: 1/Building Maintenance

Project Contact: Brad Johnson
218/725-2727

Project Cost: \$2,474.00

MOR Fund: \$2,474.00

Starting Date: August 2005

Completion Date: April 2006



Project Descriptions:

With the Pro Press solderless connection installation is quicker. The connections can be made with the piping still wet and with minimal interruption time. The Pro Press system also does not require a flame to heat the material resulting in a safer work environment. To use the Pro Press system a special crimping tool is needed.

Purpose:

The Pro Press system is a solderless fitting used with copper piping. The system uses compression crimping with o-ring seal fittings.

Test Procedure:

Cost comparisons will be done using the Pro Press system vs. soldered connection on various maintenance applications. Product failures will also be recorded with analysis of the failure.

Conclusions:

The Pro Press crimping tool has performed very well. No failures have been experienced to date. The pro press is a great time saver for hydronic system repairs.

Recommendations:

The pro press works well for repairs or small modifications; for more extensive jobs the material cost would make it cost prohibited.

Implementation:

This project has good reviews from the district and has been added to the list of projects for potential statewide implementation.

2. PORTABLE WHEEL STUD REMOVER

District/Office: 2E/Bemidji
Project Contact: Tony Bowe
218/755-2179
Project Cost: \$2195.00
MOR Fund: \$2195.00
Starting Date: September 2006
Completion Date: June 2007



Project Descriptions:

The PakPress Portable Wheel Stud Remover and Installer will allow the mechanic to remove and install wheel studs without removing the hub from the truck. A 2.5 to 3 hour job is done in 20 minutes, all while maintaining the manufactures recommendation of pressing the studs in rather than drawing them in with the nut and causing damage to threads.

Purpose:

This project saves both time and parts. This will create less work for our mechanics when it comes to hub repair giving them more time to work on other projects.

Test Procedure:

District 2 will test and evaluate this piece of equipment on several trucks. The mechanics using this will provide feedback after using it several times. This piece of equipment will be evaluated for 1) time savings per wheel versus the old way of removing the hub, replacing the studs, replacing the wheel seal and then reassembling, 2) cost saving, 3) the ease of both installing and removing and 4) workmanship of the tool and how well it stands up to repeated use.

Conclusions:

Mechanics do not have to pull hubs off to press out studs or press in new ones. This can be done by jacking up the truck, pull off the wheels and drum and install the press. Wheel seals are around \$32.00 each and labor rate is around \$60.00 an hour so just those two things are a savings of \$242.00 per hub.

Recommendations:

There is no doubt this is the better way to go. The old way was to remove wheels, drum, axle, bearings and the hub. Than clean all parts, remove old seal, install new seal and bearings. Then install the hub, adjust bearings, reinstall the axle, drum and wheels. This piece of equipment is a very useful and time savings investment.

Implementation:

This project has good reviews from the district and has been added to the list of projects for potential statewide implementation.

3. WIRELESS MOBILE LIFT

District/Office: 3A/Baxter

Project Contact: Jim Anderson
218/828-5729

Project Cost: \$43,111.00

NTREC Fund: \$14,484.00

Starting Date: December 2005

Completion Date: March 2007



Project Descriptions:

District 3 will purchase a wireless portable lift system from Gray Professional Service Equipment along with four vehicle support stands. This system is designed to lift up to 64,000 pounds to a height of 67 inches. The system has no high voltage requirements and needs no cables to interconnect the columns. It should be extremely portable and useful in a variety of areas without any additional power installations.

Purpose:

Snow and ice equipment is going through an evolution of becoming larger, heavier and longer than it was in the past. Mn/DOT's lifting equipment has to keep pace with these changes in order to safely service these units. A portable lift system is needed to address these needs.

Test Procedure:

District 3 will be making comparisons between using an in floor hoist to using a portable lift system. District 3 will make time comparisons in their use, make safety comparisons and determine the effectiveness of the portability of the wireless system.

Conclusions:

These wireless lifts take less set up time and are much easier to work around than conventional wired lifts. The only requirement for power is a standard 120 volt power source to recharge the deep cycle batteries. Cost savings are the labor and material to wire each of the truck stations to use these versus a normal wired lift system. An estimate comes to app. \$2800.00 or more for each location (X 10 = \$28,000.00) and only they would be portable as far as the cord could reach.

Recommendations:

Overall, this lift system is a good purchase and is recommended statewide in a similar situation as district 3.

Implementation:

This project has been recommended by the district but has limited applications; therefore, it has been placed on the limited application list.

4. GOOSENECK LAMPS

District/Office: 3/Monticello Truck Station

Project Contact: Jason Penaz
763/295-5525

Project Cost: \$2,055.75

MOR Fund: \$2,055.75

Starting Date: November 2004

Completion Date: June 2006



Project Descriptions:

The gooseneck lamp is basically just a low intensity light which can be used to light our controls in plow trucks.

Purpose:

The operators do not always use the same truck during snow and ice operation. They may not be very familiar with the controls so this will help them see and operate their truck safer and more efficient.

Test Procedure:

The gooseneck lamps were put in the plow trucks and used in two snow and ice seasons. These lamps will be tested for their effectiveness during night plowing operations and whether or not they help the operator see the controls better.

Conclusions:

The lights were too costly for one LED light. The cost for each light was \$82.23. The lamps worked very well and would be very nice to have in all trucks for safety reasons.

Recommendations:

The only problem was the cost of the LED lights, otherwise every thing worked great. I would recommend that these lights were a standard item when new plow trucks are ordered.

Implementation:

This project has good reviews from the district and has been added to the list of projects for potential statewide implementation.

5. SAFETY WORK PLATFORM

District/Office: 7/Mankato
Project Contact: Kelvin Smith
507/389-2946
Project Cost: \$1816
MOR Fund: \$1816
Starting Date: August 2006
Completion Date: February 2007



Project Descriptions:

Ladders limit the ability to move parallel to a truck while working on various attachments and lights on larger equipment. This provides a safe platform area for movement over a greater distance with a hand rail for safety. This is a one piece lightweight portable platform that folds for compact storage. Unit has adjustable height increments of 7" inches to accommodate various tasks on equipment. Height adjustment from 16" to 5'10" with a working platform deck of 5' L x 18" W. Working load capacity is 500 pounds. With this capacity two people could effectively work from one platform.

Purpose:

The request for two of these units provides a chance to evaluate its performance for load tarping tasks when elevated work areas are needed on both sides of the truck. The original request identified one platform; we would like to acquire two units for evaluation. The work platform with its rail system also provides the user with three points of contact to reduce fall potential as opposed to only two on a ladder.

Test Procedure:

We will evaluate the amount of time this will save and evaluate whether or not it gives us an adequate work area.

Conclusions:

The work platform has performed as expected. It has eliminated several step stools that were previously used for low level work. It also provides a larger base to work at higher elevations verses the use of a ladder.

Recommendations:

I think that we only skimmed the surface with the potential for this platform application. Once people see the platform I believe more uses will be identified were it will support our work.

Implementation:

This product was well received by the district, although it has not been proposed for implementation at this time it may be a good candidate down the road as more uses arise for it.

6. SNAP-ON HD35 FLUID CHANGER

District/Office: Owatonna Mechanics Shop-D6W

Project Contact: Steve Luekin
507/446-5945

Project Cost: \$6,495

MOR Fund: \$6,495

Starting Date: March 2004

Completion Date: June 2007



Project Descriptions:

Automatic transmissions are very expensive to rebuild or replace. Many of the problems encountered with them can be reduced or even eliminated by proper service and simply changing of the fluid. Venders have been used for changing fluid in the past however they are unable to service our medium and heavy-duty trucks.

Purpose:

This project will test and evaluate the only unit on the market that has the capability of changing the fluid on Allison medium and heavy-duty automatic transmissions.

Test Procedure:

This unit monitors and notifies shop personnel when transmission filters are becoming blocked. This action will be watched and should considerably reduce the amount of filters being changed. This system will also change fluid faster, more thorough, and more efficiently than our standard method of doing it. It will also be tried and monitored for servicing power steering systems.

Conclusions:

Preliminary results look good. Machine is easy to use and so far shows a reduction in labor to service transmissions.

Recommendations:

None at this time.

Implementation:

7. TREE PULLER

District/Office: 6/Owatonna

Project Contact: Terry Schmitt
507/263-2323

Project Cost: \$2,000

MOR Fund: \$2,000

Starting Date: November 2004

Completion Date: October 2006



Project Descriptions:

We would like to buy a tree puller that will mount on the front of a skid loader that can go into areas with a lot of small trees and pull them out. This machine would be a lot more efficient than the current way, which is using a chain saw.

Purpose:

We currently have areas with lots of small trees that require crews to go in and cut down with chain saws which can lead to back and leg injuries.

Test Procedure:

We will pull trees out of the ground with it and see how it does. Whether or not it pulls out the root or just breaks off the tree. We will also see how well it holds on the trees and if it slips or holds tight.

Conclusions:

The trees and its roots were moved easily with no excess strain on the skid steer. The tree puller was able to grasp and hold the tree without any slippage of most trees.

Recommendations:

The tree puller proved to be a very effective tool for removing trees and their roots.

Implementation:

This project received good reviews from the district but it has not been proposed for statewide implementation because we are not sure how useful other districts would find it.

