Highway patrol

The capability to monitor pavement and atmospheric conditions allows authorities to maintain better roads and save lives. But fixed RWIS by their very nature cannot cover entire stretches of roads. New mobile systems can fill in the gaps in the weather network

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Over the course of the past 35 years, government agencies in the USA and Europe have relied on fixed RWIS sites to monitor road weather conditions. Helping decision-makers to maintain safe driving conditions on their roadways, RWIS stations have become fairly advanced and are capable of detecting de-icing chemicals on the road, measuring the freeze point of liquid on the road by actually freezing a very small amount of liquid, and even monitoring conditions non-intrusively with sensors on the side of the road.

The use of RWIS by road maintenance authorities has proved to increase the level of service, which in turn means better road conditions and lives saved. But the major challenge road authorities face with RWIS is the difficulty in authorizing enough sites to provide a dense weather network needed for accurate decision-making. What is needed is a solution that can assist in filling in the gaps between data points with a much smaller investment in infrastructure, while still providing data similar to that of RWIS sites. This new data network would not replace the existing RWIS station, nor stop the addition of stations, but would instead add to the network of road weather information.

ON-VEHICLE SENSORS

RWIS collects pavement temperature data at specific locations, but what about in between sites? This is where mobile technology and using sensors 'on-vehicle' can fill in the gaps. Collecting weather data using a vehicle first began with the creation of a vehicle-mounted infrared pavement temperature system in the 1990s. These systems have become very popular, and today nearly all winter maintenance vehicles in the USA are equipped with such a system. The sensors are installed to give supervisors the ability to see pavement temperature around their area of responsibility, and give snowplow operators one last decision point before applying chemicals. Quixote Transportation Technologies (QTT) offers a mobile pavement temperature sensor, known as Surface Patrol. This innovation is a non-contact infrared temperature sensor that reacts quickly to the changing temperatures of the road surface, and measures the air temperature from a separate sensor hidden from the sun and engine heat. The data is then transferred back to an in-vehicle display unit mounted on the dashboard of

Providing road authorities with better weather data enables them to make smarter maintenance decisions

the truck, providing instant feedback to the driver on the pavement temperature throughout their route. As an alternate solution, the data can be connected to a chemical spreader and display temperatures within the cabin.

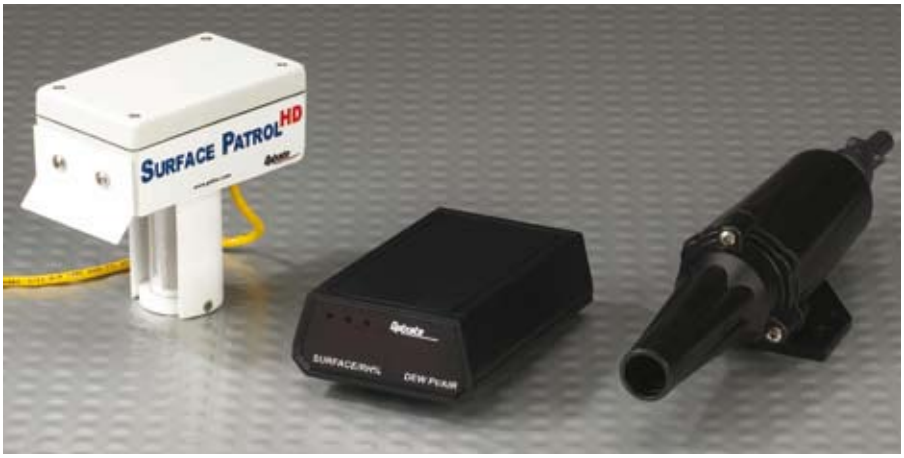
THE DEW POINT

Nobody would argue against pavement temperatures being the single biggest weather variable to monitor, but another weather condition – dew point – can also be an important factor in determining road surface conditions. Dew point has seen little attention over the years, most likely as a result of a lack of understanding as opposed to its importance – but this poorly understood weather parameter has a huge impact on road transportation. The reason for this is that the problems caused by dew point on our roads go unnoticed by the driver. Heavy rain, ice or snow has a very visible impact on the road, and drivers typically take notice and make adjustments to their behavior. Atmospheric moisture values, on the other hand, are nearly impossible to see, making them even more deadly due to the lack of change in driving behavior. Pavement temperature and dew point can change dramatically over short distances. We only need pavement temperature or dew point values to change by 1°C to cause pavement temperatures to drop below the dew point. Monitoring conditions as we move through different microclimates would be highly valuable.

FILLING IN THE GAPS

QTT has developed a mobile sensor solution for collecting dew point and relative humidity in addition to pavement and air temperature. Indeed, QTT is the first company in the world to commercially offer a sensor product that incorporates pavement and air temperature, dew point and relative humidity in a single mobile platform. The product, known as Surface Patrol HD, is an enhancement to the company's standard Surface Patrol product discussed above. By collecting pavement, air temperature and moisture data you begin to create a true mobile weather station from a vehicle.

Both the standard Surface Patrol and the newer Surface Patrol HD offer advanced methods of collecting valuable weather data



The biggest benefit of the Surface Patrol and Surface Patrol HD is the addition of data points between RWIS stations, making the entire road weather network rich with data. The vehicles provide the infrastructure needed to offset the lack of RWIS data. They can be equipped affordably and they move around, which makes them an excellent source of additional weather data points. These extra data points can provide decision-makers with better information, resulting in better operational decisions. In the example of dew point detection, areas of frost or black ice could be identified, unlike today where we sometimes rely on the first accident to trigger a response. Mobile weather data is the future of road weather information – not replacing RWIS but instead enhancing and improving the overall weather network.

In the future, additional weather parameters could also be sensed by a moving vehicle, providing even more information about the conditions on the roadway. QTT is researching ways to increase its offerings in this field. One slightly surprising outcome of collecting dew point and relative humidity from a vehicle is that it opens up several non-winter applications. For instance, the processes of applying roadway paint markings and vegetation control both require real-time knowledge of the humidity levels in the air. The Surface Patrol HD sensor has the ability to provide operators with this humidity data at the desired location. ■

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