Needs Statement 579 – Weigh in Motion ROI: Literature Search

Tuesday, July 2, 2019

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Resources searched: Library catalog, ASCE Database, TRID, Rip, Transport Database, Web

Summary: Results are compiled from the databases named above. Links are provided for full-text, if applicable, or to the full record citation. I completed my searches using the following terminology: weigh in motion, weigh station, weigh scale, enforcement, return on investment, economic benefit, benefit cost. I’ve divided the results below into the categories of most and least relevant.

Most Relevant Results

EBSCO MegaFile Database

Record: 1

Development of a Cost-Effective Wireless Vibration Weigh-In-Motion System to Estimate Axle Weights of Trucks. By: Bajwa, Ravneet; Coleri, Erdem; Rajagopal, Ram; Varaiya, Pravin; Flores, Christopher. Computer-Aided Civil & Infrastructure Engineering. Jun2017, Vol. 32 Issue 6, p443-457. 15p. Abstract: Truck weight data plays an important role in weight enforcement and pavement condition assessment. This data is primarily obtained through weigh stations and Weigh-In-Motion (WIM) stations which are currently very expensive to install and maintain. This article presents results of the implementation of an inexpensive wireless sensor-based vibration WIM system. The proposed wireless sensor network (WSN) consists of acceleration sensors that report pavement vibration; vehicle detection sensors that report a vehicle's arrival and departure times; and an access point (AP) that synchronizes all the sensors and records the sensor data. The article also describes a new method for speed compensation, an energy-efficient algorithm (adaptive sampling method) to increase battery life, and a new modeling procedure to estimate gross vehicle weights. The system deployed near a conventional WIM system on I-80W in Pinole, CA passed the accuracy standards for WIM systems and outperformed a nearby commercial WIM station, based on conventional technology. [ABSTRACT FROM AUTHOR] DOI: 10.1111/mice.12269. (AN: 122988469)

Persistent link to this record (Permalink): http://search.ebscohost.com/login.aspx?direct=true&db=keh&AN=122988469&site=ehost-live

State-of-the-art review on bridge weigh-in-motion technology. By: Yang Yu; Cai, C. S.; Lu Deng. Advances in Structural Engineering. Sep 2016, Vol. 19 Issue 9, p1514-1530. 17p. 1 Color Photograph, 1 Diagram, 1 Chart, 1 Graph. Abstract: Weigh-in-motion technology is an effective tool that has been extensively used to monitor traffic on highways. Pavement-based weigh-in-motion systems usually have poor durability and will cause traffic interruption during their installation and maintenance process. The recently developed bridge weigh-in-motion technology provides a more convenient and cost-effective alternative to the pavement-based weigh-in-motion technology. Bridge weigh-in-motion systems can be installed without interrupting the traffic. Also, bridge weigh-in-motion systems have the potential to deliver better accuracy than pavement-based weigh-in-motion systems. Due to these significant advantages, the bridge weigh-in-motion technology has been playing an increasingly important role in bridge health monitoring and overweight truck enforcement, and many studies have been conducted to continuously improve the bridge weigh-in-motion technology. In this review, the common algorithms for bridge weigh-in-motion are discussed in detail, and the typical instrumentation of bridge weigh-in-motion systems is also introduced. Meanwhile, much effort is made to identify the remaining issues in the application of bridge weigh-in-motion technology, and the corresponding future research is proposed. [ABSTRACT FROM AUTHOR] DOI: 10.1177/1369433216655922. (AN: 117662252)

Commercial Vehicle Information Systems and Networks (CVISN) is a collection of information systems, communications networks, and Intelligent Transportation Systems that support commercial vehicle (large truck) operations. The three main functions of CVISN are electronic credentials administration, safety information exchange, and electronic screening or transponder-based preclearance/bypass programs for roadside weigh/inspection stations.
This report presents the results of an independent evaluation of the deployment and operation of CVISN technologies across the U.S. With the main goal of measuring the effects of CVISN on the safety, efficiency, and economics of commercial vehicle operations, four main analyses were performed: motor carrier survey, cost analysis, safety analysis, and benefit-cost analysis. In addition, the current status of CVISN deployment was assessed, and qualitative benefits as reported by transportation and law enforcement officials in states deploying CVISN technologies were summarized. A total of 848 commercial motor carrier companies participated in a national survey. It was found that carriers are generally aware of CVISN technologies, but that, in terms of power units represented in the survey, a much larger proportion take part in electronic credentialing than in electronic screening. Average per-state costs to deploy CVISN for e-credentialing were about $1.35 million; for safety information exchange about $680,000, and for e-screening about $1 million to $2.8 million. If CVISN safety and screening technologies were to be deployed and operated at all weigh stations nationwide, depending on the deployment scenario, approximately 4,000 to 17,000 additional commercial vehicle-involved crashes could be avoided per year, compared to those avoided through current inspection selection practices. This equates to the saving of between 56 and 215 additional lives that otherwise would have been lost in those crashes per year. Economically, a series of nationwide roadside enforcement scenarios provided positive societal benefit-cost ratios ranging from 1.9 to 7.5, and electronic credentialing showed a life-cycle benefit-cost ratio of 2.6. All scenarios were modeled over a 25-year life cycle. Taken together, these results indicate that all aspects of the National CVISN Deployment Program examined in this BCA, when they are deployed, are expected to produce significant net benefits to society and are economically justified.