8. GPS CAMERAS

District/Office: Metro

Project Contact: Gene Lorentz
651/234-7934

Project Cost: \$5,200

MOR Fund: \$5,200

Starting Date: November 2004

Completion Date: April 2006



Project Descriptions:

We will evaluate five GPS cameras. They will be assigned to Maple Grove sub area to capture guardrail hits. The second we be given to Permits to track Mn/DOT fence that is damaged by non-Mn/DOT plows pushing snow into them. The third will be utilized by the maintenance crews repairing impact attenuators. The fourth will go to Oakdale Traffic Services to track problems they encounter with construction contractor signing. The fifth will be used by Metro Maintenance Engineering Services to track different preventative maintenance project we going.

Purpose:

As described above.

Test Procedure:

Maple Grove will track guardrail hits with photos and evaluate the information. Permits will evaluate if processing claims is any easier or effective with this GPS camera compared to other methods. The camera given to the attenuator crew will track the high hit impact areas. Traffic services will determine whether or not their assistance is needed in coordinating signing in construction areas. Engineering Services will evaluate the number of uses they actually have for a GPS camera.

Conclusions:

We can see many possibilities to use GPS digital camera technology, here are a few...Communicating problems/issues with construction projects to the construction personnel. Documenting issues we have with private companies plowing snow into our fences; taking before and after photos with GPS coordinates. Documenting severity of hits ("anecdotal information") on some of our new high tension cable barrier, etc. This camera is not the solution; however we are currently evaluating camera attachments/integration with our more robust Trimble GPS units.

Recommendations:

We do not recommend this model of the Ricoh Caplio Pro and software for tracking GPS coordinates on digital photos unless very basic information is needed and the user is very tech-savvy and patient.

Implementation:

This project was not received well by the district therefore this type of GPS Camera will not be proposed for implementation.

VI. MAINTENANCE RESEARCH PROJECTS ON GOING 2005-2007

A. Winter Maintenance

1. ANTI ICING UNIT

District/Office: D-2/Crookston
Project Contact: Mike Sugden
218/436-2577
Project Cost: \$4500.00
MOR Fund: \$4500.00
Starting Date: December 2005
Completion Date: On Going



Project Descriptions:

A slide-in anti-icing unit will be purchased and set-up in our pick-up. This will be deployed before approaching winter storms in critical areas that may benefit from the anti-icing process. Approaching weather will be watched closely as well as areas the storm has past to determine the most advantageous times to utilize the anti-icing process. Post storm meetings will provide sharing of information and insight into the use of anti-icing for the next event.

Purpose:

Since anti-icing is being used in many areas of the state, what is learned from our experience would have a direct impact in areas that are hesitant on its use do to geology, wind conditions, etc. This could be a huge benefit for everyone including counties, cities, and other states.

Test Procedure:

Regain times will be closely monitored and visual observations will also be conducted. Material usage on these routes will be compared to other similar roads in the sub-area.

Conclusions:

This test is still active.

Recommendations:

None at this time.

Implementation:

2. IOWA SNOW AND ICE INNOVATIVE EQUIPMENT

District/Office: 6E/Rochester

Project Contact: Dave Redig
507/285-7361

Project Cost: \$8650

MOR Fund: \$8650

Starting Date: April 2007

Completion Date: April 2008



Project Descriptions:

A live bottom tandem truck box with 2 in box 450 gallon saddle tanks and a tailgate brine tank/sander combination. This system would have the capability to apply brine at the recommended 80 gallons per ton of abrasive instead of the present 8 to 10 gallons and/or anti-ice a route with brine only. An Existing Snow Plow Truck chassis to be equipped with stainless steel chutes allowing the chemical abrasive and brine to be applied near the road surface rather than being thrown onto the ground with our present spinner application system. The truck would also be rigged with a pressure pump brine application system rather than the present gravity system. In addition, the truck would be rigged with a rubber slush removing cutting edge located behind the steel cutting edge to clean the road of any slush or snow left behind in rutted wheel paths.

Purpose:

This project could make our snow and ice operations much more efficient and effective by applying more liquid to our salt which will activate the salt sooner.

Test Procedure:

The projects equipment would be evaluated by visual observation of how well the equipment worked and how much repair was needed during the course of the testing. The real test would be how much effect there would be on the regain times of the road the truck was assigned to. It is our speculation and perception that the more brine we can apply with our chemical abrasives (80 gallons per ton), the better the salt will work on the road.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

3. GPS SPEED CONTROL

District/Office: 7/ Windom

Project Contact: Tony De Santiago
507/831-1226

Project Cost: \$5,000

MOR Fund: \$5,000

Starting Date: June 2006

Completion Date: On Going



Project Descriptions:

According to the manager at Gopher one call I will be able to go out mark my one call, punch up my coordinates on the GPS hand unit. Than I will fill out my work sheet bring up my map. They told me it will default to the street location, but than I can enter my GPS coordinates. Than after entering it will bring up my exact location on the map. Sounds away to easy. I asked how many people are using this system so far. They knew only of one, but the system was just recently put into place.

Purpose:

The use of a GPS hand held unit will save us time and effort in our Gopher one calls. It will make finding our location on the map a lot less time consuming. It will give us away of tracking and compiling a history of one calls. If carried in the field and we find a one call situation, we can take coordinates imminently of the location. With the use of the computer program and GPS unit there's endless possibilities.

Test Procedure:

Assuming that everything works with the Gopher one call system the time savings alone will be cut in half or better. Having the ability to send out one person with any vehicle to mark and take coordinates alone already improves our situation. A lot of times it is our mowers out in the field who discover problems that need to be fixed. If they have the hand held GPS unit with them they can just punch up the coordinates which will save us the time and effort of trying to find the location by their description.

The other take on this is by buying the Arc pad software we can plug information into our computers. With that information we could map all our one call repairs and compile a history of information on what's happening out there. Once we get familiar with our GPS unit and computer program I think the possibilities of use are endless.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

4. GUIDANCE LASER

District/Office: 7W/Mankato

Project Contact: Randy Glaser
507/389-2848

Project Cost: \$3,995

MOR Fund: \$3,995

Starting Date: January 2006

Completion Date: On Going



Project Descriptions:

This laser unit is mounted under the cab shield and pre-aimed by the operator. A switch inside the cab turns the unit on which then projects a green dot in front of the truck and allows the operator to “see ahead” and display the future path of the wing. The laser system features a lens heating system to help keep it clear of freezing precipitation.

Purpose:

When using a wing plow it can be tough to estimate the path of the wing and allow proper distance to avoid obstacles such as sign posts and curbs.

Test Procedure:

When testing the laser we will test its usefulness and whether or not we can actually see it and also if we reduce the number of accidents involving wings and fixed objects.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

5. HERBICIDE HEAD/PUMP

District/Office: 7/Mankato

Project Contact: Randy Glaser
507/389-2848

Project Cost: \$5,500

MOR Fund: \$5,500

Starting Date: July 2006

Completion Date: On-Going



Project Descriptions:

We will install two herbicide heads with injection heads, injection pumps on our 6,000 gallon water tankers to do herbicide spraying. Having the heads with the injection pumps allows us to spray larger areas with a controlled (speed) measuring system saving time and material. Employees will not have to measure the mix or rinse the herbicides out. They just have to hook up a 15 gallon container and the head and pump do the rest with no waste.

Purpose:

With the injection heads and pumps we can perform a safer, more efficient spraying application and we will not expose our employees to more herbicide than necessary.

Test Procedure:

We will look at the amount of time and materials saved by using the tankers to do all of our herbicide spraying.

Conclusions:

This test is still ongoing.

Recommendations:

None at this time.

Implementation:

6. TUFF TECH BAG

District/Office: District 7/Mankato

Project Contact: Randy Glaser
507/389-2848

Project Cost: \$11,242.00

MOR Fund: \$11,242.00

Starting Date: July 2006

Completion Date: On Going



Project Descriptions:

This bag will be installed in a class 35 plow truck that is assigned to a high volume high speed route. The pump will plug in to the control point sander controls making it completely ground orientated. Because it's in liquid form the deicer is active as soon as it's applied, there is no delay waiting for the material to liquefy and migrate over the road surface. This bag is easily removable so that if condition warrant you can go back to granular, by simply dumping the bag on the ground and putting the sander back on. We will also be able to use the bag for use in the summer for dust control, nurse tank for herbicide or roller.

Purpose:

With the use of this bag we will be able to apply deicing chemicals (salt brine) instead of granular and be able to do it at a rate of speed that makes it safer for the traveling public as well as the operator.

Test Procedure:

We will evaluate the amount of liquid that can be applied while maintaining the same results as similar routes and what the cost savings end up being by reduced applications of a less expensive product, number of rounds that need to be made and regain time, which reduces interruptions to the traveling public, and to see if the bags hold up.

Conclusions:

Based on my research I believe that this system can be used on most routes under most conditions. Now that our trucks are coming more standardized this bag will fit any of the new elliptical boxes with no modifications needed to the truck making this bag truly universal.

Recommendations:

Tuff Tech Bags have been used in Canada for deicing chemicals with great success; they also have been used by the military for fuel storage. This is a very sturdy bag that should perform well for us.

Implementation:

The district recommends this project in some applications but has not decided at this time to push for statewide implementation.

7. QUICK EDGE

District/Office: Central Office
Project Contact: Craig Shankwitz
Project Cost: \$10,316
MOR Fund: \$10,316
Starting Date: January 5, 2004
Completion Date: On Going



Project Descriptions:

This project will be performed primarily by a full time University of Minnesota Mechanical Engineering student, Michael Etheridge. Michael Etheridge will be managing this responsibility in combination with normal coursework. The project will begin in January 2004 and will run into the spring of 2005. A design phase will be conducted during the 2004 spring semester. With the design complete, parts and equipment will then be manufactured and procured over the summer. Prototype assembly and testing will occur in the fall 2004 semester. Upon completion of assembly and testing, the working model will be field tested and a final evaluation will be presented in spring 2005. A more detailed project schedule can be found in the included attachments.

