

Maryland DOT: Mobile sensing supports efficient winter maintenance operation

Challenge

Road weather networks typically include only stationary stations, that report the road condition from the place of installation - but the major unknown is the situation between one and the other station.

Solution

With mobile sensing technology, MDOT control and snow blower vehicles can be equipped with sensors to fill all the gaps with real time data and support your decision making in winter maintenance.

Benefits

Better basis of data to make smarter decisions, that improve safety on roads and the operational efficiency of your winter maintenance.





536,731
crashes, caused by
winter conditions.



\$2.3 billion
spend state & local
agencies on snow/ice
control every year!



1,836
deaths annually in
US due to snowy or
ice roads.

*Source: USDOT Federal Highway Administration
data, 10 year average between 2005-2014*

Snow and ice

Over 70 percent of the nation's roads are located in snowy regions, which receive more than five inches (or 13 cm) average snowfall annually. Nearly 70 percent of the U.S. population lives in these snowy regions.

Influence on safety and traffic time

Snow and ice reduce pavement friction and vehicle maneuverability, causing slower speeds, reduced roadway capacity, and increased crash risk.

Each year, 24 percent of weather-related vehicle crashes occur on snowy, slushy or icy pavement and 15 percent happen during snowfall or sleet.

Winter road maintenance accounts for roughly 20 percent of state DOT maintenance budgets. State and local agencies spend more than 2.3 billion dollars on snow and ice control operations annually. In our fast changing environment and local weather events, making the right decisions in winter amintenance isn't easy. Road weather stations are important to support decision making!



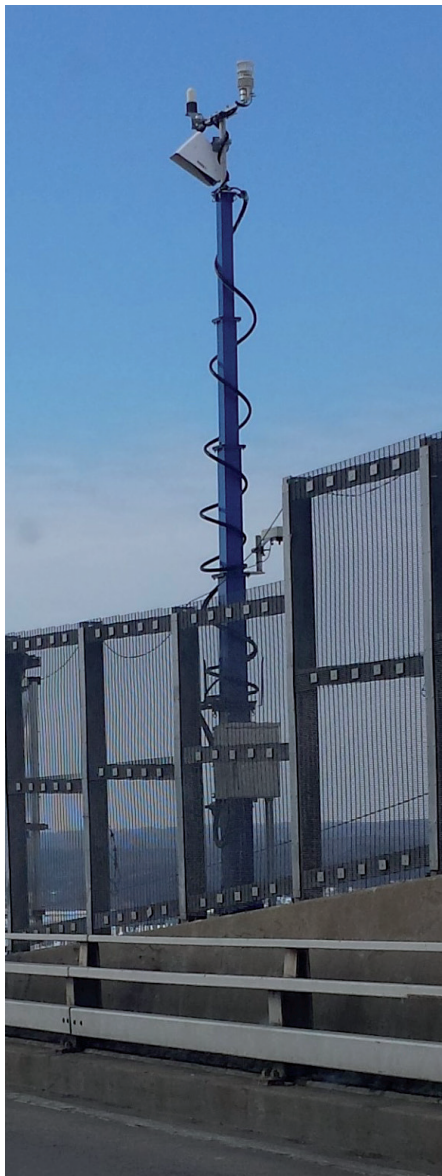


115.000
miles of highways
are located in
snowy regions,
where winter road
maintenance is re-
quired.

Learn on the next pages, what
MDOT does to improve winter
road maintenance

Case Study

The Maryland Department of Transportation State Highway Administration (MDOT SHA) is a division of the Maryland Department of Transportation (MDOT). It is responsible for building and maintaining Maryland's numbered non-tolled highways and bridges outside of Baltimore and clearing snow from the state's major thoroughfares.



Statewide management

MDOT SHA's territory comprises more than 17,000 lane miles, which need to be managed and cleared when necessary. To help them with this, they operate more than 130 stationary road weather information stations equipped with road surface condition sensors and weather sensors to get important road weather data back to the traffic management center (TMC).

The stations detect a variety of parameters including road conditions, friction, water film heights, temperature, relative humidity, air pressure, wind

direction and wind speed. However, fixed stations are unable to cover every lane mile in the state.

Due to the inclement winter weather in Maryland, road maintenance can be very challenging. The state has similar conditions to central Europe, where it has cold and wet winters and a few beautiful sunny months. Temperatures reach from about 18°F (-8°C) to +90°F (+32°C). Average temperatures in Maryland are about 80°F (27°C) in July and 35°F (+2°C) in January.

Road Weather Stations (RWIS)

On the pictures to the left and right, you can see a few of the 130 fixed RWIS stations, that are installed in the district of Maryland DOT. All of them are equipped with sensors from Lufft, that detect the following parameters:

- Atmospheric (temp., humidity, air pressure...)
- Road surface temp.
- Road condition
- Water film on road surface
- Precipitation type and amount
- and more...



Different Road Weather Stations
Source: MDOT



“However, fixed stations are unable to cover every lane mile”

This was the main reason for MDOT SHA to start in the summer of 2018 a pilot project for which they ordered 50 MARWIS.

MARWIS is a mobile sensor capable of filling in these gaps and giving MDOT SHA the ability to have a much clearer picture of what is going on throughout the state and not just at 130 fixed points.

