TTI: 0-6874

Texas A&M Transportation Institute

Further Technology Readiness of Real-Time Asphalt Mixture Compaction Monitoring

Product 0-6874-P4

Cooperative Research Program

TEXAS A&M TRANSPORTATION INSTITUTE
COLLEGE STATION, TEXAS

in cooperation with the
Federal Highway Administration and the
Texas Department of Transportation
http://tti.tamu.edu/documents/0-6874-P4.pdf

Further Technology Readiness of Real-Time Asphalt Mixture Compaction Monitoring

TxDOT Project 0-6874 Develop Nondestructive Rapid Pavement Quality Assurance/Quality Control Evaluation Test Methods and Supporting Technology

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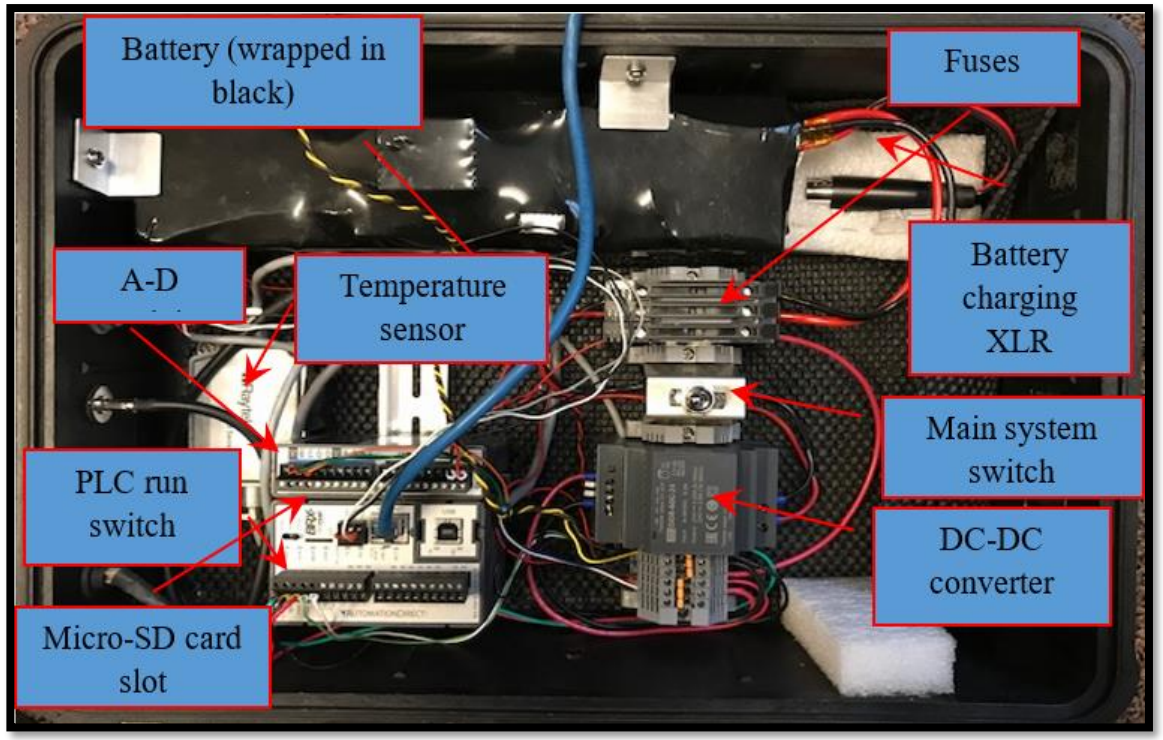
Goals

- Develop use of compaction monitoring system (CMS) for evaluating density under the breakdown roller
  - Using a compaction index (CI) concept
- Identify key factors influencing the CI model
- Develop updated factors, particularly for temperature and vibration
- Identify how CMS could be used for process control or assurance

