IC Implementation in US

ICDM / Veta WORKSHOP
April 16, 2018
Ohio DOT Computer Lab
1606 W. Broad St., Columbus, OH 43223

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Importance of Compaction
A BRIEF HISTORY OF IC IN US

- FHWA IC Road Map
- Hfl IC Study
- NCHRP 21-09 Study
- FHWA IC Spec
- EDC IC Support
- IC & Asphalt Density Study
- IC Retrofit Study
- TPF-5(128) study
- AASHTO IC Spec
- NOVA Award
- IC Retrofit Study
- TPF-5(334) study
- NCHRP 24-45 Study
- ???
IC DEFINITION

Global Positioning System (GPS)

Onboard Report System

Continuous Measurement System

Temperature Sensors
Onboard Display

GPS Antenna

Infrared Temperature Sensor

DQQ and Radio

Accelerometer

Courtesy of Topcon/RDO
**INTELLIGENT COMPACTION FOR SOIL**

**APPLICATION NOTES: INTELLIGENT COMPACTION IMPLEMENTATION ON IOWA I-80/US 65 PROJECT**

In 2013, Iowa DOT I-80/I-69 bridge expansion and ramp widening project served as an intelligent compaction (IC) testing ground. The 2.5-mile construction project in Polk County near Altoona included more than 50,000 cubic yards of soil compaction.

**BACKGROUND**

Research on compacted soils is ongoing. Significant advancements have been made in the last two decades. Researchers have studied worker influence, compacted state, traffic effects, and the overall quality of the compacted state. In the recent past, computerized compaction control systems have been introduced and a better understanding of the mechanical behavior of soil during compaction has emerged. The typical high-speed portable compaction devices used in road construction are computer-controlled, allowing complex control algorithms to operate.

Computerized control results in rapid compaction and better overall performance. The front end of the computerized compaction control system should be able to readout compacted state and control the subsequent compaction by providing feedback to the operator. This paper aims to review some of the main issues that have affected the effectiveness of intelligent compaction systems.

**IOWA I-80/US 65 PROJECT DESCRIPTION**

The project involved the construction of a new bridge carrying Iowa State Route 183 over the Missouri River. The project was completed during the summer of 2013 and included the construction of a new bridge over the Missouri River, which is a critical part of the overall project.

**APPLICATION NOTES: INTELLIGENT COMPACTION IMPLEMENTATION ON SITEKA AIRPORT PROJECT**

Intelligent compaction is designed to provide an improved pavement subbase that meets the requirements of the United States Federal Highway Administration (FHWA). Intelligent compaction technology allows for the monitoring of key parameters such as density, moisture content, and temperature during the compaction process, ensuring that the final compacted state meets the required specifications.

**USE ON THE SITEKA AIRPORT PROJECT**

Intelligent compaction was employed during the construction of the new runway at the Sitka National Guard Air Station (Sitka, Alaska). The project involved the installation of a new runway which required the compaction of the subgrade to meet the specified density and moisture content requirements. Intelligent compaction technology was used to ensure that the subgrade met the required specifications.

The use of intelligent compaction technology allowed for real-time monitoring of key parameters such as density, moisture content, and temperature during the compaction process, ensuring that the final compacted state met the required specifications.
FHWA IC EQUIPMENT DEMO
AASHTO PP 81-17 & Data Spec.

**US NATIONAL IC GUIDE SPECS**

**FHWA Soils/Asphalt IC**

**AASHTO PP 81-17 & Data Spec.**

**Standard Practice for Intelligent Compaction Technology for Embankment and Asphalt Pavement Applications**

- **AASHTO Designation:** MP NN-161
- **Tech Section:** Sc, Quality Assurance and Environmental
- **Release:** Group 1 (April 2017)

**Standard Specification for File Format of Intelligent Construction Data**

- **AASHTO Designation:** PP 81-17
- **Tech Section:** 5c, Quality Assurance and Environmental
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US DOT IC PROJECTS

Limited survey 2017
MNDOT IC IMPLEMENTATION PLAN

Percent of MnDOT Projects meeting project selection requirements.
IC/TP data

Spot test data

Vendor’s cloud Server

Automatic

Manual

USB

Manual

USB, email, etc.

