Intelligent Compaction overview

IDAHO ASPHALT CONFERENCE
October 23rd 2014
Caterpillar Paving Territory Manager
Steven Ryan

Asphalt IC roller

Equipped with a video display box that is capable of continuously recording, storing, and wirelessly transmitting data while displaying 4 color-coded maps in real time:

1. Roller position, number of roller passes & total coverage area
2. Mat temperature
3. Compaction Meter Value (CMV)
4. Percent change in CMV between passes

- Other machine operating parameters such as speed, direction of travel, frequency and amplitude settings, are displayed and recorded

- VisionLink web-based software is used for viewing and analyzing data
CAT IC roller hardware

INTELLIGENT COMPACtion

IC roller

INTELLIGENT COMPACtion
Equipment required

1. Positioning system
   - GPS – global positioning system (RTK or SBAS)
   - UTS – universal total station - Good for obstructed views
   - VRS – virtual reference station - No base stations
   - IBSS – internet based satellite system – Uses internet to extend coverage

2. Asphalt roller with color-coded display, temp sensors, accelerometer, positioning system antenna/radios

3. Office software
   - VisionLink (Caterpillar/Trimble) – web-based with subscription
   - VEDA-compatible (data must be imported to VEDA)
Navigation Systems

Augmentation Systems - SBAS

Positioning: GPS

- Utilizes US Global Positioning System
- Correlates all measurements to latitude/longitude
- Choice of position accuracy
  - RTK (1 to 3mm accuracy)
  - SBAS (1 to 3m accuracy)
Satellite-Based Augmentation Systems

Positioning: Universal Total Station

- Reads directly via laser
- Correlates all measurements to a location
- 1 to 3mm accuracy
Universal Total Station

- Accurate to 3mm

Asphalt compactor
Asphalt compactor

Intelligent Compaction on asphalt is currently used as a process control tool and is *not a direct measure of compaction.*

1. Count and record the number of passes over the entire job
2. Measure and record the temperature of the mat
3. Measure and record a Compaction Meter Value (CMV) which is an accelerometer-based Integrated Compaction Measurement Value (ICMV)

**Operator display**

- Real-time pass-count
- Real-time mat temperature
- Real-time location information

- Operator can determine when to begin rolling and when to end, based on mat temperature and CMV value

- Visible and audible warnings alert the operator if the asphalt temperature exceeds or falls below the target temperature
Data collection

- Position
- Pass count/coverage
- Compaction Meter Value (CMV)
- Vibration on/off
- Frequency
- Amplitude
- Roller speed
- Direction (forward/reverse)

In-field reporting: Printer option
Accelerometer – front drum only

Accelerometer based technology measures deeper than the freshly laid lift of asphalt.

CMV value is a *composite of the current lift and the layers below it.*

- Current Mat being compacted
- Previous HMA layer
- Sub-base layer
- Portland cement slab/embankment material, etc.
Satellite map view of pass count

Pass count map

INTELLIGENT COMPACTION
Satellite map view of temperature

Temperature map
Satellite map view of CMV

CMV map
What are the benefits of IC?

- **Increased Operator Awareness**
  - Real-time compaction, temperature, pass count data providing the operator the ability to make changes in real-time while asphalt is hot

- **Improved Density & Smoothness (asphalt)**
  - improved uniformity of compaction

- **Night-time operation (asphalt)**
  - coverage on back pass

- **Lower Operating Costs**
  - Optimized pass coverage, better efficiency

- **Documentation**
  - Quality control and post-process data analysis
  - View opportunities for improvement

**Data Management**

What do we do with all the valuable data that we have created and collected?
VisionLink Software

- Compaction module called “3D Project Monitoring”
- Internet-based software program
- Data can be uploaded wirelessly from machine or via USB drive
- Must have a paid subscription and user-account and register each machine
- Login at www.myvisionlink.com

Data: VisionLink

![Data: VisionLink](Image)
Data: VisionLink

Data can be exported in *.csv (MS Excel) format

www.intelligentcompaction.com

- www.intelligentcompaction.com

*Intelligent Compaction*

**One-Stop Shop for Intelligent Compaction (IC)**

IC is an EDC 2 Innovation

Veda 1.6 has been released! Data management is critical when implementing Intelligent Compaction (IC). The data collected by IC is new to most people and tends to be large in size and complex in nature. This free Veda data management tool in the solution Veda is powerful enough to manage data collected from any IC capable system. Users analyze the data and then displays the compaction information in easy-to-read formats. Take a quick look at how Veda can help improve pavement performance and save you money and time! Check out the ICDM-Veda workshop brochure and workshop schedule.

Learn IC through Field Projects

Check out IC field projects around the U.S. view project information, YouTube videos, photos, reports, and more. Learn about how IC works in the real world.
IC Summary

1. Intelligent Compaction (IC) provides benefits over traditional testing methods:
   i. Increased operator awareness – “self training”
   ii. Improved density & smoothness – real time actionable info
   iii. Improved rolling pattern – real time
   iv. Lower operating costs by more efficient rolling patterns
   v. Documentation – for the Owner and the Contractor

2. IC includes:
   i. Compactor integrated data measurement
   ii. GPS positioning tied to collected data
   iii. Ability to analyze & document data

3. IC on Soils is more a direct measure of compaction
4. IC on Asphalt is more process control at this point

Thank you for your attention. Discussion… Questions??