Kansas Department of Transportation

TECHNICAL SUMMARY

Effectiveness of Automated Pavement Restriping Systems, Phase I: Cost Comparison Between Manual and Automated Systems

Report Number: KS-24-04 ▪ Publication Date: September 2024

Steven D. Schrock, Ph.D., P.E., F.ITE
Lanxi Liu

The University of Kansas

Introduction

Pavement markings are a critical component of highways because they provide beneficial navigational and roadway information to drivers, especially at night and in inclement weather. Poor quality pavement markings have been shown to negatively impact traffic operations on highways, whereas visible pavement markings increase roadway safety. Pavement markings continually alert drivers to roadway alignment, vehicle location, and other crucial driving-related activities.

Reflective road markings are necessary for nighttime driving safety because they aid drivers in low-visibility conditions. Retroreflectivity is the attribute that qualifies the capacity of a marker to reflect light from a headlight back to a driver's eyes. Sprinkling glass beads into the marking materials has been shown to increase retroreflectivity and subsequent visibility, and effective quality control in painting operations, including the proper combination of painting ingredients and glass beads, has been shown to produce highly retroreflective and durable pavement markings. However, because retroreflectivity and durability degrade over time due to traffic and the environment, pavement markings must be restriped regularly to preserve performance for these parameters.

Project Description

This research examined potential financial advantages for KDOT to deploy an automated pavement restriping system instead of a non-automated, manual approach. This report utilizes a benefit-cost ratio investigation to determine whether KDOT should continue to add these technologies to its maintenance fleet. Accuracy and field performance were not included in this study, but they could be investigated in future research once KDOT has at least one automated restriping truck in its fleet.

Project Results

Although the cost analysis revealed a benefit-cost ratio less than 1, the implementation of this automated restriping system or a similar system could still be beneficial in Kansas. First, in actual practice, the cost savings may be more than estimated if the preparation savings are greater than anticipated. Second, the automated system may

paint with greater accuracy than the current manual process, especially in challenging scenarios such as dash lines near intersections and gore areas. This could result in a higher quality application with fewer errors. Third, the need to manually measure the width of the restriped pavement markings would be eliminated or significantly decreased due to the enhanced accuracy of the automated system, thereby boosting crew safety by decreasing the times crew members must leave their vehicles. This new system also boosts manpower flexibility because the automated approach employs a smaller workforce and requires less training to operate the striping convoy. This means that fewer field personnel will be required to operate the convoy, and because less training is required a wider pool of manpower could be more easily assigned to the striping convoy on a short-term basis. In addition, in the automated system, the layout truck can move as quickly as the flow of traffic, thereby increasing the effectiveness of the restriping preparation, and even in inclement weather conditions, the layout truck can utilize the GPS location system to collect road data, thereby extending working hours.

If desired by KDOT, when the District 5 restriping equipment has been upgraded to the automated system, the accuracy of the field performance of the new automated system could be compared to the current manual process, and the estimated cost savings developed in this study could be further refined.

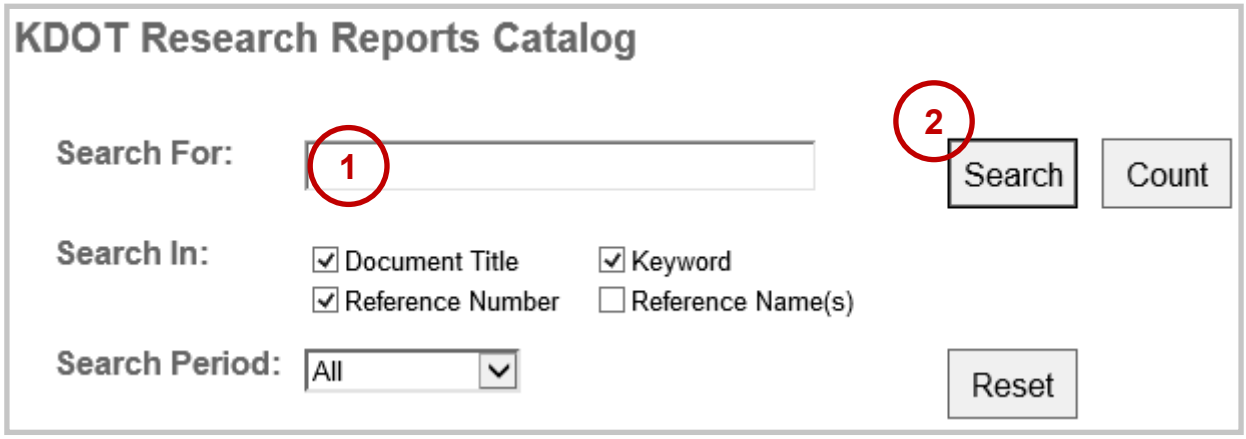
Project Information

For information on this report, please contact Steven D. Schrock, Ph.D., P.E., F.ITE; The University of Kansas, Learned Hall 2159B, 1530 West 15th Street, Lawrence, KS 66045; (785) 864-3418; schrock@ku.edu.

Directions for Downloading the Full Report

To download the full report, visit https://kdotapp.ksdot.org/kdotlib/kdotlib2.aspx and do the following:

1. Enter KS-24-04 in the search box.
2. Click the Search button to the right of the search box.
3. You may have to scroll to find the specific report.
4. To download the report, click on the title of the report to open the PDF file and save it to your hard drive.



If you have any questions, please email us at KDOT#Research.Library@ks.gov.