Intelligent Asphalt Compaction Analyzer

Highways for LIFE Partnerships 2008 Award $200,000

HIGHWAYS FOR LIFE

Accelerating Innovation for the American Driving Experience.

Project Status

Five prototype units were developed for installation on vibratory compactors, and the technology was validated during the construction of both full-depth and overlays of asphalt pavements. Tests by independent users will evaluate IACA operations and will be completed in June 2010.

FWD Testing

Test Site : I-35 Norman, Oklahoma

- Subgrade: 200 mm @ 10% cement kiln dust (CKD)
- Aggregate Base: 200 mm
- Asphalt Layers: Two 100-mm asphalt layers S3 PG 64- 22 OK and 3rd lift of 75-mm S3 PG 76-28 OK

Verifying the seating and location of the test site.

Contact Information

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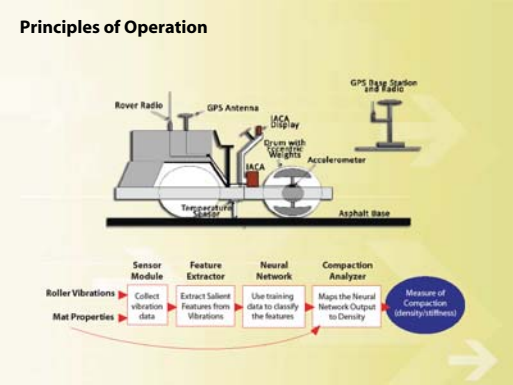
Need for Innovation

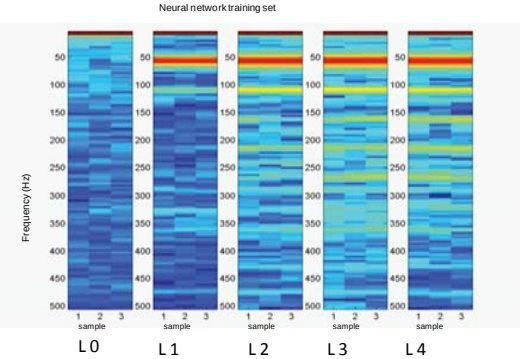
Proper compaction of newly applied asphalt helps ensure a crack-free paved surface and longer lasting roadway. But if compaction levels do not meet the design requirements it can result in early degradation of the pavement. Currently, compaction is verified by testing core samples extracted from the hardened asphalt. Low compaction will result in either reduced payment or no payment for the sections. The Intelligent Asphalt Compaction Analyzer (IACA) is a device mounted to vibratory compactors to provide real-time data so compaction inconsistencies can be remedied while asphalt is still pliable. Replacing the time-consuming manual process will reduce construction time and make pavements last longer.

Project Overview

The IACA is a device based on neural network technology that can measure the density of an asphalt pavement continuously in real-time during its construction. Early field trials demonstrated that, after calibration, the accuracy of the IACA is comparable to a nuclear density gauge or a non-nuclear density gauge. Haskell Lemon Construction Company and the University of Oklahoma refined the technology, developed commercial prototypes, and conducted extensive field testing.

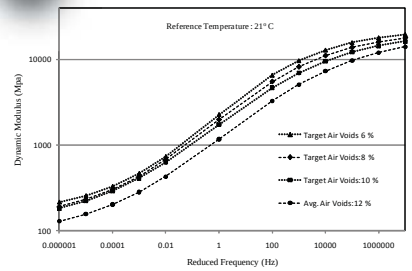


The IACA measures the density of asphalt pavement in real time so workers can detect and fix compaction problems during the paving process, saving time and money. The components consist of a GPS receiver (not shown, but mounted on the roof of the compactor) and an embedded computer/display which mounts on the vibratory compactor.

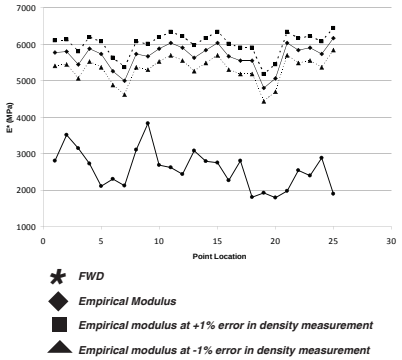


Changes in the compaction are displayed left to right based on the number of passes.

Results



Developed Master curve for target air voids



Comparison of empirical modulus (20 C and 5 Hz) from measured density and FWD measured modulus at locations on the finished pavement.

Conclusions

The results obtained during field compaction agree with FWD measurements from the completed pavement. Empirical calculations of the modulus in the laboratory provide significantly higher values of the modulus and are not suited for quality control during compaction. On the other hand, the IACA can estimate the modulus in real-time during the compaction process and can be used to ensure uniform compaction of the asphalt pavement.

Project Team

Haskell Lemon Construction Company
Oklahoma State University
Volvo