Idaho DOT Motorist Warning System

The Idaho Department of Transportation (DOT) installed a motorist warning system on a 100-mile (161-kilometer) section of Interstate 84 in southeast Idaho and northwest Utah. This road segment was highly prone to multi-vehicle crashes when blowing snow or dust reduced visibility. From 1988 to 1993, poor visibility contributed to 18 major crashes involving 91 vehicles, 46 injuries, and nine fatalities. While the proportion of trucks on this rural freeway was 33 percent, the percentage of trucks in these crashes was 44 percent. Traffic managers display advisory messages to motorists to influence driver behavior under adverse conditions.

System Components: Road, weather, and traffic condition data are collected by sensor systems and transmitted to a central computer. Environmental Sensor Stations (ESS) detect pavement condition (i.e., dry, wet, or snow-covered), wind speed and direction, precipitation type and rate, air temperature, and relative humidity. Sensors with forward-scatter detection technology measure visibility distance. Inductive loop detectors record vehicle length (i.e., passenger car or truck), vehicle speed, and travel lane. Warnings of adverse conditions are posted on four roadside Dynamic Message Signs (DMS).

Idaho DOT Visibility Sensor

System Operations: The central computer records sensor readings every five minutes. When field sensor data indicates that visibility has fallen below a predetermined threshold or that driving conditions are deteriorating, the computer in the Port of Entry control center alerts traffic managers. Based upon prevailing road conditions, traffic managers decide which messages to display and manually activate DMS.

Transportation Outcome: A system evaluation conducted from 1993 to 2000 assessed changes in driver behavior due to road condition data displayed on DMS. The evaluation compared traffic speeds with advisories to speeds without warnings. When traffic managers displayed condition data during high winds (i.e., over 20 mph or 32.2 kph), average speed variance was reduced and average vehicle speed decreased by 23 percent from 54.8 to 42.3 mph (88.1 to 68.0 kph). When high winds occurred simultaneously with moderate to heavy precipitation, average speeds were 12 percent lower. Under these conditions, mean speeds were 47.0 mph (75.6 kph) without advisory information and 41.2 mph (66.2 kph) with warning messages. A 35-percent decline in average vehicle speed occurred when the pavement was snow-covered, wind speeds were high, and warnings were displayed. Average speeds fell from 54.7 to 35.4 mph (87.9 to 56.9 kph). Advisory information presented by traffic managers prompted changes in driver behavior, improving safety and mobility.

Implementation Issues: After determining that a motorist warning system was warranted based upon local traffic patterns, weather conditions, and crash history; traffic managers assessed three different types of visibility sensors. Tests were conducted to determine the accuracy of visibility measurements in a rural setting and to select the most reliable and cost effective sensor. System operators used a Closed Circuit Television (CCTV) surveillance system to evaluate visibility sensors.

A CCTV camera was pointed at five roadside target signs equipped with flashing lights. The target signs were positioned along the interstate at known distances from the camera (i.e., 250, 500, 850, 1,200, and 1,500 feet or 76, 152, 259, 366, and 457 meters). Actual roadway conditions were confirmed by viewing video images of target signs. After field sensors were selected, their locations were determined and power supply and communications systems were designed. To ensure that weather and traffic data was collected at the same location, ESS were installed within a few hundred feet of the vehicle detection sites.

System integration issues arose due to the various field data types and formats, hardware and software incompatibility, as well as communication system and power system failures. For example, the software used to control two of the DMS was not compatible with the central computer. Because leased telephone lines in this rural area were not reliable for transmission of sensor data at the desired frequency, a dedicated telephone cable was installed from the system location to the control center. Power supply reliability was also a concern. Numerous power outages, shortages, and surges damaged field and central components. Uninterruptible power supplies were installed to address these problems.

In the future the Idaho DOT plans to upgrade obsolete field hardware (e.g., DMS with rotating drum technology) and the central control system (e.g., replacing DOS-based software). Other enhancements may include the deployment of addition DMS and a Variable Speed Limit system.

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