Purpose:

A system can be designed that will require less time and manpower and that will put workers at less risk of injury than the current bolting method for attaching cutting edges to underbody plows.

Test Procedure:

The design will initially be evaluated on its field performance. Assuming that the new Quick Edge system performs adequately, it will be compared to the current bolted system. Cost, time, and manpower, and risk of injury will all be taken into account in the evaluation process.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

8. MUD FLAPS

District/Office: Co/Maintenance Research

Project Contact: Farideh Amiri
651/366-3545

Project Cost: \$1,500

MOR Fund: \$1,500

Starting Date: June 2006

Completion Date: On-Going



Project Descriptions:

This project will explore the use of highly reflective sign material installed on an aluminum sign plate and compare costs and durability when taking the place of the printed/bonded type of mud flap sign.

Purpose:

If successful this project could not only be implemented statewide as new trucks are completed at Central Shop, but could be used on new plain black flaps when replacement of existing truck flaps becomes necessary. This may also be a viable business venture for the State Sign Shop through the production of the signs and reducing expenditures for Mn/DOT without reducing safety for motorists and Mn/DOT operators.

Test Procedure:

This project will be measured by comparing the aluminum signs against the bonded material signs for durability and longevity. They will also be measured for reflective intensity which will determine the potential safety benefits when making the back of the truck more visible because of headlights/etc. of other vehicles illuminating the reflective materials.

Conclusions:

This test is still active.

Recommendations:

None at this time.

Implementation:

9. CONTROL PRODUCTS TEMP SENSORS

District/Office: Co/Maintenance Research

Project Contact: Curt Pape
651/366-3571

Project Cost: \$3,500

MOR Fund: \$3,500

Starting Date: July 2006

Completion Date: On Going



Project Descriptions:

Mn/DOT's current practice is to use Sprague temperature sensors on its snowplow fleet. Several years ago Maintenance Research purchased several Sprague and Control Products sensors for evaluation purposes. At that time there were several issues with the Control Products sensor which, coupled with the higher price tag, led to Mn/DOT developing a contract with Sprague. Since that time Control Products has made several changes to address these issues and in an independent evaluation done under contract for the Aurora consortium the Control Products sensor showed itself to have higher accuracy with a lower rate of failure than Sprague. Due to the limited scale of field testing in that comparison I feel it would benefit Mn/DOT to purchase several of the Control Products sensors and conduct testing of their own.

Purpose:

If successful, the results from this project could lead to a change in vendors for Mn/DOT and results could easily be implemented on a statewide basis.

Test Procedure:

Since Mn/DOT currently mounts Sprague sensors on all of its snowplow trucks the Control Products sensors can be mounted in 4 of these units to facilitate a side by side comparison. I will work with Central Shop and snowplow drivers from 4 different Districts to match the test units with drivers willing to do the comparison tests and document the results.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

10. TEMP SENSORS-VAISALA

District/Office: Co/Maintenance Research

Project Contact: Curt Pape
651/366-3571

Project Cost: \$18,000.00

NTREC Fund: \$8,000.00

Starting Date: July 2006

Completion Date: On-Going



Project Descriptions:

This pavement sensors will test the accuracy and reliability of the non-intrusive units against in-place RWIS sensors, vehicle mounted sensors and visual observations.

Purpose:

If successful, the results from this project could lead to a change in vendors for MN/DOT and the results could easily be implemented on a statewide basis.

Test Procedure:

These units will be evaluated in a side by side comparison to find accuracy, dependability and durability during the 2007-2008 snow and ice season.

Conclusions:

This test is still active.

Recommendations:

None at this time.

Implementation:

11. EXPERIMENTAL SANDER

District/Office: Metro
Project Contact: Norm Ashfeld
651/234-7907
Project Cost: \$10,000.00
MOR Fund: \$10,000.00
Starting Date: June 2005
Completion Date: Ongoing



Project Descriptions:

Modify new sanders to provide for 2 chutes (one on each side) and a spinner in the middle accomplished with a dual auger sander.

Purpose:

This new sander would be effective in multi-lane operations as well as sanding ramps. With the ability to sand multi lanes at once it could reduce the number of rounds the operator makes.

Test Procedure:

This sander could greatly reduce material loss on the shoulder of the road due to less bounce and scatter of material.

Conclusions:

This project is still on going.

Recommendations:

None at this time.

Implementation:

12. HENDERSON SPREADER

District/Office: Metro
7/Mankato

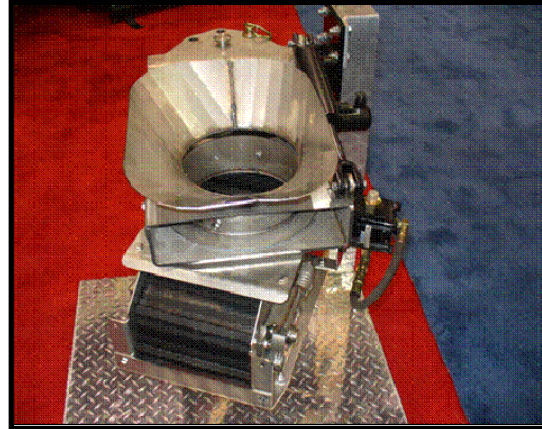
Project Contact: Norm Ashfeld (Metro)
651/234-7907
Randy Glaser (District 7)
507/389-2848

Project Cost: \$4,000.00

NTREC Fund: \$4,000.00

Starting Date: January 2006

Completion Date: On-Going



Project Descriptions:

The concept behind the Henderson HTS55 Direct Placement Sander is that it is capable of placing the material directly on the centerline of the highway at the equivalent speed of the truck. This minimizes the material loss from roadways by reducing material bounce.

Purpose:

Mn/DOT would like to test these new sanders in order to greatly reduce material loss to the shoulders. Operators can control the exact placement of the material at higher speeds with the sander being mounted inches from the road surface. The test will evaluate the direct placement sander vs. current sanders with a spinner.

Test Procedure:

The performance, cost effectiveness and salt loss to the shoulder of the road will be monitored. Mn/DOT has used sanders similar to this one in the past with great results allowing operators to cover the roadway faster and with reduced salt losses. With the new technology in the Henderson HTS55, the final result has great potential to surpass the sanders Mn/DOT uses currently.

Conclusions:

This test is still ongoing.

Recommendations:

None at this time.

Implementation:

13. SPRAY NOZZLES

District/Office: 7E/Mankato
Project Contact: Randy Glacer
507/398-2848
Project Cost: \$900.00
MOR Fund: \$900.00
Starting Date: January 2007
Completion Date: On Going



Project Descriptions:

Most nozzles will not work for high speed spraying applications because of the drifting that occurs at speeds excessive of 55 mph along side the application vehicle. The semi tanker has the capability to control the flow to the nozzles at any speed. With the ability to do multi lanes in one trip this will save time, money and make applying safer for the public as well as the operator.

Purpose:

This project will explore high speed chemical application and its effectiveness. With increasing traffic volumes this will create a much safer operation.

Test Procedure:

This test will evaluate the variable orifice nozzles to see if salt brine can be sprayed in multi lanes at high speed without drifting or misting problems.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

14. KT-90 ACTIVE ADAPTERS

District/Office: 8/Willmar

Project Contact: George Bowman
504/537-3615

Project Cost: \$3,000.00

MOR Fund: \$3,000.00

Starting Date: January 2005

Completion Date: On Going



Project Descriptions:

Carbide cutting edges are expensive but a necessity for Mn/DOT to effectively accomplish our plowing operations. Much time is spent installing new carbide edges as well as other costs of hardware and materials. Longevity of carbide edges is crucial in keeping costs to a minimum.

Purpose:

This project will evaluate and determine if using a flexible shock absorbing mounting system will increase life of cutting edges and will the extended life period be long enough to justify the additional costs of the system.

Test Procedure:

The Active Adapters will be installed on several plow trucks with new cutting edges. They will be compared with a standard edge for both hours used and miles accumulated before replacement is necessary to standard edges.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

15. MOBILE ANTI-ICE SYSTEM

District/Office: Metro

Project Contact: Mark Fischbach
651/492-2160

Project Cost: \$7,500.00

MOR Fund: \$7,500.00

Starting Date: October 2004

Completion Date: On Going



Project Descriptions:

Anti-icing has proven itself as a valuable tool in snow and ice control. At the present time budget restraints and other reasons prevent us from expanding our program to a cover a broader range of high traffic crash areas. This mobile system may help provide a higher level of safety in critical locations.

Purpose:

To test and evaluate a new mobile anti-ice system that promises to perform an anti-icing procedure for critical areas and that is easily movable to other locations.

Test Procedure:

This system will be set up on a traffic lane that is plagued with crashes due to slippery driving conditions. Snow and ice along with frost have often been a contributing factor. Crashes will be monitored and recorded throughout the winter trial season and the results will be compared to existing data from previous years. Although weather conditions will not be identical, a fairly good picture of the effectiveness of the unit should emerge. Reliability and maintenance of the unit will be recorded and reported.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

16. RUBBER CUTTING EDGES

District/Office: Metro

Project Contact: Norm Ashfeld
651/234-7907

Project Cost: \$1,512.00

MOR Fund: \$1,512.00

Starting Date: August 2006

Completion Date: On Going



Project Descriptions:

Mn/DOT Metro currently uses all steel cutting edges along with carbide blades. The steel cutting edges tend to remove the pavement markings and also wear off the reflectivity of the pavement markings.