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Evaluating Michigan Commercial Vehicle Enforcement Strategies and Facilities
Kwigizile, Valerian; Oh, Jun-Seok; Alkhatni, Fathi; Jorge, Randy; Ceifetz, Andrew; Yassin, Joyce
Abstract. This report documents evaluation results and recommendations for Michigan commercial vehicle enforcement strategies and facilities. Through literature review, online survey and site visits, enforcement strategies and facilities in other states and countries were studied. Site visits of existing Michigan commercial vehicle enforcement sites and
review of current and past reports by the Michigan Department of Transportation (MDOT) and the Michigan State Police (MSP) revealed the existing conditions of facilities and potential needs for improvements. Benefit-cost analyses for the existing fixed weigh stations and other enforcement sites were conducted. The results indicated that addition of low-speed Weigh-In-Motion (WIM) with bypass lane is most likely to improve efficiency of a number of existing fixed weigh stations. Also, adding a preclearance system was found to improve efficiency of specific fixed weigh stations. The results, however, showed that fixed weigh stations are not economically beneficial when located along low volume roads. Recommendations for removing such stations are also provided. Furthermore, the report recommends implementation of systems that integrate enforcement technologies and consolidate data to assist enforcement officers in screening and verifying compliance of commercial vehicles.

Benefit-Cost Analysis of Fixed Weigh Stations: The Michigan Case
Kwigizile, Valerian; Ceifetz, Andrew H; Oh, Jun-Seok; Yassin, Joyce L; Firman, Jason

Abstract. A research study was conducted to evaluate fixed weigh stations used for commercial vehicle enforcement to determine the best and economical improvements of such facilities in Michigan. Enforcement strategies and facilities in other states and countries were studied by performing a literature review, online survey, and site visits. Site visits of existing commercial vehicle enforcement strategies in Michigan and a review of current and past reports by the Michigan Department of Transportation (MDOT) and the Michigan State Police (MSP) revealed the potential need for improvements. Benefit-cost analyses for the existing fixed weigh stations were conducted by considering alternative options for improvements such as adding Weigh-In-Motion (WIM) sensors, changing site layout and adding preclearance systems. The results indicated that the addition of low-speed WIM scale with bypass lane is likely to improve efficiency of a number of existing fixed weigh stations in Michigan. Also, adding a preclearance system was found to improve efficiency of specific fixed weigh stations. The results, however, showed that fixed weigh stations with Commercial Vehicle Average Daily Traffic (CADT) less than 2,200 are not economically beneficial. Furthermore, the study recommends implementation of systems that integrate enforcement technologies and consolidate data to assist enforcement officers in screening and verifying compliance of commercial vehicles. The findings of this research study are not restricted to Michigan and should be of value to agencies in other jurisdictions. They elaborate the importance of advanced technologies and site layout design in improving efficiency of fixed weigh stations.
Least Relevant Results

Transport Database

Result 1.

Title The use of Tracking Technology for Improved Management of Trade Corridors.


URL http://dx.doi.org/10.1109/ITSC.2013.6728459

Abstract The sub-Saharan African economy is suffering from the inefficient management of trade corridors. Long delays experienced at weigh bridges and border posts are a big contributor towards the slow average movement of freight. Weigh bridge and cross-border operations are complicated by the conflicting law-enforcement objectives of authorities versus efficiency objectives of transport operators. It furthermore suffers from illegal practices involving truck drivers and officials. This paper provides proof that the efficiency of trade corridor operations can be improved based on the availability of more accurate and complete information supported by currently available tracking technologies. The authors first quantify the size of the problem and estimate the potential economic benefits that will be created by improved trade corridor operations. Secondly they propose a combined GPS/RFID system that can provide the required level of visibility to support improved operational management, resulting in a simultaneous increase in the efficiency of law enforcement and commercial freight operations. A cost-benefits analysis is performed to show that an attractive return on investment can be achieved if the majority of industry players will participate in such a system.
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Year