Data Export

VETA INTELLIGENT CONSTRUCTION
STANDARD IC SOFTWARE - VETA
STANDARD VETA ANALYSIS
IDENTIFY WEAK AREAS

TPF IC project at TxDOT
Pre-Mapping Subbase

Asphalt Compaction

TPF IC MNDOT Project
IC IDENTIFIES CAUSES OF FAILURES

Failed density due to static passes

Passed density with vib passes Aided using IC

Courtesy of Rebecca Embacher, MnDOT
IC IMPROVE ROLLING PATTERNS

Before

After

TPF IC Study – IN Site
IC IMPROVES CONSISTENCY OF COVERAGE

Lift 1 without IC
< 3 Passes: 31 %
≥ 3 Passes: 69 %
COV : 71%

Lift 2 with IC
< 3 Passes: 10 %
≥ 3 Passes: 90 %
COV: 55%

30% Increase in Compaction Efforts

Courtesy of Rebecca Embacher, MnDOT
TPF-5(334) ICDM (Veta)

MNDOT IC IMPLEMENTATION AND TPF-5(334) FOR VETA

IC Support
View helpful info and contact us for support at our IC Technical Support Service Center.

Veta Upgrade
Download the latest version of Veta, the IC data management and analysis software.

Learn IC in a Day
Attend an IC workshop and learn how to use IC to ensure longer pavement lives.

Specifications
View and download asphalt and soils IC specifications.
Intelligent Compaction

IC Technical Support Service Center

At the Intelligent Compaction Technical Support Service Center (IC TSSC), you can request support and view the IC knowledge base. The knowledge base contains frequently asked questions (FAQ), documentation, workshop information, and IC project information.

We provide email and phone support through the IC TSSC Monday - Friday from 8:00am to 5:00pm Central Standard Time. We answer voicemail messages within a 24-hour time period with the exception of messages left in the system on Fridays—we’ll answer those voicemails the next business day.

Call +1 (512) 659 1231 for support with any IC-related topic, including: general (IC equipment/systems/GPS), specifications, workshops, and Veda data management software.

To contact us about IC or Veda for any reason, please submit an IC support ticket.
FHWA IC SUPPORT

- Technical Support Service Center (TSSC)
- Phone: +1 (512) 659-1231
- Email: ICSupport@TheTranstecGroup.com
- 5 days a week (Monday - Friday)
- 8:00am to 5:00pm CST
SHRP2 Pavement Solutions
R06C Rapid Technologies to Enhance Quality
Control of Asphalt Mixes Roadway Workshop

DESCRIPTION
The Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO) are pleased to offer your state DOT the opportunity to host a half-day workshop to highlight the use of paver mounted thermal profiler technology to improve the uniformity of asphalt concrete mixes being placed in your state. The agenda for this workshop event will include project team presentations, agency and contractor perspectives highlighting the application, benefits and lessons learned from several field demonstration projects. This outreach activity will disseminate information about the techniques and methods successfully used by State DOTs to increase the uniformity of asphalt concrete mixes to extend the life of asphalt pavements.

TARGET AUDIENCE
The target audience is State Highway personnel, contractors, and others involved in the placement of asphalt concrete mixtures.

OUTCOMES
At the end of the event, workshop participants will be familiar with:
- The SHRP2 R06C research and products, including the paver mounted thermal profiler
- State DOT construction practices
- The various R06C field demonstration projects built around the U.S.
- Contractor and Agency perspectives on the use of thermal profilers for QA and QC

Participants will also have the opportunity to participate in Q&A sessions with the project team and local officials.

INFORMATION
For more information about the Workshop and other R06C opportunities, please contact:

FHWA: Steve Cooper
Tel: 443-257-7145
Steve_Cooper@dot.gov

AASHTO: Kate Kurgan
Tel: 202-624-3335
Kkurgan@aashto.org

ARA: Harold Von Quintus
Tel: 512-218-5088
hvq@ara.com

ARA: Joe Retter
Tel: 217-356-4020
jreitter@ara.com
## Preliminary Agenda

Objectives of the RD6C – Paver Mounted Thermal Profiler Workshop are to: (1) discuss the value added by using Thermal Profiler technology (what it is, why you should care, how this affects your bottom line, how do you get there), and (2) present a summary of the results from the field demonstration projects. The workshop is targeted both to contractor and agency personnel.

