RESEARCH PAYS OFF

Wisconsin's Winter Weather System

Weather forecasting plays an important role in planning for highway maintenance in winter. The Wisconsin Department of Transportation, hoping to provide more accurate information on which to base decisions on highway conditions and treatment, investigated the development of the Wisconsin Winter Weather System (WWWS). An improved forecasting method would enable highway maintenance managers to supplement personal and other opinions on winter weather conditions.

Use of Wisconsin Winter Weather System for forecasting provides more accurate information for making decisions on snow and ice control operations.

Problem

Highway maintenance managers rely on winter weather forecasts and pavement information to make critical decisions on snow and ice control operations. If the information supplied is inaccurate, personnel hours can be wasted and deicing chemicals and abrasives used inappropriately. Improved techniques for collecting and analyzing pavement information data and surrounding atmospheric conditions would enhance the accuracy of weather forecasts and the decisions made by highway maintenance managers. WisDOT wanted to find out whether technological advances in sensors for meteorological and pavement information, coupled with advances in the use of personal computers, could provide this information.

Solution

In the fall of 1985, WisDOT solicited a request for proposals for a project to research and develop a Wisconsin Winter Weather System. The WWWS was to provide pavement surface data from modern sensing devices and, with the help of personal computer systems, use this information to generate forecasts for WisDOT headquarters and various districts and counties. A single site was selected as a pilot project for the winter of 1985-1986, and Surface Systems, Inc., of St. Louis, Missouri, was selected as the contractor.

The site chosen was the Hoan Bridge, a high bridge across the Milwaukee harbor on the Lake Michigan shoreline. The data to be collected included pavement surface temperature and its trend.

Equipment was installed and the weather and pavement data were reviewed. Separate field temperature measurements verified the accuracy of the data, thus providing the initial impetus for further experimentation with and implementation of the WWWS.

A schematic of the system components for WWWS is shown in Figure 1. The computer software needed to store, compile, and analyze data from the various components is implied. Data from the various sensors are stored by the remote processing unit (RPU). The RPU can then be accessed via telephone by the central processing unit (CPU), by which the data can be analyzed and used directly or combined with other information to help make more accurate weather predictions.

Personnel cost savings can be made at the beginning and end of each storm. If pavement temperature, brine content, and an accurate pavement temperature forecast are known, savings on overtime costs can be achieved and more precise work schedules planned. Savings of up to four hours per individual (a total of approximately $144,000) can be realized for each significant storm.

Use of the WWWS also leads to reduced application of chemicals and abrasives at the start and end of each storm because there is greater accuracy in predicting a storm's incidence, duration, and any adverse conditions resulting from it. The use of the WWWS during a single storm is now estimated to save about $75,000, by reducing the need for 2,500 tons of salt. If the WWWS is used statewide for 15 storms, or about 50 percent of the storms, then season savings would be 37,500 tons of salt, or $1,125,000.

For further information, contact Ted Stephenson or David Vieth, Wisconsin Department of Transportation, P.O. Box 7916, Madison, Wisconsin 53707-7916 (telephone 608-267-7830).

Suggestions for "Research Pays Off" articles are welcome.

Contact Crawford F. Jencks, Transportation Research Board, 2101 Constitution Avenue, N.W., Washington, D.C. 20418 (telephone 202-334-2379).

Application

During the winter of 1989-1990, the WWWS was used at 29 sites, providing data and assumptions directly to eight highway districts and 57 of the 72 county supervisors who make winter highway maintenance decisions.

A six-hour training program for WWWS use was set up, three hours of which are devoted to meteorology. District and county maintenance supervisors are required to attend. After initial training, each maintenance office is offered a programmed portable PC equipped with a modem that allows access to the WWWS.

The portable PCs have been programmed to be user friendly. With use and experience, the WWWS could help provide even more cost-efficient winter highway maintenance operations. The challenge remains to involve more first-level supervisors in the project.

Benefits

The cost savings for state highway winter maintenance operations are achieved principally by reduced personnel overtime costs and decreased use of deicing chemicals and abrasives.

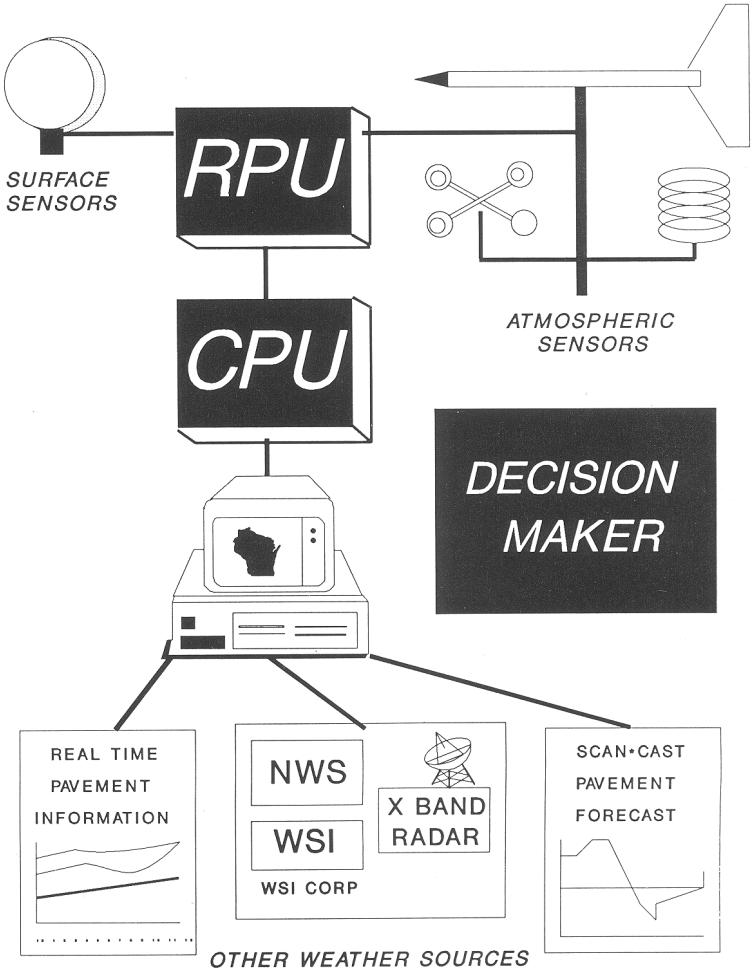

FIGURE 1 System components of Wisconsin Winter Weather System.