Purpose:

The concept behind the rubber blades is that they are softer and will glide over the pavement markings without harming them and still remove snow effectively.

Test Procedure:

This project will test these new rubber blades and potentially decrease the need to reinstall pavement markings as often. Rubber plow blades vs. steel blades performance, cost effectiveness and reflectivity of the existing skip stripes would be monitored and compared.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

17. WIPER SHAKERS

District/Office: Metro/Camden

Project Contact: Tom Osthoff
612/520-3560

Project Cost: \$400.00

MOR Fund: \$400.00

Starting Date: November 2006

Completion Date: On Going



Project Descriptions:

This product will help remove snow and ice build up from the windshield, improving the driver's visibility and safety. Four sets will be installed on the existing wiper blade arms of 4 state snowplow trucks as well as a Shaker. The Wiper Shaker connects to the existing wiper blade arm and then the wires are run through the firewall to a power supply or a cigarette lighter.

Purpose:

The shaker will help keep the windshield wiper clear of snow and ice during plowing operations. Using the shakers operators will not have to get out of their truck to clean frozen snow and ice stuck to their wipers.

Test Procedure:

The drivers will provide feedback after a period of time on whether the product was beneficial in the operation of snow removal and whether or not this product will withstand the rigors of our harsh environment. The information will be compiled into a final report.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

B. Winter Material

C. Road and Bridge Maintenance

1. ROLLMASTER 5000

District/Office: 6E/Rochester

Project Contact: Ed Vitse
507/533-4413

Project Cost: \$1,295.00

MOR Fund: \$1,295.00

Starting Date: March 2007

Completion Date: On Going



Project Descriptions:

This marker is economical. It pumps paint directly from a standard 5 gallon pail to the roller which in short means no tank to clean. Also fool proof a peristaltic pump driven by 12 volt gear motor and built in charger. One charge will stripe over 24 hours. This unit is very safe to use (no high pressure pumps or hoses). It is very quiet and clean to use, no engine or compressor noise or harmful fumes.

Purpose:

This small compact roller will be used for small marking applications. It is very user friendly and simple for anyone to use.

Test Procedure:

This project will test the abilities of this more economical roller vs. bringing in a large crew to mark parking lots and inside our maintenance facilities.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

2. 3 POINT JETTER

District/Office: 6W/Owatonna

Project Contact: Andrew Kubista
651/366-3560

Project Cost: \$30,000.00

NTREC Fund: \$30,000.00

Starting Date: April 2006

Completion Date: On Going



Project Descriptions:

The unit is a hydraulically driven, 3-point hitch tractor/skid-steer mounted jetter that is supplied by a 1500 to 6000 gallon “nurse” water tanker. The jetter will be utilized in various areas of the district and sub-areas to clean and open culverts clogged and/or plugged by silt, gravel or other granular residues, trash and/or ice.

Purpose:

This piece of equipment can be easily passed around the district for others to use. It will also be used to clean the culverts that are hard to get to because of their location.

Test Procedure:

An hourly usage will be recorded. This will be compared with the cost per hour of a truck mounted and trailer mounted unit operated by a city and/or contractor. The type of road and culvert conditions that the unit is used in will determine its workability in less than perfect operating conditions.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

3. TAILGATE PAVER

District/Office: 7E/Mankato
Project Contact: Randy Glaser
320/389-2848
Project Cost: \$27,250.00
NTREC Fund: \$27,250.00
Starting Date: April 2004
Completion Date: On Going



Project Descriptions:

Smooth roads are one of the priorities Mn/DOT customers expect. It is safer both for them and also provides a much less demanding maintenance schedule for Mn/DOT work crews.

Purpose:

This project proposes to evaluate tailgate paving machine with new innovative equipment so that it is more versatile. These new features were not available on previous units and greatly enhance the paving unit abilities.

Procedure:

The production of this unit will be measured against previous methods of completing small pavement jobs. Tonnage can be compared for each days work. Also this unit promises the ability to complete repairs pertaining to wheel tracking on older bituminous which will be monitored and evaluated.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

4. BITUMINOUS THERMAL CRACK REPAIR

District/Office: 7/Mankato

Project Contact: Steve Oakey
Gary Martinson
507/389-6858

Project Cost: \$12,000.00

NTREC Fund: \$12,000.00

Starting Date: July 2003

Completion Date: On Going



Project Descriptions:

There are many miles of bituminous roadways that are not meeting customer criteria due mainly to thermal cracks creating a rough ride. This is unacceptable by consumers and repairs need to be completed.

Purpose:

The projects purpose is to repair thermal cracking using several different premium materials instead of treating the entire surface area with a re-surfacing method.

Test Procedure:

A section of highway will be assigned to each repair material used in this evaluation. The material will be monitored for ease of use, quality and longevity of repair and ride-ability.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

5. FORWARD LOOKING SONAR

District/Office: 7/Mankato

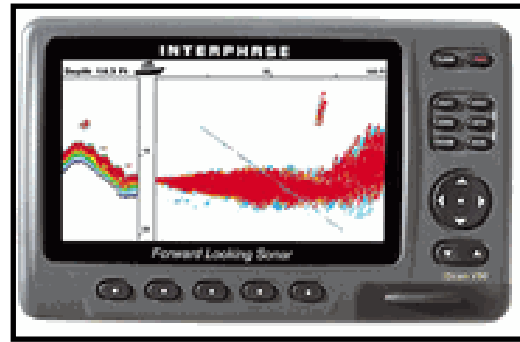
Project Contact: Larry Cooper
507/389-6959

Project Cost: \$1,615.61

NTREC Fund: \$1,615.61

Starting Date: September 2006

Completion Date: On Going



Project Descriptions:

Monitoring bridges will be compared with previous years monitoring to determine if the time expenditure is reduced and how much. The data quality and quantity will also be compared.

Purpose:

This project will capture seasonally low water levels after the next flood season.

Test Procedure:

With its sweeping vertical scan the Interphase iScan V90 continuously updates the forward looking display to show changing water depths, shoals, reefs, schools of bait, bottom structure and other suspended objects like fish. It's small easy-to-install phased-array transducer uses no moving parts and steers a 12-degree acoustic beam, in a vertical plane, from the surface ahead and down to 600 feet below.

Conclusions:

This project is still on going.

Recommendations:

None at this time.

Implementation:

6. TOP DOWN CRACKING

District/Office: Mn/DOT Material Lab

Project Contact: Bill Zerfas
651/779-5289

Project Cost: \$15,000.00

NTREC Fund: \$15,000.00

Start Date: July 2002

Completion Date: On Going



Project Descriptions:

Pavement rehabilitation has been the method for getting the most from road surfaces at a cost affordable price. With the cost of pavements increasing each day it is imperative that materials are explored which promise to extend life expectancy.

Purpose:

This project will explore the use of several products that are used to repair transverse cracks in road surfaces before a surface treatment is applied. They will also be evaluated for their performance in repairing wheel paths before the surface treatment.

Test Procedure:

Several products will be used for this purpose in test sections set up at Mn/Road. The sections will be monitored for signs of the re-appearance of transverse cracking. Wheel path sections will also be included.

Conclusions:

This project is still active.

Recommendations:

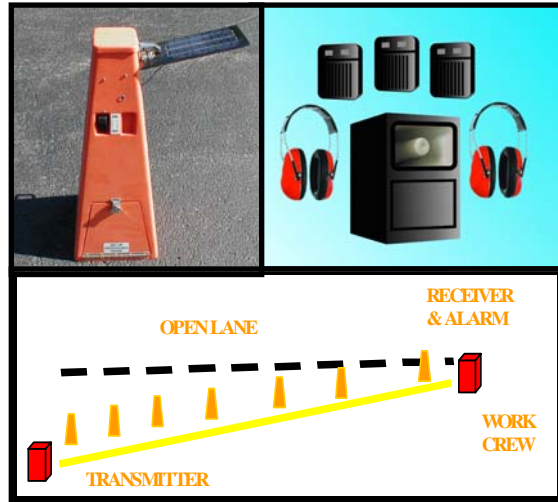
None at this time.

Implementation:

D. Safety, Traffic Control and Work Zone Safety

1. INTRUSION DEVICES FOR WORK ZONE SAFETY

District/Office: 3/Bridge
Project Contact: Doug Larson
218/828-5818
Project Cost: \$8,000.00
MOR Fund: \$8,000.00
Starting Date: September 2006
Completion Date: On-Going



Project Descriptions:

The Safety Line SL-D12 Work Zone Intrusion Alarm is an alarm that goes off whenever the work zone has been entered. It will also alert employees when they are crossing the line which sometimes happens when employees are busy and may not be aware that they are getting close to crossing the work zone boundary. The employees will therefore be alarmed by either a personal body alarm or headphones if they are too far away from the transmitter and can not hear it.

Purpose:

This product could actually preserve the safety of our employees in the work zone by alerting them of somebody coming into the work zone or if they are out of the work zone.

Test Procedure:

This system in actual work zones will be field tested.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

2. CONE SETTER

District/Office: 7/Mankato

Project Contact: Randy Glaser
507/389-2848

Project Cost: \$12,000.00

MOR Fund: \$12,000.00

Starting Date: July 2006

Completion Date: On Going



Project Descriptions:

Setting and picking up cones and other traffic control devices is one of the most dangerous jobs at Mn/DOT. The risk could greatly be reduced if it is automated.

Purpose:

The purpose of this project is to use and evaluate a new style of automated cone setter and remover. A special operator platform will be constructed by the district and will be able to easily be mounted and used on different trucks when necessary.