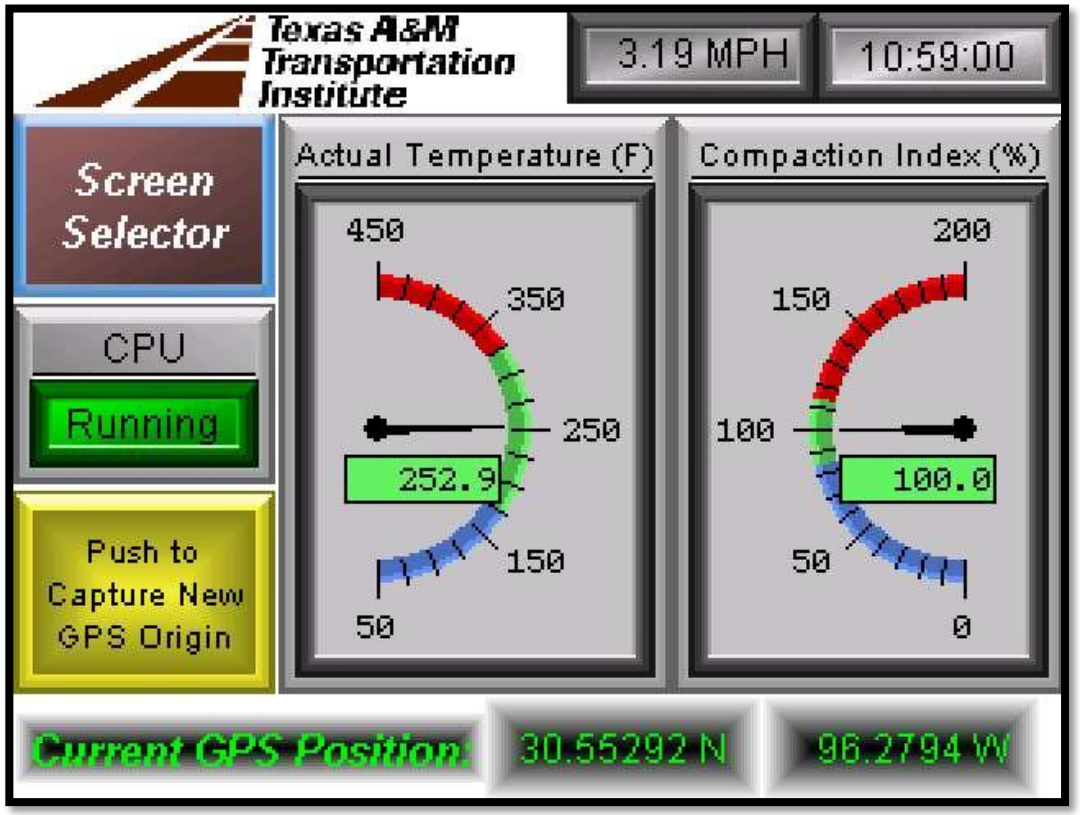
Key activities completed

- Developed PLC/HMI form factor
- Developed approaches for
  - Revised drum weighting factor
  - Temperature factor
  - Vibration factor
- Pilot testing on multiple projects

