High-profile runway resurfacing project at New York's JFK airport puts advanced milling control technology to the test.

MILLING IN THE BIG APPLE

By Don Talend

Photos courtesy of Don Talend.

JFK's 13R-31L ("Bay") Runway—the nation's third-longest at 14,572 feet—was resurfaced with an 18-inch layer of concrete to yield an expected maintenance savings of $500 million over an expected 40-year life span compared with an anticipated 8-year asphalt life span. Because JFK is a key component in the nation's commercial air-traffic system, the first phase of the $376.3 million project was put on a fast-track schedule of 120 days, with overall completion due in late 2011. In addition to financing from the owner, the Port Authority of New York and New Jersey, the project received $73 million in Federal Aviation Administration and $15 million in American Recovery and Reinvestment Act funding.

Milling, grading, and paving subcontractor Intercounty Paving Associates kept the first milling phase of this first phase on track by simultaneously utilizing a combination laser-Global Navigation Satellite System (GNSS) on multiple Roadtec RX-900 cold planers.

PROCEDURAL CHANGES WORK OUT

Preparations began during night closures the month before the start date. Tutor Perini surveyors George and Tom Harris localized the jobsite using Intercounty's GR-3 base station from Topcon Positioning Systems. The GR-3's 1-watt UHF radio left "dead zones" at both ends of the runway, typical in radio signal-dense airfield environments. So the Harris brothers set up Topcon's 35-watt external radio, allowing them to position the base station along the runway, near the middle of the jobsite, providing full radio coverage without interference from voice traffic. Also complicating matters were several unseasonably large snowfalls during February. Once control points were located, they had to be cleared before the shots could be taken and drifting snow routinely refilled the control point holes.

Even when construction scheduling is designed to minimize the effects of adverse weather, a few snags are inevitable. Thirty-five-mile-per-hour winds delayed flights for an average of about 2 hours the first day and Intercounty also experienced a few equipment problems. A couple of the company's Roadtecs, having been maintained over the winter, had clutch problems and the starter motor had to be replaced on another. The Topcon Positioning Systems Millimeter GPS+ machine-control systems with which they were equipped were also affected by high winds, rain, and blockages from other equipment on the jobsite. Despite the fact that Intercounty made adjustments on the Roadtecs to allow for unexpected issues with the lasers, the system turned out to be invaluable for milling efficiency.

MILLING THE RUNWAY

The roughly 12,000-foot runway was divided into quadrants of about 6,000 feet in length and 200-feet wide from the centerline. The 200-foot widths were subdivided into two adjacent 100-foot-wide subsections to accommodate eight passes by the 12½-foot-wide Roadtecs. With the entire job now accurately localized for GPS at its midpoint with a single control point file, Intercounty's project supervisor, Jim Egerter, figured that mounting the PZL-1s on 15-foot-tall towers would provide the lasers with continuous coverage. But nonstop 40-mph-plus winds would not allow continuous rotation of the self-leveling Topcon PZL-1 lasers at that height.

So Jim Cleary of Intercounty's Topcon dealer, Cleary Machinery Co., Inc., lowered the PZL-1s to their standard 2-meter height on tripods. Intercounty had five milling machine rovers and three survey rovers all corrected by a single base station despite being located thousands of feet apart. A three-dimensional site model

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developed by Mesh Consulting was loaded into the Roadtecs' machine-control systems. The original plan was to fine-mill the surface to within ¾ of an inch of the specified elevation in a single pass using three machines deployed in a staggered formation. The machine making the "virgin cut" would have Millimeter GPS+ controlling both sides of the drum. Each trailing machine would "joint match" on one side using the RX-900's hydromation system, while utilizing Millimeter GPS+ on the other side. Four PZL-1s were spaced apart by 750 feet, affording a pass length of 3,000 feet before the machines would have to "square up" and return to original starting point.

The equipment blockages and weather caused the Roadtecs to cut to within 0.02 foot with laser reception and within 0.05 foot without it. These factors, coupled with severe machine vibration caused by the deep cut in hard material, made precisely milling to the specified elevation in one pass difficult. But the situation turned out to be a blessing in disguise, as it forced Egerter and Intercounty's milling superintendent, Joe La Placa, to devise an alternative process that proved to be even more efficient than the original plan.

ALTERNATIVE PROCESS

The decision was made to disconnect the laser receivers on three of the Roadtecs and have them rough-mill the existing surface to 1.5 inches above finished subgrade. Egerter and La Placa reasoned that since the machines were going to cut the last lift with the Millimeter GPS+ anyway, the rough mill accuracy was not as critical. Three machines cutting without the lasers actually put Intercounty ahead of schedule and two other Roadtecs fine-milled where possible at any given time.

Egerter noted that, after the rough start, Intercounty was hitting the daily production goal of 2,000 by 100 feet over the past few days. "It was a little tough in the beginning, but we're finally getting the daily production that we're supposed to be getting," he says.

CONTINUOUS ACCURACY

"You could almost say that GPS isn't any more accurate than manual at station, but between stations, it is," Cleary points out. "It performs like a virtual stringline, calculating smooth transitions from station to station. And it eliminates the occasional blown grade." "That's right," adds La Placa, echoing the greater continuity that was possible with the new system. "Plus, there's no human error factor. It's like a computer—garbage in, garbage out; if you put the correct information in, the correct information will come out."

One of the biggest advantages of the system's accuracy is prevention of overmilling, Langdon adds. "The entire area was milled without a single mark on the ground, which is roughly 8,000-plus shots in a 25-by-12-foot grid over 11,000-plus feet," Cleary concludes. "You could assume that two cuts would have been required with any other method, given the hardness of the surface. The mark-out costs associated with 16,000 shots is actually insignificant compared with the potential downtime resulting from waiting for the marks to be made, due to the large penalties enforced for not finishing the job on time. When you consider increased machine productivity and the concrete material savings the accurate milling provided, you could say that these contractors reaped the same benefits that GPS machine control has been providing grading and excavation contractors for the past decade." ■