Test Procedure:

This unit will be used several times in the parking lot prior to getting evaluated under actual traffic control operations. Both setting and picking up the cones will be evaluated. More than one operator will test the cone setter in different applications and under a variety of weather conditions.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

3. HORIZON PORTABLE TRAFFIC CONTROL SIGNAL

District/Office: 7W/Windowm

Project Contact: Ron Gaffke
507/831-1227

Project Cost: \$35,500.00

NTREC Fund: \$35,500.00

Starting Date: April 2007

Completion Date: On-Going



Project Descriptions:

The SQ2MP Portable Traffic Control System by Horizon Signal would be used on lane closure for bridge maintenance projects on two lane roads. Currently bridge maintenance staff has two flaggers for a lane closure project. The device selected would have three 12" lights (red, yellow and green), programmable times, unit to unit communication (3 mile range), conflict monitoring and other advance features to ensure the safety of both the bridge maintenance crew and the traveling public.

Purpose:

With a permanent crew of 4 people this only leaves 2 people to do the work. Using the SQ2MP Portable Traffic Control System will allow all four individuals to perform the needed work cutting the lane closure time in half.

Test Procedure:

The SQ2MP Portable Traffic Control System will be set up on the opposite ends of the work area. They will be monitored, watched to evaluate how well traffic obeys the lights and to make sure the product does not fail during a closure.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

4. AVOIDING COLLISIONS WITH PLOWS

District/Office: CO/Maintenance Research Section

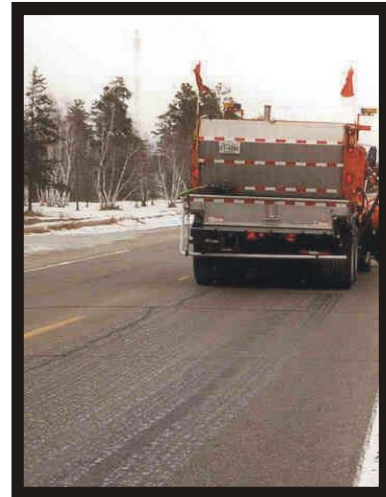
Project Contact: Albert Yonas
Lee Zimmerman
University of Minnesota 612/624-6805

Project Cost: \$31,000.00

NTREC Fund: \$31,000.00

Starting Date: April 2004

Completion Date: On Going



Project Descriptions:

Previous research has shown that a driving condition exists during fog that affects motorists in a negative way. Speeds are actually increased rather than decreased adding to a hazardous condition. These conditions are repeated during plowing operations by snow clouds associated with that type of work. This is called low luminance contrast.

Purpose:

This project will assess how much of the low-luminance contrast illusion can be accounted for by information flowing along the chromatic pathways.

Test Procedure:

This project will utilize a driving simulator and evaluate drivers' reactions to varying conditions when approaching plow trucks. The studies themselves will evaluate the effects of lighting methods, etc.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

5. IN VEHICLE VIDEO CAMERA

District/Office: Metro

Project Contact: DeWayne Jones
651/366-5165

Project Cost: \$12,000.00

MOR Fund: \$8,700.00

Starting Date: September 2005

Completion Date: On-Going



Project Descriptions:

This in-vehicle video camera records to a DVR (digital video recorder). Once mounted in a maintenance vehicle it can be switched on and off when necessary. It can be used for filming road conditions, snow and ice events, incidents, detours and haul routes prior to construction and for training purposes.

Purpose:

The footage is recorded to the DVR and uploaded into a PC for viewing. With its GPS receiver, the coordinates can be determined and recorded.

Test Procedure:

It will be evaluated for its usefulness in Training (including snow and ice training), Tort claims and Incident Management.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

E. Roadside Maintenance

1. NO MOW GRASS

District/Office: 3A/Isle
Project Contact: Bryan Karels
320/676-3173
Project Cost: \$500.00
MOR Fund: \$500.00
Starting Date: April 2005
Completion Date: On Going



Project Descriptions:

This project will test no mow grass around guardrail instead of using chemicals to control vegetation. This is a slow growing grass that does not require very much maintenance.

Purpose:

This product could possibly reduce the amount of chemicals sprayed and man hours spent mowing or weed eating around our guard rail.

Test Procedure:

Vegetation will be monitored for growth and height throughout the summer and fall. This test will also evaluate the amount of maintenance required throughout the growing season.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

2. MINI MIGHT PATROL

District/Office: 4/Detroit Lakes

Project Contact: Dennis Redig
218/846-7943

Project Cost: \$ 22,000.00

NTREC Fund: \$ 22,000.00

Starting Date: July 2006

Completion Date: On Going



Project Descriptions:

This attachment for a skid steer loader will take the place of a small motor grader work which is used for maintaining shoulders. With the high cost of purchasing and operating motor graders and the need to more fully utilize present needed skid steer loaders, this makes a cost saving tool to use a piece of equipment for more than one purpose.

Purpose:

This machine is smaller and more user friendly. It has a lot of the same capabilities of a full size motor grader but fits on the front of a skid steer.

Test Procedure:

Evaluation will be ease of use for maintaining narrow gravel shoulders and estimate of cost saving by not having to use a large motor grader for this work.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

3. NOXIOUS WEEDS

District/Office: 4/Alexandria

Project Contact: Daniel Peterson
320/763-5045

Project Cost: \$20,270.02

NTREC Fund: \$10,000.00

Starting Date: April 2007

Completion Date: On-Going



Project Descriptions:

This project will develop a performance measure for noxious weeds in the states right of ways. The University of Minnesota (U of M) has completed a research project in which sampling recommendations are made for the various noxious weeds. To implement these recommendations, District 4 will sample the recommended 50, 100 and 200 foot segments in July and will need help from the U of M to analyze the results of the 2007 data which will in turn verify the recommendation.

Purpose:

This project will determine the amount of individual noxious weeds in the districts right of way. By completing the noxious weed survey each year the District could determine the amount of individual weeds and compare the past to see if they are being controlled.

Test Procedure:

By January 2008, a report will be submitted to the AME group to see if the noxious weed performance measure could be applied statewide.

Conclusions:

This test is still ongoing.

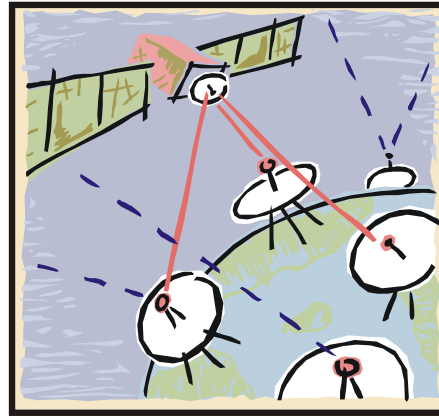
Recommendations:

None at this time.

Implementation:

4. GPS-GIS EDGE DRAIN MAPPING

District/Office: 4/Morris
Project Contact: Shannon Wait
320/763-5045
Project Cost: \$20,000.00
NTREC Fund: \$20,000.00
Starting Date: April 2003
Completion Date: On Going



Project Descriptions:

As budget deficits continue to cut deeper into operating funds, it becomes more imperative to use resources to the best of our ability. Traditionally, edge drains must be monitored for damage or possible failure each year. The question to be asked: 1) is this amount of coverage necessary 2) could less time be spent if only the potential or problem areas be identified?

Purpose:

The purpose of this project is to use GPS to map and identify edge drains that need or will need repair or maintenance and when to repair and do maintenance. This can then be monitored for failure rate. Also information can be used to determine actual resources needed to maintain the drainage system.

Test Procedure:

The drains will be mapped and recorded as to how much repair and maintenance are required and the potential for future maintenance. The percentage of correct information recorded can then be used to determine where and when repairs will be acquired and how much they will cost.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

5. HYDRAULIC PLATE COMPACTOR

District/Office: 6W/Owatanna

Project Contact: Brian Bustad
507/433-0554

Project Cost: \$6,000.00

MOR Fund: \$6,000.00

Starting Date: March 2007

Completion Date: On Going



Project Descriptions:

Compactor/drivers combine high frequency vibration with high impact power to make quick work of any compaction or driving task for trenches, around foundations, on slopes and driving posts. The plate compactor delivers 3000 lbs of impulse force at 2000 cycles per minute assuring maximum lift compaction.

Purpose:

This piece of equipment will reduce the amount of physical labor when it comes to repacking the soil in open trenches along with other soil packing applications.

Test Procedure:

With the compactor on the end of the backhoe boor there will be no need for a trench box when digging trenched because there will be no employees down in the trench manually packing the soil. With that said safety and time saved will be the main focus of the test procedure.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

6. GUARDRAIL SPRAYER

District/Office: 6W/Owatanna

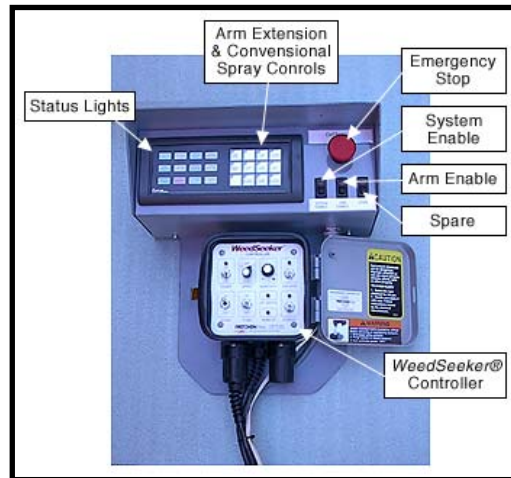
Project Contact: Tom Johnson
507/379-3414

Project Cost: \$6,000.00

NTREC Fund: \$6,000.00

Starting Date: January 2007

Completion Date: On Going



Project Descriptions:

This is a custom built unit for a tractor to be used like a boom type guardrail sprayer. The sprayer will be used on guard rails, concrete center jersey walls and any other hard to reach areas to spray notorious weeds and grasses.

