Intelligent compaction is the “smart” way to get better compaction – real time information that allows roller operators to make adjustments on the fly and optimize the compaction process.

But intelligent compaction has another, perhaps less obvious, benefit. It not only produces a better pavement but it can also provide better quality control.

For road builders, it is the last step, the finishing touch and arguably the most important part of the paving process. If you want long lasting durable pavements, good compaction is essential. But conventional compaction has its shortcomings, primarily because many of the critical factors that influence compaction (the underlying materials, the lift thickness, the type of hot mix and the mat temperature, for example) are invisible to the roller operator.

Intelligent compaction using rollers equipped with computer based positioning and measure-
Intelligent Compaction as a QC Tool

Intelligent Compaction Rollers
The U.S. Federal Highway Administration’s definition

Vibratory rollers equipped with:
- Real-time Global Positioning System radio and receivers for horizontal and longitudinal tracking;
- Integrated measurement computer system to collect and analyze roller and pavement response information;
- Accelerometers mounted in or about the drum to monitor applied compaction effort and resulting responses from the underlying layers;
- Temperature instrumentation to monitor the HMA surface temperature;
- A GPS-based documentation system providing continuous roller generated data in real time during the compaction process on a colour-coded on-board display.

Intelligent compaction benefits:
- Real-time feedback to the roller operator
- Permanent records of compaction data
- Statistical and geospatial analysis of IC data
- Mapping of underlying materials prior to paving and compaction

Intelligent compaction for quality control:
- Improving density. More consistent number of passes (at optimum pass count) should result in less variability of achieved density
- Identifying soft spots in underlying materials prior to paving
- Achieving 100% coverage of pavement layer being placed. Instead of spot tests on limited locations, IC technology produces a colour-coded map of roller passes, surface temperature and ICMV of the entire area being paved

But intelligent compaction has another, perhaps less obvious benefit. It provides a valuable quality control tool that will help contractors produce a better pavement.

Conventional quality control can best be described as too little too late – spot checks done well after compaction has been completed, which may not be representative of the quality of the entire pavement. By contrast, intelligent compaction provides a colour-coded map showing the Intelligent Compaction Measurement Value (a generic term for the IC measurement of the material stiffness or density), mat surface temperature and pass counts of the entire roadway surface. Agencies and contractors can use the information to identify areas of low ICMV or improperly compacted material during the compaction process so that the operator can make corrections as needed.

Intelligent compaction can improve quality control by:
- Identifying soft spots in underlying materials prior to paving. By using colour-coded mapping capabilities, repairs can be made to problem areas that could cause future maintenance problems.
- Achieving 100% coverage of the pavement layer being placed. Current QC practices rely on taking spot tests on

number of passes (at optimum pass count), which should result in less variability of achieved density.
limited locations on the compacted roadway. IC technology provides a colour-coded map of roller passes, surface temperature and ICMV of the entire area being paved, identifying potential issues that can be tested and corrected.

Collecting and analyzing the IC data during the course of the projects provides the contractor with valuable insights into the quality of its operation that are independent of the quality measures used in the QA process. There are, however, still some barriers to overcome before IC technology can be used extensively as a QC tool by highway agencies. Equipment that meets the FHWA criteria of IC equipment, which includes GPS, ICMV and temperature measurement is not widely available. The data collected by IC technology is complex and still not easy to analyze (improvements must be made to simplify this process, to standardize the data, to develop analysis software and to train field personnel). And finally, agencies and contractors have to be willing to either augment or replace some of their QC practices with these new tools.

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