PLC / HMI Form Factor

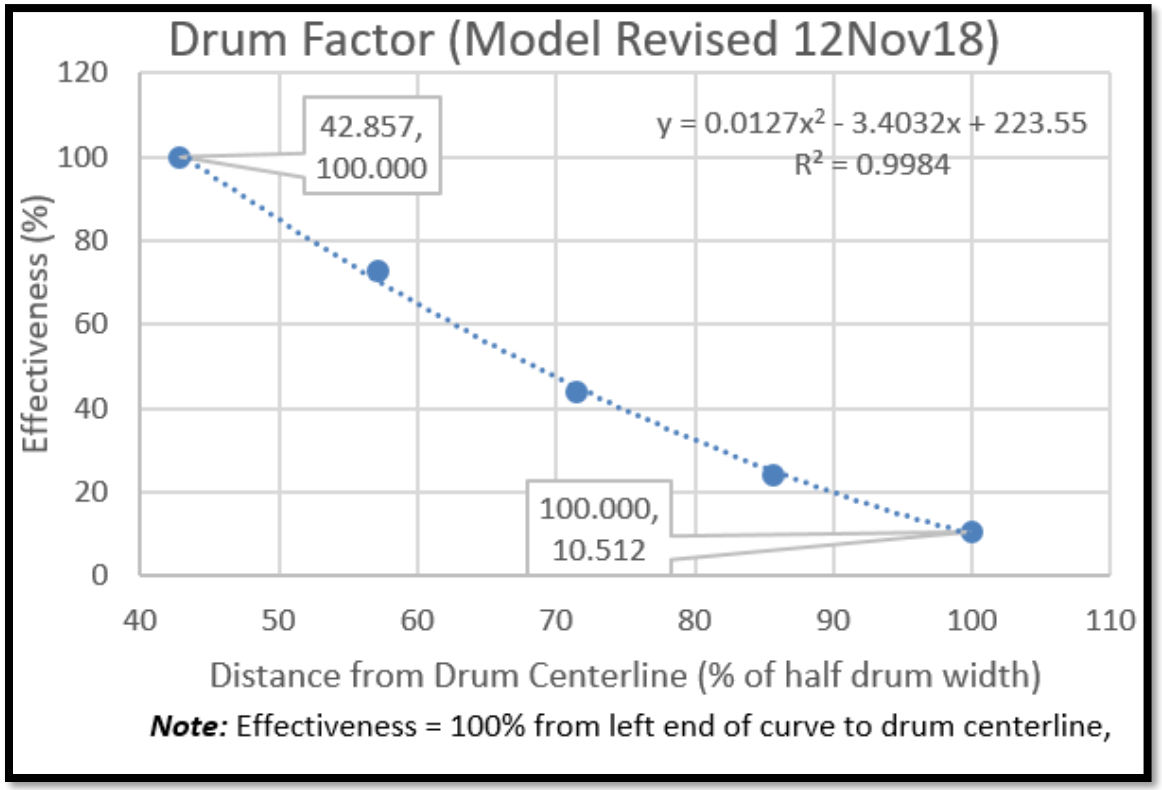


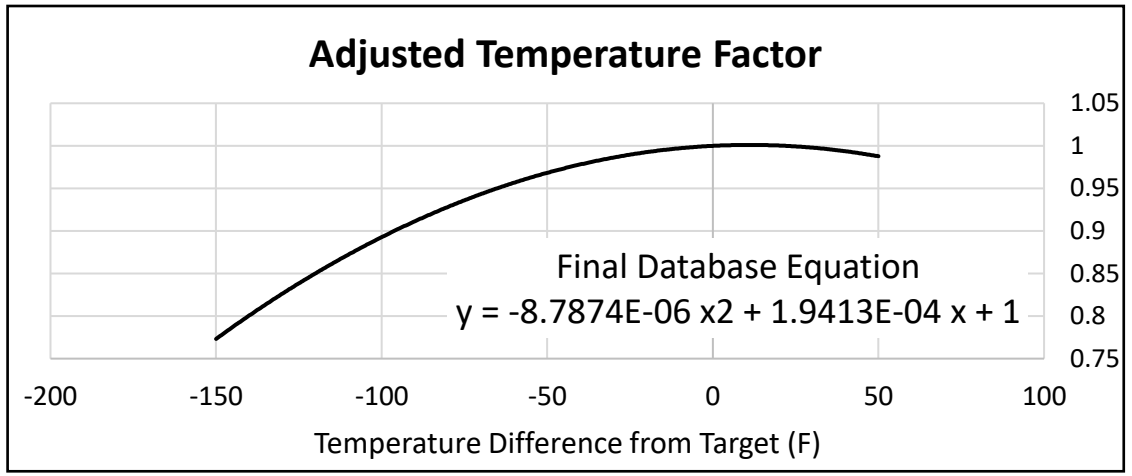
Internal view of PLC Control Box

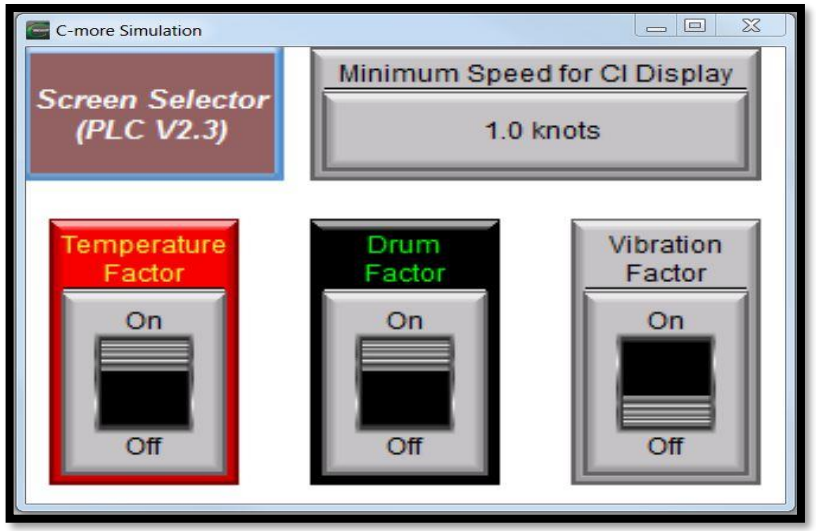


Main Screen HMI Display

CI Factors







If all factors are off, compaction index equals the number of passes

General CMS Test Process

Install CMS