Purpose:

Employees will not have to wear a back-pack sprayer which may reduce the number of back injuries. This sprayer unit will be mounted and tested for easy on and off and versatility so other sub-areas can use the sprayer and free up a tractor when not in use.

Test Procedure:

This is a quicker way to spray guardrail, to reach the target area and be more productive. This sprayer will allow the employee to stay in the tractor where the employee is protected from the spray elements.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

7. APACHE BULLSEYE 6 LASER

District/Office: 6/Owatanna

Project Contact: Dan Ludwig
507/645-8155

Project Cost: \$6,000.00

MOR Fund: \$6,000.00

Starting Date: January 2007

Completion Date: On Going



Project Descriptions:

The Bullseye 6 Laser Receiver with angle compensation automatically calculates and corrects the grade display for the angle of the dipper arm. It will check grade with the dipper arm extended or retracted up to 30 degrees. Plumb indication built in – for quick and accurate grade checking for excavators and backhoes. Center On-grades for grading operations – use on dozers, graders, scapers and box blades. It has up to 8 channels of grade information plus directional out of beam indicators. Bullseye 6 is a one man set-up (no cables, no welding on board batteries). It also has versatility built in 360 degrees reception and picks up the laser from all directions.

Purpose:

The purpose of the plumb sensor is for quick vertical only grade checking. It also has selectable accuracy on grade information plus out of beam indication. Bullseye 6 has ultra-bright LED's which are easy to see in all light conditions.

Test Procedure:

When using the Bullseye Laser the operator will be able to check grade while digging. The operator will not have to wait for someone on the ground to check grade. This will allow the operator to dig faster. Also, there will be less stuff on the ground which will be safer and less distracting for the operator.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

8. FASTRAC TRACTOR AND CLAAS MOWER

District/Office: 7/Window
Project Contact: Scott Morgan
507/389-6960
Project Cost: \$45,000
NTREC Fund: \$15,000
Starting Date: April 2007
Completion Date: On Going



Project Description:

The JCB Fastrac tractor and CLAAS mower will be on lease for two and ½ years. The Fastrac model tractor has a number of innovative features that may enable it to increase our field crew efficiency by getting the current mowing jobs completed faster.

Purpose:

This multi use tractor will be ordered with a loader and used during snow and ice operations for loading trucks or we can replace the bucket with a blower and clean bypasses and intersections. During the summer it can be used for tillage, seeding, mowing around guardrail and for auguring post holes.

Test Procedure:

The Tractor and mower will be compared with current models, such as TV 140s and 7410s with Schulte mowers. This unit will also be compared to TV140s and 7410s with snow blowers. It will be compared for its mowing productivity and also operators will be interviewed about loading and blowing operations.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

9. TRASH HARVESTER PHASE 2 (TRACTOR)

District/Office: Metro/U of M

Project Contact: Sue Lodahl, Dewayne Jones
651/366-3765, 651/234-7944

Project Cost: \$7,000.00

MOR Fund: \$7,000.00

Starting Date: November 2006

Completion Date: On Going



Project Descriptions:

This project is an extension of the \$40,000 Phase I project funded by NTREC. In Phase I a concept was developed for a prototype trash harvester. In Phase II the prototype machine will be built and attached to an off the shelf tractor. The TAP for the project has recommended that the tractor purchased in this project be upgraded in order to better meet the needs of the project. The additional cost to the project is \$26,000 with \$10,000 coming from the metro budget, \$9000 from STIP research dollars and the remaining funds, \$7,000 from MOR.

Purpose:

This piece of equipment could change the way debris is removed from roadsides. The current way is to pick it by hand but this machine can be driven through our ditches and right of ways picking the debris and putting it directly into a hopper mounted on the back of the tractor.

Test Procedure:

The final product will be evaluated against the set of design specifications agreed upon at the onset of Phase I, road worthiness, lighting and operator cab/visibility, machine performance and commercial production. Future evaluation will be done on durability, number of failures, quantity and quality of trash picked up, manual vs. machine pick up and person hours vs. machine hours.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

F. Equipment – Tools

1. SKIDSTEER LOADER POST POUNDER

District/Office: 1/Nopeming

Project Contact: Mike Hedlund, Brian Koczur, Forest Anderson
218/624-3211

Project Cost: \$4,500.00

MOR Fund: \$4,500.00

Starting Date: June 2005

Completion Date: On Going



Project Descriptions:

This project will explore the use of a skid steer mounted post pounder to install metal and wood guardrail posts during repair and installation of plate beam guardrail. It could also be used for installing posts for cable guardrail.

Purpose:

To test and evaluate this attachment on the skid steer loaders. This unit has the ability to pound guardrail posts, posts for cable rail and sign posts.

Test Procedure:

Time and labor savings will be recorded when operators auger the holes.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

2. NITROGEN TIRES

District/Office: 3/Baxter

Project Contact: Dennis Thomsen
218/828-5730

Project Cost: \$8,000.00

MOR Fund: \$6,000.00

Starting Date: December 2006

Completion Date: On Going



Project Descriptions:

Tires are the second largest fleet expense that Mn/DOT has. The District would like to purchase and install a Nitrogen Generating Tire Inflation System at the Baxter shop to replace air with nitrogen in the District vehicle fleet's tires to improve vehicle handling.

Purpose:

This project will test an alternative way of inflating tires and see what kind of impact it has on the fleet. If the department could extend the service life of tires by 10% it could create a savings of \$600,000.00 per Biennium.

Test Procedure:

Compare vehicle handling, fuel economy, tire performance and life cycle costs against current data.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

3. MOTORVAC MCS245

District/Office: 6W/Owatonna Mechanics Shop

Project Contact: Steve Lueken
320/446-5907

Project Cost: \$2,695.00

MOR Fund: \$2,695.00

Starting Date: February 2003

Completion Date: On Going



Project Descriptions:

Preventive maintenance is the key to many fuel related problems on gasoline engines in today's automobiles and pickups. The District has sent out several vehicles to have fuel injectors cleaned and have had success with them.

Purpose:

This project will use and evaluate a preventative maintenance fuel injector cleaning machine that is claimed to remedy 80% of fuel related problems on today's vehicles.

Test Procedure:

This unit will be utilized on vehicles for PM maintenance each year. The result should be a reduction in fuel related problems over the next several seasons. This will be tracked and recorded which can then be related to savings in maintenance and repair costs.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

4. AUTO GREASING SYSTEM

District/Office: 7Mankato

Project Contact: Kelvin Smith
507/389-2946

Project Cost: \$6,500.00

MOR Fund: \$6,500.00

Starting Date: June 2006

Completion Date: On-Going



Project Descriptions:

When the lubrication cycle is started, the grease is drawn from the reservoir and is pumped to the injectors via the main pipe. The injectors then simultaneously force a pre specified quantity of grease through the secondary pipes to the points to be lubricated. When the pressure in the main pipe reaches a preset value (in bar), the pressure control valve opens and the grease is no longer pumped into the main pipe. At this point the grease will go back into the tank. This way, the pressure control valve maintains the preset pressure in the system, through the entire lubrication cycle.

Purpose:

Greasing plow trucks is a time consuming job, especially during a snow and ice event. This system would do the job automatically.

Test Procedure:

Evaluate labor service savings vs. cost of manually greasing the unit which is usually 1-2 hours per unit every 1000 miles. Operators will monitor time saved and assurance that the unit is being greased completely.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

5. TESTBED TANDEM

District/Office: Central Office

Project Contact: Ryan Otte
651/366-3585

Project Cost: \$30,000.00

NTREC Fund: \$30,000.00

Starting Date: January 5, 2004

Completion Date: On Going



Project Descriptions:

Slotted Trip Plow – Allows plow to more easily ride up and over unseen objects which provides less impact to operators and equipment.

Rear Mounted Trip Edge Wing – Rear mounted for better visibility and the cutting edge is spring loaded in case of impact with buried objects.

Precision Placement System – Projects salt and sand materials rearward in a stream with ground speed match. This allows less material to be used through the reduction of blow off due to wind, vehicles and bounce.

Proportional Electric Over Hydraulic Valve Body and Joystick Controls – Valve body mounted outside reduces noise and heat inside the cab. Joy stick provides ergonomically correct position for all hydraulic operations. Proportional control means that operator can raise, lower and use all hydraulic equipment at a speed that best suits their need.

Ground Oriented Sander and Pre-wet Controls – Keeps the proper pre-set amount of de-icing material and pre-wet chemical going on the roadway at all speeds.

Back-up Camera Collision Avoidance System – Allows operator to see behind the truck when placed in a backing situation.

Purpose:

To create a truck with all of the most up to date technology and evaluate its capabilities in snow and ice operations. The feedback from the employees will be compiled in a final report.

Test Procedure:

The test procedure will be as basic as operating the truck and all of its various components. A good understanding of the components is important to know whether or not they are performing to their fullest potential.

Conclusions:

This project is still active.

Recommendations:

It is quite apparent that some of the equipment installed on this vehicle needs further improvements, modifications, etc. Others have worked out very well and the level of acceptance was high.

Implementation:

This project will be reevaluated after further testing and a decision will be made whether or not to implement part or all of this project.

