Literature Search: Intelligent Construction Pilot on City Street: Literature Search

Monday, April 13, 2020

Most Relevant Results

Ruiz, J; Torres, H; Medina, C; Chang, G; Rasmussen, R; Epps, J; Cackler, T. Implementation of intelligent construction systems in the highway industry. 24th World Road Congress, World Road Association (PIARC), 2011, 16p. https://trid.trb.org/view/1302248

Abstract: The implementation of new technologies in any field of engineering is a task that is becoming a necessity in today's projects. The technologies being used in road pavements have become a vital tool to evaluate, design, and construct high quality projects that meet the standards and specifications required by highway agencies and concessionaires around the globe. In the United States, emerging technologies in the area of pavement construction are becoming more intelligent. The term “intelligent construction” is used to describe a technology that has the ability to sense its environment, collect, and analyze information in real time to enable paving contractors and highway agencies make smart decisions during the construction stage, leading to development of better final products and projects. Intelligent construction tools provide information to make necessary adjustments and changes “on the go” to achieve high quality pavements while being both cost and time effective. This paper aims to present a review of the advancements achieved in three intelligent construction technologies used in the highway industry in the United States. First, intelligent compaction is a technology used for materials including soils, aggregates, and asphalt mixtures (subgrade, base, and asphalt layers). This technology allows performing real-time adjustments in the compaction process, improving current practices and achieving high quality and uniformity of pavement layers, which in turn ensure long-lasting high-performance pavements. Another technology reviewed herein is the real-time measurement of pavement surface smoothness. This allows making adjustments to the paving operation in nearly real time, instead of having to perform expensive corrective actions after construction. Measuring real-time smoothness helps construct more comfortable and durable pavements. Finally, the implementation of an automated curing and monitoring system is presented. This technology is used to continuously check the curing process of concrete pavements in the field and issue warnings when there is risk for premature deterioration of the concrete. By continuously monitoring the curing process, automatic adjustments can be made to curing methods, resulting in high quality pavements. This paper identifies the benefits obtained from these three technologies and also describes how they are helping construct a better highway infrastructure.


Description: Using ICDM-Veda as a tool/platform, the objectives of this effort are to incorporate features and enhancements such as the following: (1) Analysis platforms; (2) Filtering, computations, modeling, etc.; (3) Management of database and project files; (4) Enhancements and additions to existing logic and coding to facilitate efficiency and added features; (5) Mapping; (6) Mapping performance, print feature; (7) Correlation analyses; (8) Correlations between different data sets (intelligent compaction, thermal profiling, ground penetrating radar (GPR), pavement smoothness, falling weight deflectometer (FWD), density, etc.); (9) Spot tests; (10) Management of conventional spot test data (import, filtering, mapping, correlations); (11) Data import and mapping; (12) Import data sets from ProVAL, ground penetrating radar, and delimited text data; (13) Contract administration; (14) Automated items needed to administer geo-spatial technologies during construction for quality control/quality assurance (QC/QA); - Data import/mapping, acceptance, basis of measurement and documentation of quantities; (15) Asset management; and (16) Mapping of final project QC/QA data collection for use as a supplement Pavement Management Systems.


Abstract: Intelligent compaction (IC) and paver-mounted thermal profiler (PMTP) systems have been gaining popularity across the USA in the past 10 years to improve compaction quality and detect temperature segregation behind pavers. On IC and PMTP systems, color-coded maps from their onboard displays are used extensively for monitoring and visual inspection of collected field data and machine operation. IC and PMTP systems gather a tremendous amount of complex geospatial data that poses challenges for data management, analysis, and reporting. These issues have become the main hurdles during implementation. To address the above issues, the Minnesota Department of Transportation and the Federal Highway Administration (FHWA) have funded the development of the Veta software tool for IC and PMTP data viewing and analysis. Currently, the Transportation Pooled Fund (TPF) study “TPF-S(334) Enhancement to the Intelligent Construction Data Management System (Veta) and Implementation” is leading the effort for enhancing and maintaining Veta to facilitate the national IC/PMTP implementation. This Tech Brief will provide guidelines for IC color-coded maps in order to ensure clear field inspection of IC maps and interpretation of IC results.

Description: Under this project study, the contractor shall address gaps identified for Intelligent Construction Systems and Technologies (ICST) from project development through construction and develop guidance for State highway agencies to assist them in determining how best to use ICST to improve accelerated delivery. The scope of the study covers various types, sizes, and scopes of transportation projects using ICST delivered by State highway agencies. The study involves collecting, organizing and analyzing data from various State highway agencies and other facility owners using ICST. Under this contract, the contractor shall address the objectives detailed in the Key Project Objectives field.

Least Relevant Results

https://trid.trb.org/view/1631567
Abstract: This article describes the potential use of big data in the asphalt industry, focusing on the use of intelligent systems to monitor the paving and compaction of asphalt mixtures in real time from any location. The article focuses on how this data could be used to improve pavement quality. The author describes the role of density as a measure to assess pavement quality and how intelligent construction systems can monitor mixture delivery and compaction during construction. The article discusses specific equipment (such as intelligent compaction-capable rollers) and software, the role of GPS units, the incorporation of manually-input data, specifications based on temperature differentials, the improvement in achieving consistent density by using intelligent compaction rollers, and relevant Federal Highway Administration (FHWA) specifications. Readers are referred to a website (www.intelligentcompaction.com) for more information.

Color-coded IC Maps Consistent Visual Data Interpretation. TechBrief, 2017, 8p
https://trid.trb.org/view/1588984
Abstract: Intelligent compaction (IC) and paver-mounted thermal profiler (PMTP) systems have been gaining popularity across the USA in the past 10 years to improve compaction quality and detect temperature segregation behind pavers. On IC and PMTP systems, color-coded maps from their onboard displays are used extensively for monitoring and visual inspection of collected field data and machine operation. IC and PMTP systems gather a tremendous amount of complex geospatial data that poses challenges for data management, analysis, and reporting. These issues have become the main hurdles during implementation. To address the above issues, the Minnesota Department of Transportation and the Federal Highway Administration (FHWA) have funded the development of the Veta software tool for IC and PMTP data viewing and analysis. Currently, the Transportation Pooled Fund (TPF) study “TPF-5(334) Enhancement to the Intelligent Construction Data Management System (Veta) and Implementation” is leading the effort for enhancing and maintaining Veta to facilitate the national IC/PMTP implementation. This Tech Brief will provide guidelines for IC color-coded maps in order to ensure clear field inspection of IC maps and interpretation of IC results.

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Enhancement to the Intelligent Construction Data Management System (Veta) and Implementation
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