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Maintenance 2001 Project

1998-1999 : 3rd Season

Maintenance 2001: "Integrating Technology for Winter Road Maintenance"

- 30 km test route along Hwy 26, between Barrie and Stayner
- identified as an area that experiences a significant number and variety of storm conditions
- chosen as test area for demonstrating the integration of new technology and practices
- results will be compared to traditional practices
- 3 areas under investigation:
 - Advanced Road Weather Information Systems (ARWIS)
 - Advanced winter maintenance procedures and equipment
 - Tools for monitoring maintenance activities and performance
- [Summary and Results of 1997-1998 Test Season](#)
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Summary and Results of 1997-1998 Test Season

1. Advanced Road Weather Information Systems (ARWIS)

ARWIS was first considered by the ministry as a potential tool to reduce the costs of snow and ice control by helping those responsible for winter maintenance

operations become proactive in their decisions to allocate resources in a cost-effective manner.

In the first year of testing, two ARWIS sites were installed on Hwy 26. Since then, the ministry has found ARWIS to be a **functional and commercially viable winter maintenance operations tool**. Province-wide expansion of ARWIS into a functional network is planned, with initial concentration along or servicing the Hwy 401 corridor.

2. Advanced Winter Maintenance Procedures and Equipment

Putting the right material on the road at the right time is essential to efficient and cost-effective winter maintenance activities.

Spreader technology and spreading rates are two areas that the project has been investigating. Variable application rates were applied using dry salt, pre-wet salt, liquid salt and alternative chemicals. The methods of spreading included windrow and broadcast.

The **Tyler Zero Velocity Spreader** was found to be:

- effective at spreading salt in windrows at up to 70 km/h (exceeding traditional spreader speeds of 32-48 km/h)
- effective for dry or pre-wet material - approximately 90% of material remained on the road
- operationally reliable
- not effective at spreading winter sand at required application rates, or at varying spread width during operation

Etnyre brine spreader

A ground speed controlled spray system manufactured by Etnyre was used to spread liquid salt under conditions of light snow and temperatures of -50C or warmer. The unit was capable of spraying up to three traffic lanes at once, but the reactions of oncoming drivers limited its use to a single lane at one time.

Automated Vehicle Location (AVL) systems were installed on spreader, plow and monitoring vehicles in the test area. Systems developed by TRAXIS and by Compuspread collected GPS information on vehicle location and speed while other sensors recorded material application rates. The information was downloaded to an archive and display system at intervals through the season. An additional

component of the TRAXIS system to record movement of snow across the plow blade was not successful.

Infrared thermometers (IRT)

IRTs, installed on ministry patrol vehicles, were used to determine actual pavement temperatures. The Sprague units used in 1997-98 were within 20C of the actual surface temperature on bare and wet surfaces when the actual temperature was between 20C and -50C, once the sensors reached ambient temperature. Larger differences occurred at colder temperatures. Patrol staff found them to be **highly valuable in understanding the differences in pavement conditions during a snow storm**. As a result of the sound endorsement by patrol staff, province-wide implementation of IRTs on patrol vehicles is recommended.

3. Tools for Monitoring Maintenance Activities and Performance

After two seasons of operational experience using the Norsemeter Surface Friction prototype trailer, in partnership with Transport Canada and the Norwegian Civil Aviation Authority, **three friction standard concepts for winter operations were developed**. The Norsemeter was also used in conjunction with video surveillance cameras and a spectral camera developed by SPAR Aerospace to help measure the effectiveness of sand and salting operations.

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1998-1999 Test Plan

1. Advanced Road Weather Information Systems (ARWIS)

By the end of the winter season the province-wide implementation of ARWIS will include a total of 18 sites at the following locations:

- Kitchener - Highway 401 (Grand River)
- Waterloo - Highway 86 (Connestoga River) and Highway 7/8
- Seaforth - Highway 8
- London - Highway 401 (Putnam)
- Ostrander - Highway 19
- Barrie - Highway 26, 2 sites

- Woodstock - Highway 401
- Elginfield - Highway 4
- Strathroy -Highway 402
- Guelph -Highway 401
- QEW - 5 sites between Fort Erie and St. Catharines
- Ottawa - Highway 7 (Ashton)

Testing will include the evaluation of alternate hardware and forecast systems. An ARWIS system by Lufft has been installed on Hwy 26.