Construction

CMS Data Collection

Select Core Locations

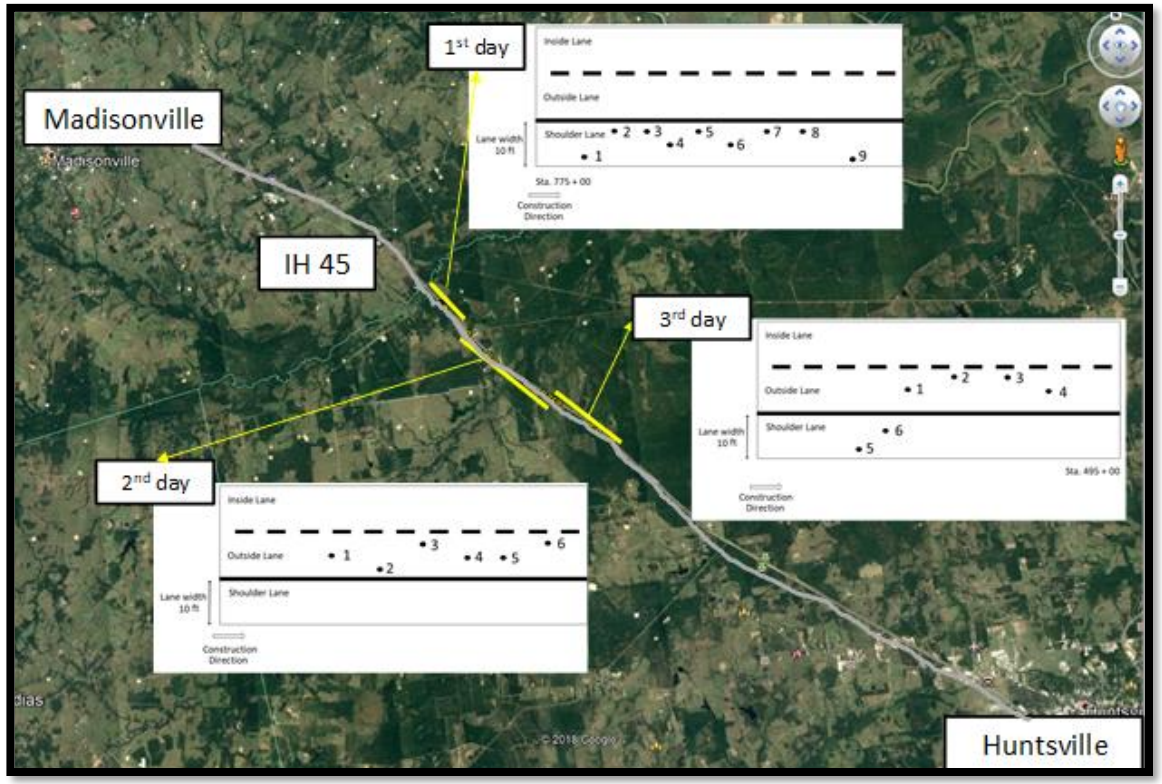
Spot tests and coring

Measure GPS

Lab work

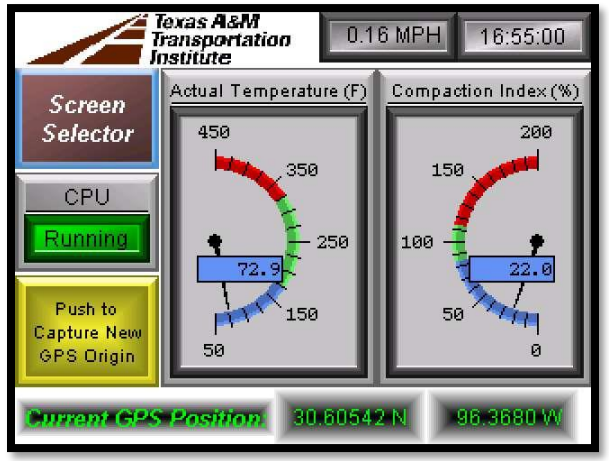
Example Field Process

- Deployed to:
  - RELLIS test site (TY D and TOM)
  - SH 77 (ATL) SP-D
  - IH 45 (BRY) SMA
  - FM 158 (BRY) SP-D
  - SH 40 (BRY) SP-C

