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SMART PAVING ON AIRFIELDS

INTELLIGENT COMPACTION METHODS USED ON AIRFIELDS IN UTAH AND ALASKA

By Dave Johnson, P.E. and Bob Horan, P.E.

The importance of achieving sufficient compaction has been well established both experimentally and through anecdotal evidence for flexible pavements. One of the latest tools available to the pavement construction industry is Intelligent Compaction (IC).

IC is an advanced, equipment-based technology intended to improve the compaction process through better quality control for the contractor. IC is part of Federal Highway Administration's "Every Day Counts 2" initiative to promote technologies they believe offer improvements to the long-term performance or safety of highway facilities.

Two Federal Aviation Administration (FAA) projects recently were completed in Salt Lake City (SLC), Utah and Sitka, Alaska that required the contractors to use IC equipped rollers for breakdown rolling operations via special provisions. This article compares and contrasts these two projects and how IC was implemented and the benefits.

The air facilities at SLC and Sitka represent two very different operations. SLC serves as the western hub for Delta Airlines plus it is used by eight other airlines. It is the fourth-busiest air facility in the United States and is at 4,227 feet above sea level. In a typical year, more than 20 million passengers on over 325,000 operations utilize this airport. Over 2.5 million people live within 30 minutes of the airport.

In contrast, Sitka is just 26 feet above sea level with about 65,000 passenger boardings annually and about 23,000 operations. Sitka is found on Baranof Island, in Southeast Alaska. Just one major carrier – Alaska Airlines, serves it. There are around 8,900 permanent residents on Baranof Island.

Despite the differences noted, in terms of size and usage at the respective facilities, both projects proceeded in a similar fashion. Both projects were constructed under the FAA P-401 specification, the Sitka project using Alaska's standard modifications to this specification.

Both projects also specified that echelon paving be used to its maximum extent and on-site remixing with a material transfer device be used for the asphalt pavement placement. Every effort was

Intelligent Compaction (IC) has been called the biggest advancement in asphalt compactor technology since the introduction of the vibratory roller in the 1970s. IC rollers are available for both soils and asphalt. Suppliers of double drum asphalt rollers with IC technology include Bomag Americas, Caterpillar, HAMM/Wirtgen, and Sakai America. An aftermarket IC option is also available from Trimble for asphalt.

IC roller technology is high-tech equipment designed to give roller operators real-time feedback to facilitate more consistent compaction on soils, aggregate bases, or asphalt pavements. To be considered an asphalt IC roller the equipment must be equipped with a Global Positioning System (GPS) including mapping, have an integrated measurement system, have a computer reporting system onboard, the ability to record mat surface temperature, and provide user feedback. User feedback is accomplished via an onboard screen of a computer tablet or laptop.

A one-stop website has been established and is maintained for all things IC at www.intelligentcompaction.com. At this website you can:

- » review past projects which required IC technology,
- » download project reports,
- » track future IC projects and workshops,
- » explore manufactures and suppliers of IC equipment,
- » review many "Frequently Asked Questions," and
- » download generic IC specifications for both asphalt and soils.

The website provides access to the Veda Software which is a powerful tool for analyzing the data from an IC roller. While anyone can download the software, any potential uses are encouraged to seek training on its usage to streamline the learning curve and to help maximize its benefit to the user.

Two IC rollers side-by-side with performing echelon paving.

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used to maximize construction quality. The more significant portions of the IC specification included provisions that the rollers shall be capable of documenting and communicating to the operator in real time the following:

- » the roller location,
- » the roller speed,
- » the compactive effort and material response,
- » the cumulative pass count, and
- » the surface temperature.

All of this information was to be submitted to the engineer daily as part of the quality control plan. The engineer approved the quality control plan before paving began.

ALASKA ENDEAVOR

The Sitka project consisted of rehabilitating and lengthening the main runway. Twenty-six calendar days were allotted for the project. The runway was completely shut down every night, but normal operations minus one Alaska Air flight occurred during the day. This put additional pressure on the contractor's crew as any equipment issues are bigger deals when you are hours away from any needed parts in the event of a breakdown.

Knik Construction Company of Anchorage, Alaska successfully used IC technology on the lengthening of the runway and pavement rehabilitation of the Sitka Airport for the Alaska Department of Transportation and Public Facilities. This project was specifically designed to utilize several innovative construction techniques.

Amanda Gilliland, Quality Control Manager for Knik, said that two Hamm tandem drum vibratory rollers equipped with Wirtgen's IC equipment were used during the entire paving operation. The use of GPS (Global Positioning System) is a critical component of IC. On this project, a TopCon base station was used, which allowed for extremely accurate positioning data for the rollers.

The IC setup includes a color-coded display that is mounted in the roller cab. This display allows the roller operator to view, in real time, the rollers location and also tracks the roller passes that are placed on the asphalt mat.

"We were using the IC rollers for breakdown rolling. After the roller operators got used to working with

the on-board display, it quickly became a very useful tool for making sure they had completed their rolling pattern without missing any areas. Improving the consistency of the roller pattern resulted in our mat and joint densities also being very consistent," said Gilliland.

She noted that the lighted display proved to be valuable for the night paving that was used on the project. It was early enough in the season that, even in Alaska, it was still very dark at night. Even with light plants set up, it was difficult to see roller lines in the pavement.

"The displays were easy to see in the dark and showed the operator exactly where they had rolled," said Gilliland.

Gilliland said that after being trained their roller operators learned quickly how to use the IC technology.

"Our most experienced roller operator said he thought the IC was an excellent tool and that it took all of the guess work out of rolling," said Gilliland.

UTAH EXPERIENCE

The SLC project was a rehabilitation of one of their main runways – 16L-34R. To accomplish this, the runway was closed for 60 days beginning on April 1, 2013, and then for an additional 30 days at night to complete non-paving portions of the project.

The Utah division of Granite Construction constructed the SLC runway. Kyle Smith, Project Manager for Granite, had many very positive statements regarding their experience with IC technology on this project.

In their case they choose to rent Trimble aftermarket additions for CAT rollers in their fleet. In much the same way as in Sitka, Granite's experience with IC technology was a positive one. Operator training was quick, and the advantage of location versus pass count information was seen as valuable feedback for the operators. This information gave the operators the ability to maintain consistently uniform roller passes throughout the project. In fact, 100 percent of Granite's density tests were passing.

In discussions with Kristen Brownson, P.E., Utah State Engineer for the FAA, she stated that she will be recommending IC rollers on all future "big" projects that she is a part of, based on the advantages she saw in SLC. While Granite's experience with

IC compaction was positive, they have chosen to not purchase the equipment for their Utah fleet at this time. As Smith explained, their equipment supplier can provide it to them on a rental basis for future projects as required. He doesn't see the need for purchase at this stage with rental option working so well for them on this first project.

CONCLUSION

Their owners, the project engineers and the contractors that built them viewed both projects as highly successful. IC technology was one of a number of tools used on these projects to help construct the best asphalt pavement possible.

The future looks bright for the use of IC on highway and airfield paving applications as contractor's and owner/agencies discover this innovative technology is available from a number of different suppliers and is ready to implement as a process control tool.

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Asphalt Institute (AI) has partnered with Federal Highway Administration on the study and implementation of Intelligent Compaction for the last five years. Prior to the Alaska project, AI regional engineers conducted a workshop that provided an overview of IC technology and a practical discussion of conducting an IC project for Alaska DOT & PF, Knik and other interested parties. These four-hour IC workshops are now available for agencies at no charge upon request through the Federal Highway Administration.