

Finnra's field test

Automatic Road Condition Detection

To keep traffic running safely in all conditions and be able to rely on the latest meteorological systems, it is essential to thoroughly test new road weather equipment until it is ready for routine use on roads. Finnra tested Vaisala's new DRS511 road sensor in their test site in southern Finland. The test results are promising.

Vaisala has worked with the Southeastern Traffic Management Centre of the Finnish National Road Administration (Finnra) since 1986, when construction of a network of automatic weather stations first began on Finland's roads. Today, the road network of Finnra is served by more than 270 Vaisala road weather stations throughout the country, and there are 36 Vaisala weather stations in the southeastern operations area alone. The latest project was a field test of Vaisala's new DRS511 road sensor at Finnra's Utti test site.

Yrjö Pilli-Sihvola, Jukka Annala and Kimmo Toivonen work at the Southeastern Traffic Management Centre, based in Kouvola. With a background of twenty years as a meteorologist, Mr. Pilli-Sihvola is the Head of Traffic Services. He has participated actively in the international development of advanced monitoring technology and in projects concerning Finnish winter maintenance systems, including cooperation with Vaisala. The Centre has pioneered many new systems in their area since the early 1980's.

With five years' experience at Finnra, Jukka Annala is in charge of traffic service operations at Kouvola's Traffic Management Centre. His responsibilities are traffic monitoring, communications and

other public information services. Kimmo Toivonen has worked as a System Specialist for eleven years. He is one of those in charge of the road weather information system of Finnra.

RDS511 sensor installed on two-lane highway

Yrjö Pilli-Sihvola explains: "The purpose of the field test was to compare the road surface conditions measured by an automatic road weather station against independent human observations on the same section of the Utti Highway."

In order to conduct the test, a road weather station and Vaisala's new DRS511 road surface sensor were installed on the two-lane Utti highway. The new sensor was equipped with a special feature to directly measure water layer thickness and to reveal the presence of ice, snow and frost.

"Carrying average daily traffic of 8,700 vehicles, the road belongs to the first class winter maintenance group. It was thus salted and kept clear of snow and ice. We can say that the test site represents a very typical Finnish road weather station site in extreme conditions with a wide range of road surface states," says Jukka Annala.

The results of the test, according to Pilli-Sihvola, were that "the measurements agreed in 86 percent of cases with the



Yrjö Pilli-Sihvola (left) and Jukka Annala from Finnra's Southeastern Traffic Management Centre, located in Kouvola.

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almost 300 human observations collected by professionals from Finnra. The observations were collected at various times of the day, throughout the whole winter from October 1998 to April 1999.”

Thorough analysis

“The road surface conditions were analyzed by Vaisala’s ROSA road weather station, equipped with two DRS511 surface sensors. The sensors can optically determine the coverage on the road surface, the surface conductivity, electrochemical polarizability, surface capacitance, surface temperature and ground temperature. By providing more information on the road conditions, the optical measurements, together with the enhanced analysis model, produced more reliable information on road surface states than before,” concluded Kimmo Toivonen.

One road sensor was located in the wheel track and the other near the centre line outside the wheel track. The analysis was run separately for each sensor. The data was collected from the station and the analysis was done by computer.

The ROSA weather station reported eight road states – dry, moist, wet, moist and chemical, wet and chemical, frosty, snowy, and icy.



Finnra tested Vaisala’s new DRS511 road sensor on the Utti Highway in southeastern Finland during winter 1998/99. Pictured Vaisala’s ROSA weather station.

According to Yrjö Pilli-Sihvola, the field test results show that the road weather stations can be reliably used for the automatic control of traffic signs. “Especially when the road states indicated by two or more sensors are combined in an intelligent way, it is possible to reach a confidence level of over 90 per cent, offering rather

reliable automatic winter traffic control. In the future, the test will be continued by making more detailed observations and applying strictly defined principles for different surface states.”

He continues: “Our preliminary expectations of the DRS511 road sensor were high, because we were looking for a sensor to use for automatic surface detection in order to control traffic signs in winter time. The sensor has been durable. In analyzing the road weather information, the results have been more reliable than those of the old-type sensor. During the test period, the weather analysis program was improved. I have very positive expectations of the sensor, but there are still things to develop.”

Finnra focuses on development projects

Winter road management in southeastern Finland is directed by the Traffic Management Centre, located in Kouvola. It operates under the Finnish National Road Administration. Ensuring traffic safety during the winter is a major challenge for the region’s road authorities.

Road conditions can vary from dry conditions to cold rain, sleet or snow, with unexpected icy patches, all winter long.

During the 2000/2001 winter, Finnra is planning to further test the new DRS511 sensor for use on weather-controlled roads. Finnra’s weather-controlled signs advise drivers of changing weather and road conditions in real time. Weather-controlled traffic signs match winter speed limits with actual road conditions.

“We are also going to improve the control principles of the weather-controlled road. We are focusing on further research methods with weather observations and on developing the flow of weather information between Finland and Russia. During 2000, Finnra will define the architecture of road technology, including all weather observation equipment. That is the way to expand operations rationally and economically.” According to Pilli-Sihvola, the key concepts in developing new features for traffic monitoring equipment and increasing its accuracy are reliability and cost-effectiveness. ■



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