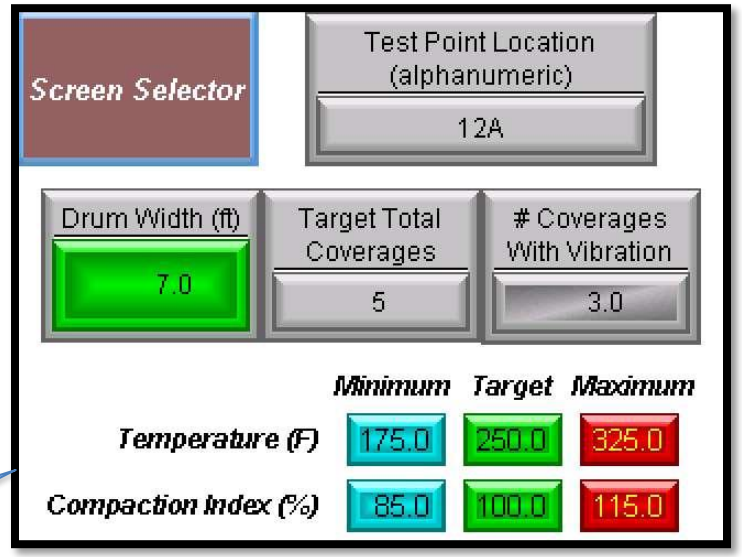


Test location summary – IH 45

Setting up CMS Operational Parameters

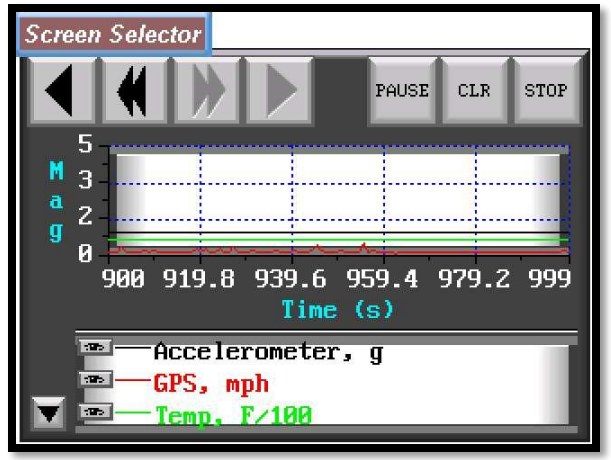


Home Screen



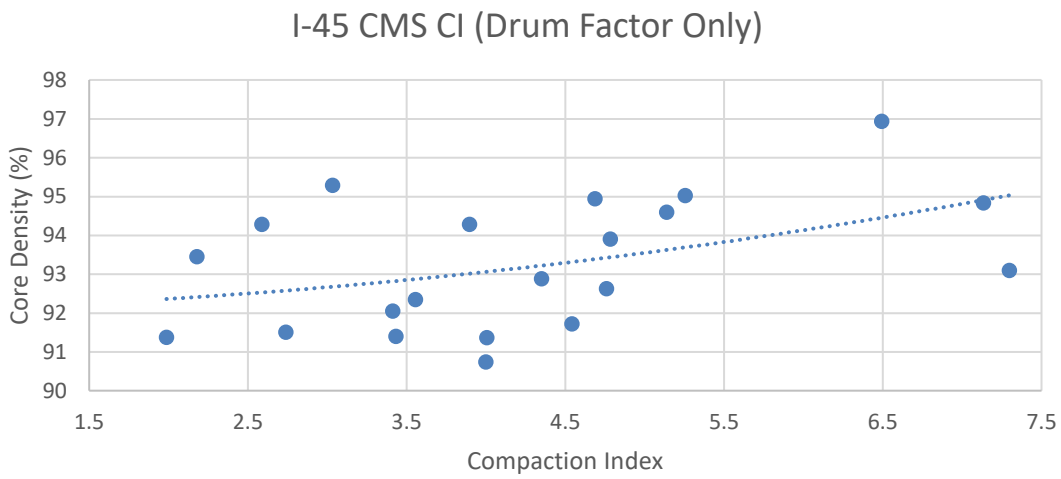
Setup Screen

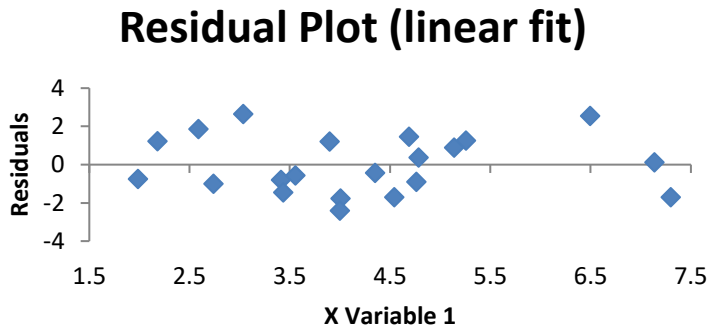
User inputs desired targets here

