VAISALA / SUCCESS STORY

ROADS

Using Weather Information to Reduce Accidents and Improve Traffic Flow

The Trouble Spots

The Oregon Department of Transportation (DOT) manages over seven thousand miles of roadway throughout the state. The Office of Maintenance and Operations leads and supports highway maintenance and operations activities throughout the state by developing and implementing programs to ensure efficient, effective and consistent maintenance and operation of Oregon's transportation infrastructure. Like most Departments of Transportation, Oregon's road network has its trouble spots – the particular locations where accidents are more common due to congestion or weather-related incidents.

Just southwest of Portland, Oregon, there is a state highway that connects U.S. Route 26 and Interstate 5. This state highway, Oregon Route 217, has numerous interchanges where drivers are moving on and off the system, and these interchanges are close together. Because of the on and off volume of traffic, speeds often vary near the entrance and exit locations. It is not uncommon for rear-end crashes to occur near the interchanges. Further, where Oregon Route 217 (OR 217) and U.S. Route 26 intersect, there are curved ramps. When wet or icy these ramps are troublesome for drivers moving too fast. Vehicles slide off the roadway in adverse weather conditions because they are not prepared for the conditions and lose grip.

Challenge

- A high rate of on/off traffic volumes throughout the corridor added to congestion and drivers needed to be aware of recommended traffic speeds
- Better notification to drivers was needed when weather delays were occurring
- A particular curved section of roadway during wet and icy conditions was a trouble spot, and vehicles were sliding off the roadway

Solution

- A fully automated warning system to notify drivers about speeds throughout the corridor
- Vaisala non-intrusive weather systems to provide information on grip and current weather conditions
- A curve-warning system at the trouble spot to notify drivers about wet or icy conditions

Benefits

- Automated notifications inform drivers about changing conditions, allowing them to react quickly
- Drivers adjust speed and keep traffic flowing
- Throughput increased by 5% during commute times and delay variability decreased by 10%
- Safer conditions for drivers – reduced accidents and reduced severity of accidents
- The number of crashes decreased by nearly 21%
- Successful results set an example for other departments of transportation and provided Oregon DOT additional funding for future projects

Implementing Driver Notification

With increased use of the corridor, Oregon DOT wanted to ensure it was safe for drivers, and that they were properly notified of speeds and weather conditions along the route. The Oregon DOT had previous experience in the state with automated warning systems, or Intelligent Transportation Systems (ITS), and wanted to implement a similar system for OR 217.

Before implementing a driver notification system for the entire corridor, the trouble spot at the intersection of OR 217 and U.S. Route 26, was addressed. At three of the ramps in this interchange, where the roadways curve, Oregon DOT placed two Vaisala roadway weather systems, one on each side of the highway. The weather systems provided pavement temperature, condition, visibility, and a grip value. The grip measurement provided a numerical value to indicate how slippery conditions were for drivers, and allowed the DOT to monitor if conditions were deteriorating or improving.

Dennis Mitchell, Region 1 Traffic Engineer and ATMS Program Manager with the Oregon DOT, commented, "Accidents on the ramps were almost always a result of weather conditions." The weather systems at this intersection were installed to warn drivers of conditions and reduce accidents. The Oregon DOT knew they wanted to use pavement condition information because it could be used to activate warning signs. Using an algorithm based on conditions reported from the Vaisala weather systems, message signs activate and notify drivers to slow down on ramps. "It worked very well," Mitchell added.

The other trouble spot to address was the main corridor of OR 217. An automated system to notify drivers about changing speeds through the main corridor was planned, and with the successful application of weather information at the OR 217 and the U.S. Route 26 junction, a grant from the Federal Highway Administration (FHWA) allowed Oregon DOT to add weather information and modify the software program used to activate the signs. "FHWA wanted [Oregon DOT] to test the weather information in the corridor, and see if would make a difference for drivers," Mitchell noted.

Two additional Vaisala weather stations were placed along the corridor, again monitoring weather and grip conditions. The software and algorithms were modified to address both traffic speeds and weather conditions. The system continuously monitors weather and traffic congestion, and whichever has the largest affect to drivers is used to activate automated message signs. Mitchell explained that the system was smart enough to choose between a weather message or a traffic message.

For example, if there is adverse weather, the software sends a message to activate variable speed signs and automated message signs to notify drivers. With this information drivers can quickly react and to slow down to avoid an incident.

Ensuring Safe and Smoother Traffic Flow

Oregon DOT realized the results of the curve warning system and corridor weather stations right away. Having weather information along the corridor, and being able to notify drivers based on conditions, reduced crashes by nearly 21%. Further, there was a significant reduction in the severity of incidents, and throughput increased by 5% during commute times. Throughput is the number of vehicles passing through the corridor, an indication of improved efficiency. Corridor reliability also improved, with average daily variability in travel times decreasing by 10%.

Based on the results from the driver warning system, ITS America recognized Oregon DOT with the Best New Innovative Service Award in 2015. The award is not only a high distinction for Oregon DOT, it also sets an example for other DOTs to use in their trouble spots.

Using traffic and weather information together, Oregon DOT was able to improve service to drivers in their state, and ensure safer travel with improved traffic flow. And Oregon DOT continues to improve service in the state. Based on the successful programs they have implemented, the Oregon DOT applied for a TIGER (Transportation Investment Generating Economic Recovery) grant from the FHWA. They were awarded 10 million dollars to add traffic and weather systems on two additional highways and five other arterial roadways.