Continued testing of ARWIS systems will include optimization of system performance, down time, and MTO's use of information. A benchmarking program will be initiated as a first step in developing performance standards for ARWIS forecasts. The benchmark parameters will include accuracy of surface temperature, time of pavement freezing or thawing, time of snowfall and total snow accumulation.

2. Advanced Winter Maintenance Procedures and Equipment Spreader technology

This year the Swenson Precision Placement Spreader will be evaluated under the same criteria used for the Tyler model.

Anti-icing and Prewetting

Recommendations made by the Strategic Highway Research Program (SHRP) will be verified and optimized for Ontario conditions.

Infrared Thermometers

Evaluation of the Control Products IRT will be done, under the same criteria used for the Sprague IRT. The IRT data will also be used to begin a thermal mapping program in support of the planned ARWIS expansion.

3. Tools for Monitoring Maintenance Activities and Performance

A production model of the Norsemeter was purchased by the ministry for this testing season. This model is more precise in measuring speed and friction, offers automatic raising and lowering of the measurement wheel, and improved software. Designed for highway use rather than runway use, it is operationally more robust

and capable of long distance highway use.

Evaluation of friction as a performance monitoring tool for winter maintenance will continue with focus on comparison of the benefits of alternate types of friction devices, and analysis of data accumulated in partnership with Transport Canada and other organizations.

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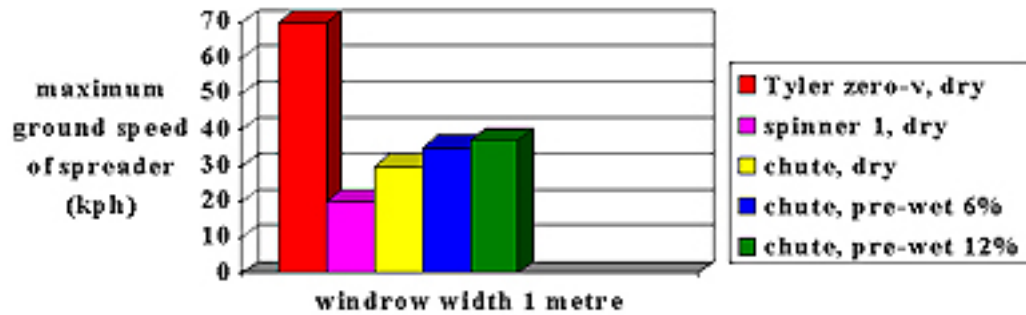
Early Results

- [Zero Velocity Spreader Testing](#)
- [Infrared Thermometer Testing](#)
- [MEDCS Testing](#)
- [Winter Friction Testing](#)

Evaluation of Tyler Zero Velocity Spreader for Increasing Vehicle Productivity

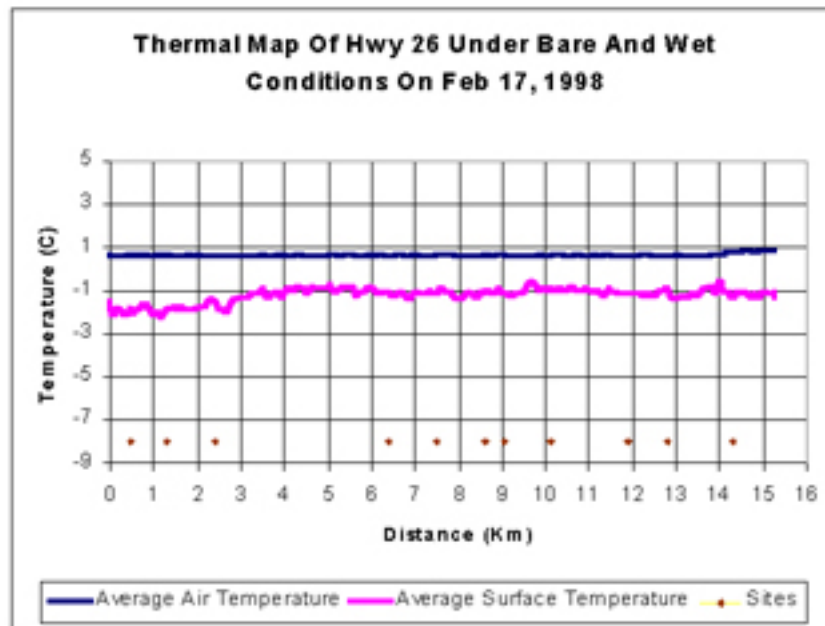
- Effective at spreading salt in windrow at up to 70 kph
- Dry or pre-wet material
- Operationally reliable
- Not effective at broadcasting winter sand at required application rates
- Not possible to vary spread width while underway

