

TRUCK SAFETY WARNING SYSTEM

By: New Jersey Department of Transportation

IN THIS CASE STUDY YOU WILL LEARN:

1. How an automated warning system alerts truck drivers of critical situations with relevant warning signals and alert messages.
2. A traffic operations center (TOC) is able to verify a truck rollover by using one of the NJDOT's traffic surveillance cameras and thus significantly reduce the dispatch time of emergency personnel to the scene of the rollover.
3. The number of trucks entering the ramps at a speed which could cause an overturning of the vehicle has already been reduced.



BACKGROUND

The New Jersey Department of Transportation (NJDOT) initiated a Truck Safety Warning System (TSWS) project at two critical interchanges based on a history of truck rollover incidents and crash data. The high rate of truck rollovers at these locations resulted in serious injury, property loss, and disruption to the lives of thousands of travelers by causing roadway delays and hazardous conditions as well as environmental pollution. In order to reduce these incident types at these specific interchanges, NJDOT's Division of Mobility Engineering, in collaboration with the consulting firm of Advantage Engineering Associates, P.C., used the deployment of Transportation Systems Management and Operations (TSMO) strategies involving ITS technologies, to provide a safety warning message to truck drivers as a preventive solution.

In the event that there is an actual truck rollover, NJDOT's Woodbridge Traffic Operations Center (TOC) would be notified by the system and could respond faster than waiting for someone at the scene to call 911. The TOC would then be able to verify the rollover by using one of NJDOT's traffic surveillance cameras and thus significantly reduce the dispatch time of emergency personnel to the scene of the rollover. While the truck overturning would have a negative impact on travel times, the quick response time would serve to reduce the impact as well as provide emergency medical aid quicker.

TSMO STRATEGIES DEPLOYED

The successful implementation of this program involves different TSMO strategies. The major strategies undertaken by the department to make this program successful are listed below.

Intelligent Transportation Systems

The Truck Safety Warning System is intended to determine when a potential tractor trailer rollover condition exists based on the truck's real-time speed, weight, super-elevation and curvature. An automated and specifically targeted warning system alerts truck drivers of critical situations with relevant warning signals and alert messages via a variable message sign located just before the ramp's critical area of curvature. If prevention is not possible, then providing immediate emergency help to the driver is of paramount importance along with the immediate deployment of maintenance staff and equipment to clear the incident and restore conditions quickly. Through the use of state-of-the-art video analytic cameras for truck rollover detection – this pilot project is the first in the nation where modern video analytic cameras are deployed with a TSWS system, which is capable of sending real-time on-screen alerts with an audio alarm to alert Traffic Operations Staff of an incident.

The TSWS system controller will use the detection data, measured vehicle weight, and roadway construction curvature data to perform the

CASE STUDY: TRUCK SAFETY WARNING SYSTEM

necessary calculations to predict the probability of an incident. Based on the scientific algorithm calculated results, if the vehicle is deemed to be traveling at a safe speed for its intrinsic weight and roadway characteristics, no action will be taken by the system to warn the driver. However, if the electronic controller calculation results are found to be above an acceptable threshold level of probability, the controller output will automatically trigger the input of a dynamic message sign (DMS) controller to cause the display of the appropriate and pre-programmed message residing in the DMS controller message library.

At this point, the driver will be alerted by a warning message on the DMS to slow down, and give that person the opportunity to slow down to a safe speed for the curve. If the truck slows down enough so that the truck remains in the driver's control and does not leave the roadway, the system will detect the successful completion of the vehicle's passage through the turn and another detection device will deactivate the DMS warning sign, and the sign will go blank.

Emergency Response and Traffic Incident Management

NJDOT's Traffic Operation Center North, due to its location in Woodbridge is responsible for monitoring and managing the TSWS for effective and successful operation. The TSWS system is equipped with a video analytics system which is integrated into the department's existing video management system for receiving real-time alerts of an incident. As soon as the rollover occurs, the TOC Operators' workstations receive an alert with an audio alarm and an automatic email is sent to the pre-programmed Traffic Operations Supervisory Staff.

At this point, the on-duty operator can verify the incident via a separate pan/tilt/zoom camera at that location. After verification, the operator dispatches appropriate emergency and safety personnel. This system allows for the immediate notification, verification, and reaction to an incident. Using real-time alarms and notifications not only helps to reduce travel time delays but also saves lives in the event there are serious injuries.

Data Collection

The installation of WIMS as part of the TSWS allows the collection of data on the critical ramps for future research. The data collected at these locations could be used for law enforcement purposes and predicts safe speed limits as well as future interchange design/improvements.

Inter-Agency Collaboration

The collaboration among different agencies to make this project a success cannot be over-emphasized. There was a need for partial/full closure of the roadway during construction of the project which required inter-agency coordination including the Freight Community, Port Newark Container Terminal, the Federal Aviation Administration (due to a nearby airport) and the New Jersey Office of Information Technology.

OUTCOME, LEARNINGS AND PUBLIC BENEFIT

Construction and testing was completed in July 2018, and currently this project is in the verification and validation phase. However, preliminary results look positive. The number of trucks entering the ramps at a speed which could cause an overturning of the vehicle has already

been reduced. As a result, the speed reduction has increased safety by lowering the possibility of the truck overturning.

Due to the positive signs witnessed so far from this pilot project, NJDOT is considering other interchanges in the state where there are high rates of truck rollovers to implement similar systems and to explore new technologies such as thermal cameras, detection sensors, etc., for future projects.

FURTHER INFORMATION

NOCoE Knowledge Center: <https://transportationops.org/knowledge-center>