6. COMPRESSED AIR BOTTLE

District/Office: Metro/Shakopee

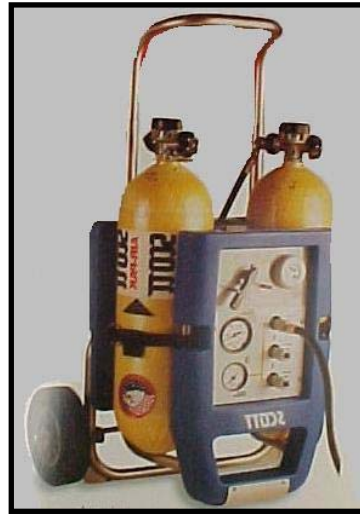
Project Contact: Mark Fischbach
952/492-2160

Project Cost: \$600.00

MOR Fund: \$600.00

Starting Date: January 2006

Completion Date: On Going



Project descriptions:

Not all of the shops are equipped with portable air for guardrail repair or changing tires when out on the road. These air bottles are very cost effective and have the ability to perform many duties in the field including guardrail repair and changing tires

Purpose:

The Compressed Air Bottle will eliminate one onsite vehicle and make the job more efficient when using air tools for making guardrail repairs or changing tires.

Test Procedure:

This unit will be evaluated by the Shakopee sub area for its usefulness and ability perform the duties described above.

Conclusions:

This project is still active.

Recommendations:

Not at this time.

Implementation:

7. WIRELESS DATA LOGGER

District/Office: Metro/Maple Grove

Project Contact: Mark Fischbach
952/492-2160

Project Cost: \$10,000.00

MOR Fund: \$10,000.00

Starting Date: December 2004

Completion Date: On Going



Project Descriptions:

This data logger would be installed on the Epoke sander that Metro purchased in December of 2004. This data logger manufactured by B-North inc. would transfer material usage from the spreader control to the computer at the truck station and be accessible from any computer with the correct software. The transfer will be accomplished totally wireless whenever the vehicle gets within 2 miles of the truck station.

Purpose:

At present the operators are asked to fill out a material usage report after their snow and ice shift. This has proven to be inaccurate with error in reporting up to 30%.

Test Procedure:

Areas of focus are reliability and accuracy of the data evaluated as well as the ease of which the data is being collected.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

8. TRUCK WASHING SOAP

District/Office: Metro
Project Contact: Mark Fischbach
651/492-2160
Project Cost: \$7,575.00
MOR Fund: \$7,575.00
Starting Date: Summer 2005
Completion Date: On Going



Project Descriptions:

Corrosion and rust caused by sodium chloride creates a huge expense each year for Mn/DOT. The average price for a paint and refinish job on one of the class 35 tandems runs around \$7,000.00.

Purpose:

The purpose of this project is to use and evaluate a special additive to track wash water that promises to reduce chlorides on the metal significantly which would result in less corrosion and maintenance costs.

Test Procedure:

Trucks will be washed both with and without the added solution. Test kits will be used to determine the remaining chlorides on the trucks and determine the effectiveness of the increased washing and cleaning ability of the new product. The corrosion and rust will be visually monitored over a period of time to watch for a reduction instead of acceleration of the corrosion problem.

Conclusions:

This project is still active.

Recommendations:

None at this time.

Implementation:

VII. APPENDIX A – PREVIOUS STATEWIDE MOR/INTREC REPORT

Previous Statewide MOR/NTREC Project Reports

In the infancy stages of the MOR/NTREC Program, the initial research focused on snow and ice field studies and projects were very limited. As the MOR/NTREC Program matured and developed, it expanded into other fields of maintenance including roadside and bridges. Other offices became involved with the quality and evaluation of the projects. As projects were completed and possibly implemented, there was a need to communicate these results to the rest of the state and others.

Following is a list of the project reports that have been published since 1992. Some projects had been carried over from year to year due to improvements made as results are reached. The projects listed below are in the report as it was first introduced to the program and may have conclusions in later reports. If you are interested in any of these projects, you may contact the Maintenance Operations Research Engineer.

1992-1993 Winter Season Report:

- Camden Pre-wetting Field Study
- Lakeville Pre-wetting Field Study
- Plymouth Anti-icing Field Study

1993 Report:

- Corrosion Research
- Road Weather Information System
- Truck Ergonomics Task Force
- Snow Fence Research
- Vehicle Conspicuity Research
- Solar Powered Culvert Deicer
- Quality Control of Premixed Sand/Salt Blender Hopper
- Laserlux Road Striping Management
- Smooth Pavement Task Force
- Remote Driven Vehicle
- Remote Slope Mower
- Zero Velocity Salt/Sand Spreader
- Timesheet Generated Interface
- Short Grass Research Plots
- Extendable Snow Plows
- Portable Interactive Weather Prediction System
- Municipal Waste Salt Water as a Pre-wetting Agent

1994 Report:

- Culvert Rehabilitation
- Thermal Mapping
- Portable Interactive Weather Prediction System
- Temperature Sensors
- Snow Fence Research
- Work Zone Safety Projects
- Circuit Rider Program
- Finnish Emulsion Gravel Pavement

- Automated Call-Out System
- Timesheet Generated Interface & MMS/TIS Interface
- Bar-Coding
- Maintenance Research Project Tracking System
- CB Radios
- Innovative Sprayers
- Band Cleaner
- NIDO Liquid Spreader
- Wash Water Recycling System
- Salt Brine Mixing Systems
- SHRP cutting edges
- Gravel Shoulder Reclaimer

1995 Report:

Winter Maintenance

- Maintenance Concept Vehicle Partnership Project
- System 2000 Stationary Salt Speeder
- Automated Liquid Bridge Deck Deicer
- Brine Applicator
- Power Liquid Spreader Control Unit
- Electronic Pre-wet hang Tanks
- Integrated Tailgates Research
- Improved Snow Plow Design
- Grader End Gates
- Combined Front-Slush Plows
- Ice Buster
- Norsemeter Friction Meter
- Magnetic Pavement Taping

Road and Bridge Maintenance:

- Slurry Seal Patching Machine
- MicroSurfacing
- Automated Pothole Patcher
- Cascadia Enduraseal 300 Asphalt Rejuvenator
- Highlift Flatbed
- Earth Penetrating Radar Concrete Delamination Detecting System
- Lightweight Power Screed
- Retrofit Dowel Bars
- Culvert Rehabilitation Project
- Culvert Grapple Extractor (Beaver Dam Grapple)
- Stenciling Unit for Message Painting

Maintenance Management:

- Thermal Mapping
- Pavement Condition and Weather Reporting
- Interactive Travel Information Systems (Minnesota Travel Partners)
- Travel Partners Demonstration Project

- Mobile Road Weather Information Systems
- Timesheet Generated Interfaces & PMS/MMS/TIS Interface
- Pavement Marking Management System
- Dial in Server for Operations Management System Pilot
- Bar-coding
- Paperless Field Data Collection
- Maintenance Research Project Tracking System

Roadside Maintenance:

- Herbicide Sprayer
- Flexstake Weedmats
- Remote Slope Mower
- Biological Control of Canada Thistle

General Maintenance Management:

- All Terrain Crawler Tractor; Posi-Track
- Tracks and Dozer Blade on Skidsteer Loader
- Kentrol Gate Material Control System
- Tire Experiment, Michelin

Technology Transfer:

- International Worker Exchange Program
- Finnish Emulsion Gravel Partnership Project

1996 Report:

Winter Maintenance:

- Heated Truck Box Using Exhaust System
- Truck Box with a Fiberglass Floor
- Snow Shield Research
- Combined Front Slush Plows
- Anti-icing using Brine from Wash Water Recycling (North Branch)
- Anti-icing using a Herbicide Sprayer Attachment, Spraytroics (Metro)
- Mn/DOT – Hennepin County Anti-icing Project
- Fiber Optic Lighting Research
- Wing Plow Research (mounted at the rear of the truck)
- National Friction Measurement Study (FHWA)
- Integrated Tailgate Research
- Extendible Hood Snow Plow
- 21-Foot Snow Plow
- Cutting Edge Research
- Multiple Uses for Low-Boy Tractor
- Dual Spinner
- Elkin Spreader
- Salt Brine Mixing Systems
- Oscillating Underbody Scraper

Road and Bridge Maintenance:

- Evaluation of Radar for Snowplows

- Automatic Pothole Patcher
- Front mounted Shoulder Retriever
- Bunyan Friction Screed
- Crack Sealing
- Color Flexi Probe Inspection System
- Culvert Rehabilitation Project
- Peel-A-Way Lead Paint Removing Process for Bridges
- Lite Stripe Laser and Camera Pointer Systems

Maintenance Management:

- Automatic Low-Visibility Warning System Using Video Cameras
- ARTIC Dispatch Center
- CD Authoring, Writing, and Sharing Project
- Automated Route Planning and Optimizing Software

Roadside Maintenance:

- Boom Sprayer Rebuild
- Hooded Ground Sprayer
- Polecat Obstacle Mower

General Maintenance Research:

- Reusable Energy Absorbing Crash Terminal
- ProPatch Head Cover, Prototype
- Bioremediation Pilot Project
- Portable Hot Water Pressure Washer
- Multi-purpose Utility Vehicle with Electrical Power tool Package
- Demo Maintenance Truck with Updated Hydraulic System

Work Zone Safety:

- Remote Driven Vehicle Unit #3
- Flashing Stop/Slow Paddle Implementation Project

Technology Transfer:

- Maintenance Expos – Fall and Spring
- Saving Salt – Simple Solution

1997-1998 Report:

General Maintenance:

- Aerosol Alternative
- Drillco Sawblade
- Easy Bend
- Ford Smith Four Post Hydraulics Lift
- Multiple Uses of Hot Water Pressure Washers in Highway Maintenance
- Plasma Cutter
- Remote controller for Boom on Sign Truck
- Vacutec Leak Detector
- Video Image Scope

Maintenance Management:

- Blowing and Drifting Snow Control Market Research
- Evaluating Locating and Record Keeping Technology
- Fleet Management System Coordinator
- GIS Project Specialist
- Maintenance Business Planning: Measuring Quality
- From the Customer's Viewpoint
- Pavement Marking Market Research RFP
- Transmap GIS Mapping for Sign Inventory
- Striper Record Keeping/Downloading Using a Laptop Computer
- Maintenance Business Planning: Winter Operations Survey.