To prepare their staff for the Marwis roll out, Lufft provided the necessary training on location in Maryland while Communications Electronics Inc installed the sensors on user vehicles. In total, roughly 95 MDOT SHA employees took part and received hands on experience. MDSHA has been utilizing Marwis since mid-January 2019 to monitor their roadways and learn how Marwis can help them to optimize their winter maintenance program.

Since the roll out, they have been able to monitor the highways from their

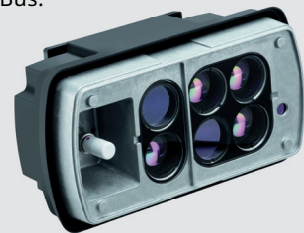
TMC and see what conditions are statewide, as opposed to only a select number of fixed locations.

MDOT SHA is utilizing ViewMondo for the real time visualization and historical data collection of the mobile sensors data. Promising early signs since the setup, Marwis units have worked reliably during a few winter weather events and are being utilized by the MDOT SHA maintenance staff and management. According to a DOT employee,

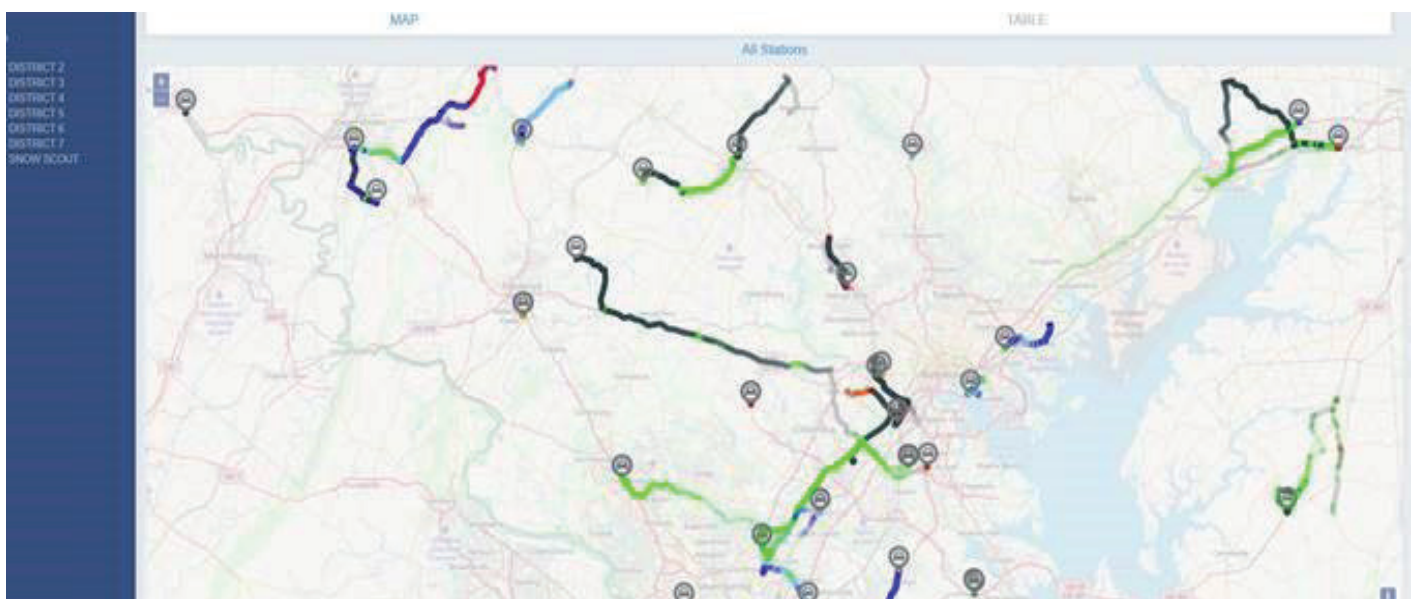
“We’ve received favorable feedback on the units since the training. It seems our crews will quickly integrate this tool as part of their processes” MDOT SHA, in conjunction with Communications Electronics Inc. and Lufft, will continue to monitor and learn how the data obtained through these sensors can help MDOT SHA manage their winter maintenance operations and resources.

More about MARWIS

Marwis works by means of LED transmitters, photos receivers and an infrared pyrometer. The necessary calculations take place in the sensor directly, offering an output rate of up to 100 measurements per second. Thus, it is capable of delivering data in real time, transferring the data wirelessly via Bluetooth, hardwired via RS485 or CAN-Bus.



Lufft also offers software in the form of a free Android or iOS App for in vehicle data visualization and back end software for the TMC is available. ViewMondo can easily display both stationary and mobile UMB road weather stations. It receives the data via a SIM card of the used tablet, smartphone or router, making it a pure plug-and-play data transfer device without any display.



Screen shot of the ViewMondo software dashboard showing all the vehicles out and about.

MARWIS in use at MDOT

Three of the fleet of 50 vehicles, that are equipped with the mobile road sensor MARWIS.



“

We've received favorable feedback on the units since the training. It seems our crews will quickly integrate this tool as part of their processes.

”

More projects, more customers

MARWIS is in operation on roads, highways and runways all around the world.



City of Amsterdam, Netherlands
Left picture

Directorate of Roads, France
Right picture

Airport Bergamo, Italy
Bottom picture



Technologies used

 **Lufft**



MARWIS

Mobile road weather sensor

Road weather measurements in real time for mobile spot checking.