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic/Presentation</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00</td>
<td>Registration</td>
<td></td>
</tr>
<tr>
<td>8:30</td>
<td>Call to Order</td>
<td>Host Agency</td>
</tr>
<tr>
<td>8:30 to 8:40</td>
<td>Welcome and Introductions</td>
<td>Host Agency, FHWA and AASHTO</td>
</tr>
<tr>
<td>8:40 to 9:15</td>
<td>Introduction to Infrared Technology: What is it and Why is it Needed?</td>
<td>ARA</td>
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<tr>
<td>9:15 to 9:45</td>
<td>Equipment and Software Demonstration: Getting Real Time Information for Decision Making</td>
<td>Equipment Supplier and/or ARA</td>
</tr>
<tr>
<td>9:45 to 10:30</td>
<td>Field Demonstration Projects: What was Learned?</td>
<td>ARA</td>
</tr>
<tr>
<td>10:30 to 11:15</td>
<td>Break</td>
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<tr>
<td>10:45 to 11:15</td>
<td>Perspectives of the IR Scanner as a QA Tool:</td>
<td>ARA</td>
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<tr>
<td>11:15 to 11:45</td>
<td>Implementation:</td>
<td>Contractor/Agency and/or ARA</td>
</tr>
<tr>
<td>11:45 to 12:10</td>
<td>Products from Study</td>
<td>ARA</td>
</tr>
<tr>
<td>12:10 to 12:30</td>
<td>Questions/Answers and Closing Comments and Wrap-up</td>
<td>Host Agency, FHWA, and ARA</td>
</tr>
<tr>
<td>12:30 to 1:00</td>
<td>Ground Penetrating Radar Presentation and Demonstration (Optional)</td>
<td>GSSI</td>
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</table>
GAPS - concerns, goals, potential solutions

1. Return on Investment
2. Train-the-trainer
3. Field Demo
4. Retrofit Optimization
5. Field data (Error recognition, solution protocol, and corrective action)
6. VETA implementation
7. Forensic Investigation
GAPS - concerns, goals, potential solutions

• Even though there are 29 States have implemented IC at different paces and levels, most DOTs still faced many obstacles when starting, or during the process of incorporating IC in to their specifications.

• The main obstacle is lack of understating of technology, technical support and training for IC, PMTP, and Veta.

• Veta is an essential software tool for managing IC data as required in the national standard AASHTO PP81, and several state DOT specifications.
GAPS - concerns, goals, potential solutions

• Examples of DOTs who have started implementation and in need of training are AL, AZ, CT, IL, KY, ME, MO, MS, ND, NY, OH, OK, TN.

• Example of DOTs who started the implementation of IC/PMTP, but have been stagnated are NM, PA, TX, VT.

• Caltrans, as a national leader, is challenged with the IC certification/qualification process and further implementation of the technology due to lack of training and technical support.
• The “GOAL” Under the leadership of FHWA, to implement IC similar to programs such as International Roughness Index (IRI) for smoother roads.
Ongoing Research

• NCHRP 24-45 “Evaluating Mechanical Properties of Earth Material During Intelligent Compaction.”

• Goal - To develop procedure(s) that measure mechanical properties of earth materials to facilitate adoption of IC technologies for field acceptance.

• OH, MI, MN, and IL Field Projects

• This project anticipated to be completed by end of year 2019.
Future Research

• “Evaluation of high levels of Intelligent Compaction Measurement Values (ICMV)” as per Road Map described in the FHWA ICMV Tech Brief.

• **GOAL** - To create a research product that will elevate the usage of IC with higher quality of measurements and lay the foundation for future IC certification, and the overall technology.
Future Research

- “Evaluation of Reference/Standard Intelligent Compaction Rollers.”

- **GOAL** - To identify and qualify reference and standard IC rollers capable of directional vibration for the use in future IC certification programs.
AASHTO IC related specifications

- AASHTO MPNN-18: Standard Specification for File Format of Intelligent Construction Data. It is a draft standard as a companion standard to PP81-17 to provide a standard for data exchange and storage.
- AASHTO TCCC Courses
Future AASHTO Activities

• “Development and Implementation of IC Certification Programs and associated AASHTO specifications.”
  IC equipment/system Certification
  IC setup,
  IC operators,
  IC data management/analysis/report with Veta.

• “Train-the-Trainers Program.” An intensive program to equip DOT engineers with IC knowledge and hands-on experience in order for them to train their staff and contractors.
Thank you!

Michael Arasteh
Technical Committee member of IICT

PAVEMENT AND MATERIALS TEAM, FHWA
Michael.Arasteh@dot.gov