

Missouri US Highway 63 – HMA Paving – July 2014

DEMONSTRATION PROJECT DATES/ DURATION

July 21 to 24, 2014

RESEARCH PROJECT TITLE

MoDOT/APAC-Missouri Partnering Project

DEMONSTRATION PROJECT SPONSOR

Missouri Department of Transportation

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MORE INFORMATION

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Introduction

This project was executed through a partnership between the Missouri Department of Transportation (MoDOT) and a Missouri paving contractor, APAC-Missouri. The project was located on US Highway 63 and involved hot mix asphalt paving on north- and southbound lanes of the highway between MO94 in Callaway County to Route WW overpass in Boone County, Missouri. Two breakdown rollers (Caterpillar) and one finish roller (Volvo) were equipped with Trimble retrofit intelligent compaction (IC) monitoring systems on this project. All three rollers were equipped with satellite-based augmentation system (SBAS) global positioning systems (GPSs) to record pass coverage. The finish roller was equipped with temperature sensors on the front and rear. The temperature sensor on the finish roller was a mobile automation (MOBA) infrared scanner.

Field Demonstration

IC data were collected over a four-day demonstration period. Over the first two days, the display units on the machines were closed for viewing by the operator, but the data were continuously collected. Over the last two days, the displays were left visible to the operators. Asphalt density cores were obtained by MoDOT during paving operations.

The objectives of the field demonstration were to assess the advantages of having the display units in improving the overall roller coverage and to develop correlations between core results, pass coverage, and temperature measurements.

The data collected during this demonstration project were imported into the VETA software analysis program developed by The Transtec Group and Federal Highway Administration (FHWA).

The software allows the user to visually see each roller pass as well as the roller speed, vibration amplitude, frequency, and temperature of that pass. Users can also input GPS coordinates of test results to see visually what the final pass coverage of that area was.

Challenges and Lessons Learned

Analyzing data from all three rollers and conversion between Trimble's software and VETA created some challenges. Data were analyzed separately for each roller in the end to simplify interpretations.

Roller pass coverage analysis indicated number of compaction passes varied between 1 and 13, with a mean of 5 and standard deviation of 2 (Figure 1). This illustrated an erratic rolling pattern and presented an opportunity for improvement.

Temperature measurements obtained varied between 90°F and 185°F, with a mean of about 152°F and standard deviation of about 7°F (Figure 2). These temperatures are relatively low for asphalt compaction.

The mean roller speed was about 5 mph. The vibration frequency and amplitude were not recorded in the data. Without this information, impacts per feet could not be calculated.

Recommendations

Use higher precision real-time kinematic (RTK) GPS.

Download and examine IC data with VETA on a daily basis right after the field compaction—one machine at a time—due to complexity of the IC data.

Use infrared temperatures for all rollers at breakdown, intermediate, and finish positions.

This document was developed as part of the Federal Highway Administration (FHWA) transportation pooled fund study TPF-5(233) – Technology Transfer for Intelligent Compaction Consortium (TTICC).

The sponsors of this research are not responsible for the accuracy of the information presented herein. The conclusions expressed in this publication are not necessarily those of the sponsors.

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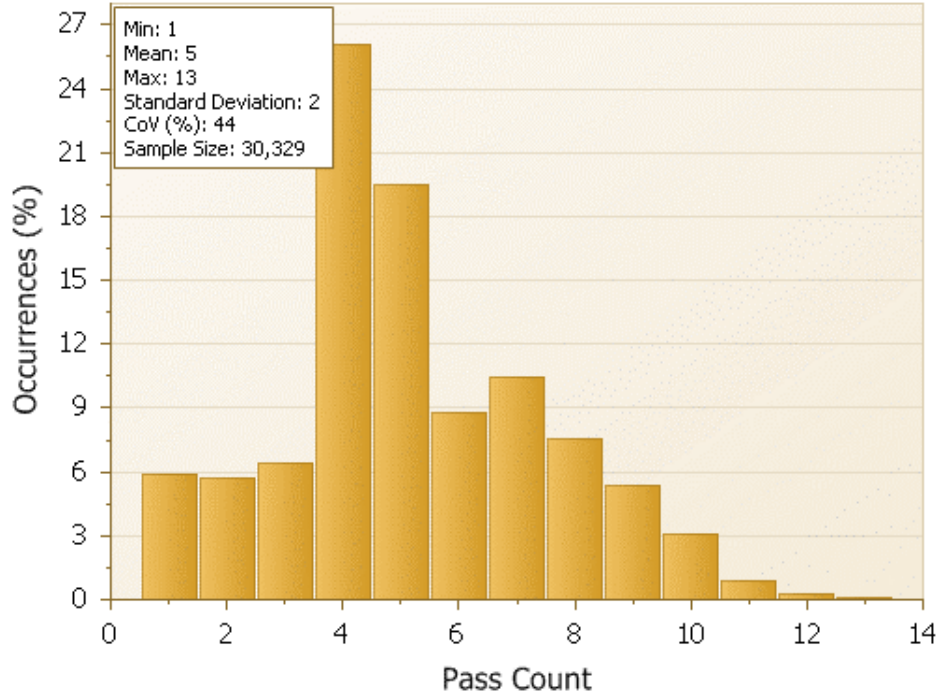


Figure 1. Histogram of pass count data over a selected section

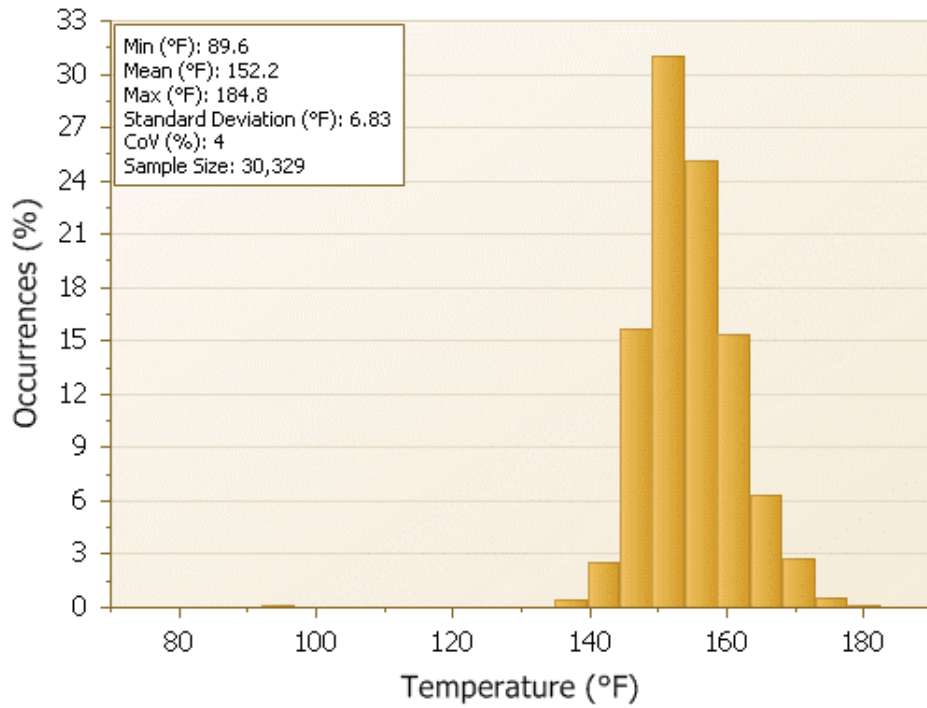


Figure 2. Histogram of temperature data over a selected section