Research Project: SP209B4G
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RESEARCH SUMMARY

UTILIZING AUTOMATIC IDENTIFICATION TRACKING SYSTEMS TO COMPILE OPERATIONAL FIELD AND STRUCTURE DATA

Problem

The federally mandated materials clearance process requires state transportation agencies to subject all construction field samples to quality control/assurance testing in order to pass standardized state inspections. The Office of Materials Technology (OMT) at the Maryland State Highway Administration (SHA) is responsible for materials clearance, specification, and quality assurance programs for preliminary engineering and active construction projects. The current process utilizes hard copy reports and significant data entry making it labor intensive and open to transcription errors.

The use of Automatic Identification Tracking Systems (AIT) such as barcodes and Radio Frequency ID (RFID) provide a means of capturing and storing data with minimal human involvement. They have proven to increase productivity and streamline processes and as a result, are gradually being integrated into specific areas of civil engineering such as materials tracking. Given the potential benefits, SHA was interested in exploring the implementation of AIT into the materials clearance process.

However, before SHA can implement this type of system, it must consider (1) the type of unique identifier that will best meet SHA's needs, (2) the type of reading device best suited for the field and laboratory personnel, (3) necessary modifications to the current Materials Management System (MMS) and wireless network, and (4) required software development to allow the device to communicate with the unique identifier.

Objective

The objective of this project was to document what would be required if SHA were to integrate AIT into the materials clearance process and MMS, and to provide AIT system hardware recommendations, software development and integration considerations, estimated investments costs, and the estimated return on investment.

Description

This project began with a review of SHA's MMS, the existing workflow through OMT's laboratories, and the various types of AIT currently available on the market. The evaluation of AIT options for construction, materials management, and assembly applications were documented to provide SHA with an understanding of the time and resource savings these systems could provide.

RESEARCH SUMMARY

In order to illustrate the advantages of AIT, case studies on previous use in construction applications were investigated. AITs applicable to OMT laboratories were studied and each system's architecture and characteristic benefits, as well as recommendations on system hardware and software, were documented. The final report provides SHA with a preliminary implementation guide for integrating AIT into its materials clearance process and possibly other areas within the organization.

Results

After examination of OMT's current daily materials management operations, it was apparent that the use of AITs can offer a more organized and efficient materials management system. For smooth integration into the existing MMS, the research team recommended that SHA work with a vendor to design an HTML5 server application and data request processer, to allow simultaneous access (level of access will be determined by log-in information) to sample information without disturbing the existing network firewall.

Integration of an AIT into OMT's technology divisions has the capability of providing MMS with wireless data collection, automatic data processing, and remote data storage. Despite the challenges that come along with AIT integration, it is possible to design an MMS application that can mesh seamlessly with current applications. A combination of handheld, mobile, and tablet devices with One-Dimension (1D), Two-Dimension (2D) and RFID reading capabilities, wireless and Bluetooth connectivity, imaging technology, Microsoft Windows operating system, and design to operate in a rugged environment are recommended for SHA. Utilizing a mobilized information system, both OMT laboratory and field personnel can eliminate redundant data entry processes, further streamline business operations, and allow real-time or near real-time remote access to test data. Learning to use handheld readers, scanners, or smartphone applications requires little time. The interface on these systems can be designed to be no different than online webpages or basic online forms and the hardware is mostly intuitive.

Implementation of barcode technology can reportedly result in a time savings of 50% to 80% for operational tasks. This is the result of faster processes, the elimination of unnecessary steps, and smoother information flow. Integrating an automated data capture system within OMT's laboratories could lead to improved productivity, fewer errors, and improved efficiency of SHA's materials clearance process.

Report Information

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Link to Final Report

http://shawwwstage/OPR_Research/MD-14_SP209B4G_Utilizing-Auto-ID-Tracking-Systems-to-Compile-OFS-Data_Final-Report.pdf