Road and Bridge Maintenance:

- Epoxy Striper Research Project
- Heated Dump Box-Tapping System
- Laser Level Plane
- Patchrite Self Propelled Pothole Patching Machine
- Silane
- Vibratory Concrete Floats

Roadside Maintenance:

- Box Beam Guardrail
- Contour Tree Planter
- E-Z Dig and E-Z Grader
- Funda Flex
- Power Broom/Trimmer for Light Duty Sweeping
- Weld on Wear Pads
- Wheeled Debris Blower
- Wood Chip Blower

Technology Transfer Partnerships:

- DNR Tandem Truck
- Truck Driving Simulator

Winter Maintenance:

- ALLU Screen Crusher
- Athey Force Feed Loader
- Automated Data Logger for Odin System
- Blending System for Mixing Sand and Salt
- Chemical Storage Building
- Commercial Visibility Instrument
- Continuous Friction Measurement Techniques Research
- Culvert Deicing Resistance System
- Cutting Edge Study
- Dresbach Anti-Deicer System
- Dual Auger Spinner Sander
- Dual Rear Wing Truck

- Elkin Sander
- Enclosed Salt Brine System
- Enhanced Snowplow Visibility Using Radar Technology
- Etnyre Anti-Icing Unit
- Extendable Hood Snowplow
- Heads Up Research Summary
- Henke Heavy Duty Wing
- Hydraulic Snowblower
- I-35 Fixed Bridge Deicer System
- IceBan (Liquid Deicer)
- Large Capacity Integrated Tailgates
- Nokian Tires Part One and Two
- Pick up mounted Anti-icing units
- Rebuilding Frame Work on CL-35 Snowplow
- Road Closure Gates
- Salt Conveyor
- Salt Solutions
- Snake Creek Bridge
- Stainless Steel Integrated Tailgates
- VLB Industrial Snowblower

Work Zone Safety:

- Cone Reflective Spinners
- Cone Setter/Retriever Research Trip
- Message/Arrow Brickboard
- Portable Advisory Roll-Up Sign Assemblies
- React 350 Reusable Energy Absorbing Crash Terminal
- Remotely Driven Vehicle
- Speed Control Display Systems
- Striper Crew-Programmable Light Emitting Diode Sign on Shadow Vehicle

1999-2001:

Winter Maintenance

- Cryogenically Treated Cutting Edges
- Non Rotating Carbide Bit System for Underbody Blades
- Hydraulic Driven Snowblower
- Infrared Ice Detector Maintenance Upgrade
- Swenson Precision Placement System
- Expansion and Implementation of Anti-ice Methods
- Adaptable “Slide-in” Anti-ice/Herbicide Spray Unit
- Critical Area Spot Spreaders
- New Component Test Bed Truck

Winter Material

- Ice Ban M-50
- Medium Grade Salt (Nu-Salt)
- Anti-icing Liquid (Caliber)

Road and Bridge Maintenance

- Air Prep System
- Laser Based Clearance measuring System
- For the Birds
- Rubberized Asphalt Melter Applicator
- Aging Optimization Study
- Hot Box
- Spaulding RMV Hot Patcher/Reclaimer

Traffic/Work Zone Safety

- Smart Arrow Messenger Board
- Scorpion Truck Attenuator
- Solar Powered Warning Signals/Flashers

Roadside Maintenance

- Noxious Weed GPS/GIS Mapping
- Posi-Track Soil Compaction Reduction Project
- Harley HST 6 Shoulder Reclaimer
- Geotextile Fabric Laying Machine
- Living Snow Fence
- Dynamic GPS Performance Evaluation
- New Holland Disc Mower
- TRACC System
- ET-2000 Guardrail End Treatment
- (GS-ED-60-50) Side Dozer

Equipment/Tools

- Spray on Box Lining and Irathane Systems
- Wire Feed Welder
- Laxo Quick Lock System
- Brake Watch
- JAGZ Interlocking System
- Retractaflap
- Mud Flap Jack
- Clear View Wiper Mirror
- Lane Scan Mirrors
- Heated Windshield Wiper Blades/Blizzard Blades
- High Intensity Discharge Lighting
- Trailer Safety Lights
- Cordless Impact Drivers
- Mini Skid Loader
- Underbody Grease Banks
- Truck Mounted Roller
- Collision Avoidance Monitors
- Electronic Hearing Protectors
- On-board Truck Scale

- Connect Under Pressure Hydraulic Couplers

Building

- Pre-cast T Panels for Cover-all Storage Buildings
- Wireless for Truck Stations

Technology Transfer

- Truck Weight Education Project
- Field Works
- Snow and Ice Pamphlet
- Snowplow Simulator Phase I
- Electronic Multi-meter
- Electronic Technical Data Collection

2001-2003:

Winter Maintenance

- Critical Area Anti-icing D-8
- Dultmeir Brine Production System
- Hydraulic Driven Snowblower
- LED Wing Lights
- Stainless Steel Hopper
- Precision Placement System
- Plow Guards
- GPS Tire Road Friction
- GPS Gang Plowing
- Expansion of Anti-icing Methods
- D-3A Rear Mount Wings
- Micro-Trac Anti-icing
- Blizzard Plow
- Pre-wetting Liquid Storage Tank
- Anti-icing Equipment
- Wing Wheels
- Crash Attenuator Anti-icing
- Dultmeir Anti-ice Unit
- Liquid Chemical Transfer Pump Station
- Dual Carbide Underbody Edges

Winter Material

- Anti-icing Liquid

Road and Bridge Maintenance

- Hollow Deck Machine
- Over-height Vehicle Detection System
- Silicone Pump
- High Mast Light Pole Inspection
- Night Time Wet Line Recovery
- Air Prep System
- Laser Based Clearance Measuring System

- GL 3000P Laser Guidance System
- Aging Optimization Study
- Wedge Paver
- Bridge Sweeper
- Universal Maintenance Unit

Traffic Control and Work Zone Safety

- Voice Activated Message Sign
- Roo Guard Barriers
- Active Portable Warning System
- Emergency traffic Control Truck
- Scorpion Truck Attenuator
- Stabilization of Aggregate Shoulders
- Safety Light Wand

Roadside Maintenance

- Sprout Guard
- Brown Mower
- Tree Shear
- Erosion Control Equipment
- Noxious Weed GIS/GPS Mapping
- Ditch Hitch
- New Holland Disc Mower
- ATV Swisher Mower

Equipment – Tools

- Lane Scan Mirrors
- Dynamic Performance Evaluation
- Rear Vision Color Monitor
- Backup Safety Cameras
- Ready Welder
- HID Sander Lights
- Clear View Mirror Wiper
- Underhood Air Compressor
- Protective Coated Oil Pans
- Reiter Plastic Truck Body
- Hydraulic Ground Level Trailer
- Laxo Quick Lock System
- Boss Light
- Mud Flap Jack
- Mini Concrete Mixer
- Trailer Safety Lights
- Test Bed Tandem
- Accu Place Spreader
- Ribbon Lift
- Retro Reflective Mud Flaps
- Electro Luminescence Light Signs

- Open Systems Architecture for RWIS
- RWIS RPU Modifications
- Sylvania Silverstar Lights
- Quicksilver Bed Liner

Building

- Wireless for truck Stations

2003-2005:

Winter Maintenance

- Dultmeir Brine Production
- Expansion and Implementation of Anti-icing Methods
- Anti-ice Unit and Geomelt M
- Anti Ice Unit
- Joma 6000 Edges
- Salt Brine Injection
- Pre-wet Tanker
- Dual Carbide Underbody Edges
- Hydraulic Wing Push Arm
- KT-90 Active Adapters
- Transfer Pump Station
- Slap Me Wipers
- Quick Edge Replacement
- Mobile Anti-ice System

Winter Material

- Cargill Clearlane
- Geomelt M
- Geomelt
- LCS 5000
- Andersons Additive

Road and Bridge Maintenance

- Top Down Cracking
- GPS-GIS Edge Drain Mapping
- Bituminous Thermal Crack Repair
- Tailgate Paver
- Ribbon Lift

Safety Traffic and Work Zone Safety

- Solar Traffic Lights
- Cone Setter
- El Conspicuity Light Signs
- LED Lighting
- Avoiding Collisions With Plows
- Lighted Vests
- Lighted SMV Signs
- El Lighted Mudflaps

Roadside Maintenance

- Beaver Abatement
- Just in Time Sign Replacement
- Bobcat Wolf Disc

Equipment – Tools

- Reiter Plastic Truck Body
- Motorvac MCS245 – 50
- Skidloader Backhoe
- 6 Way Dozer Blade
- Snap-on HD35 Fluid Changer
- Heated Bituminous Box
- 6x9 BDS Mirrors
- Cut Off Saw
- Porta Shear
- Truck Washing Soap