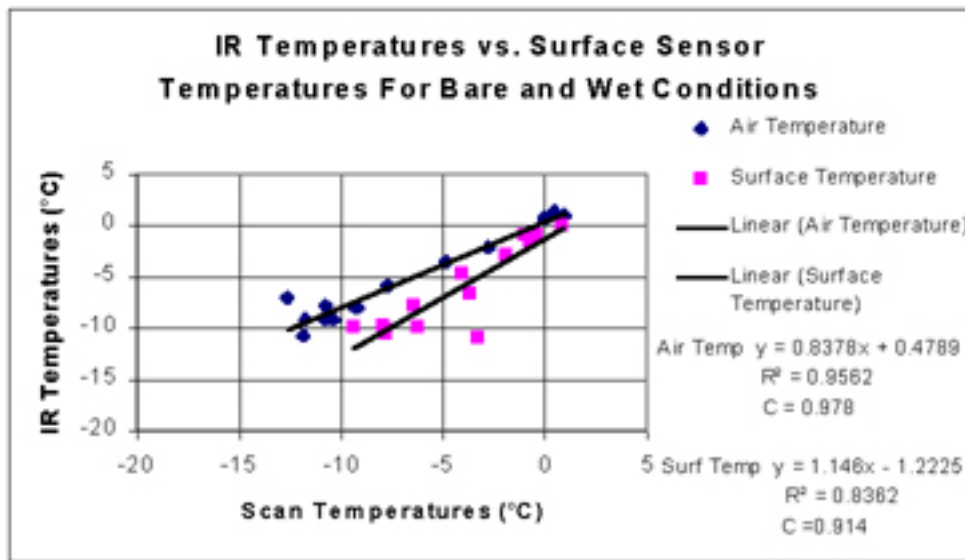
Maximum Spreader Speed for Salt Windrow Application



Infra-red Thermometers (IRT) as a Decision Support Tool

Temperatures reported by Sprague IRT were usually within 2 degrees C of actual surface temperatures once the device was equilibrated to outside air temperature.



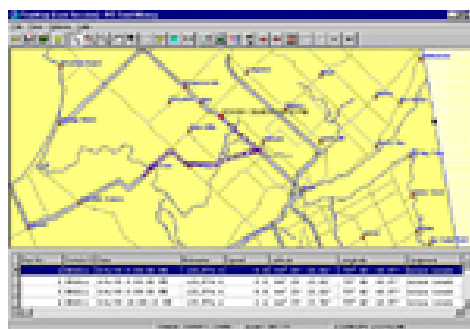


IRT Plans for 1998-99

- Begin Province-wide implementation
- Evaluate Control Products IRT using same criteria

Mobile Electronic Data Collection System (MEDCS)

- TRAXIS and Compusread systems were used to collect Global Position, vehicle speed and spreader operation data and displayed the collected data in map form.
- TRAXIS also collected IRT data.
- Monitoring of plow blade status was not successful.



Click to see larger image

Winter Friction Testing

- Two seasons operational experience with Norsemeter RUNAR prototype in partnership with Transport Canada and Norwegian Civil Aviation Authority.
- Three friction standard concepts for winter operation are under evaluation.
- Friction is being used to compare effectiveness of winter operations strategies.

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