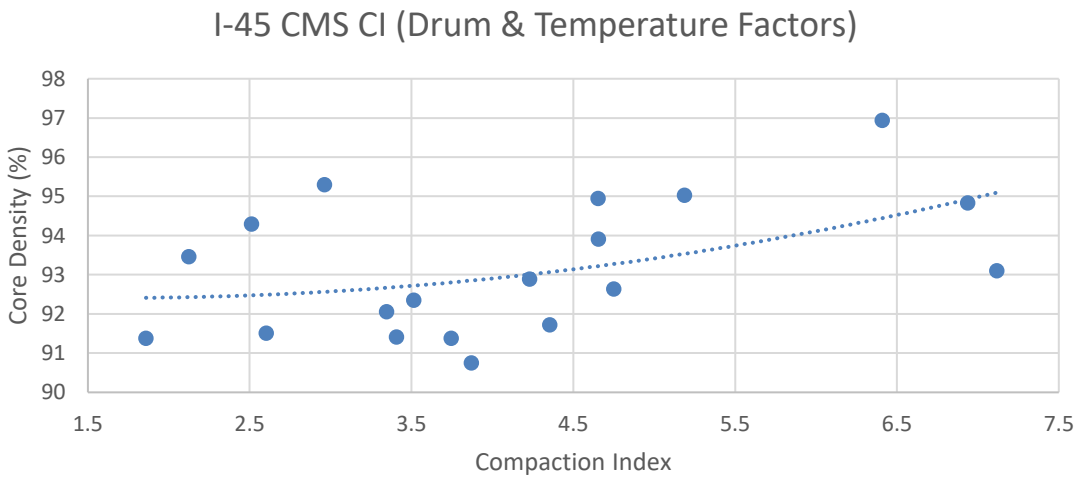


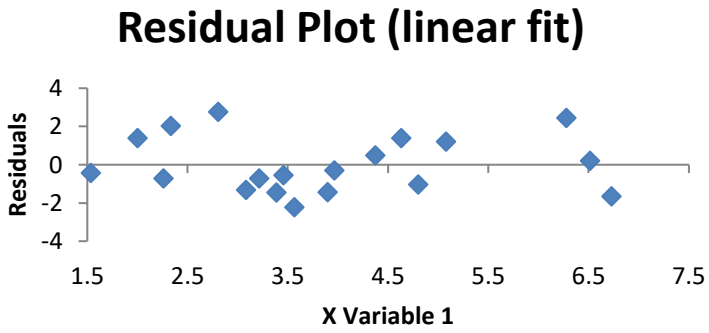
History Screen

Example Data, IH 45

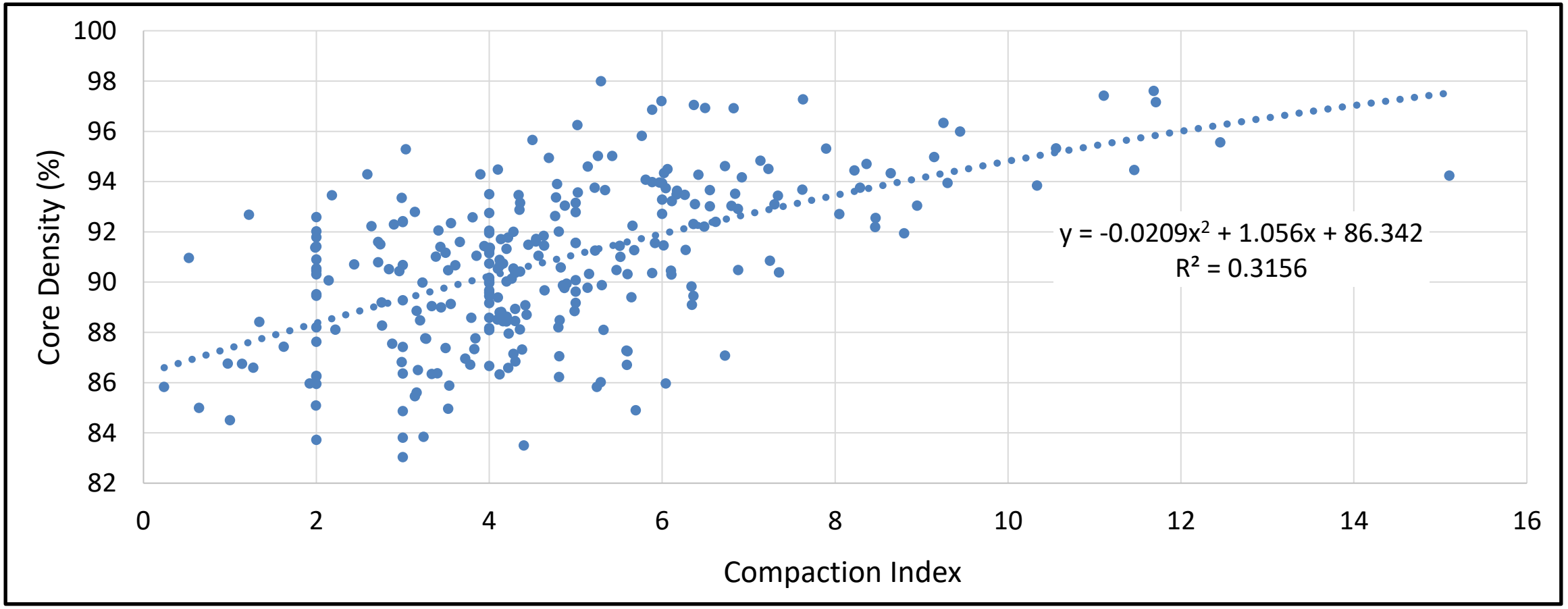








Summary from all Projects Tested



Summary

- CMS can document if prescribed rolling pattern applied
- Reliably estimating density difficult with CMS model
  - Expanded factors in CI model still do not provide accurate enough measurements for applications other than general process control
- Best potential use is in process control for continuous feedback with far more testing coverage than routine use of a density gauge

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