Machine Controlled Excavation Makes Short Work of a Long Canal

Canal maintenance is a high priority for Jefferson Parish in Louisiana. The parish, which contains most of the New Orleans suburbs with a population of about 430,000, was one of the areas hardest hit with flooding in the wake of Hurricane Katrina in 2005. Parish officials don’t want to see a repeat.

One of the most troublesome canals in Jefferson Parish is the Gardere, a 60-foot wide, shallow, “W-shaped” canal, with a 20-foot middle section about 5 feet deep, and 20-foot wide keyways along the outer edges that are about 7 feet deep. The canal is 2.5 miles long. Canal cross sections are precisely designed and must be maintained as designed for adequate performance. The problem faced by Jefferson Parish was constant erosion; the parish was spending a great deal of money every couple of years to dredge the canal and restore the banks. In terms of asset management, the Gardere Canal was an obvious challenge.

In 2012, the U.S. Army Corps of Engineers worked with Jefferson Parish to design a rehabilitation that would permanently repair the canal so that it would be relatively maintenance free. The new design calls for a concrete canal floor and riprap banks, in which rock and other material are used to armor shorelines. Implementing the design is a major feat of dredging and precise excavation.

The project was contracted to New Orleans-based Cycle Construction in 2013 and was initially expected to take about two and a half years to complete. But early on, Cycle made a crucial investment that is on pace to complete work in about 20 months—a reduction of one-third.

How did Cycle Construction achieve such a significant timeline reduction?

Machine Controlled Excavation
Cycle Construction has been using machine controlled bulldozers for several years and is completely convinced that machine control is a ‘must have’ technology for any progressive firm. “Machine control is a big step forward for the construction industry, and any company that doesn’t

Leica iCON excavate 41 Advanced 3D Excavator Control Systems guide the work on the Gardere Canal.

All images courtesy Haag & Trammell (http://haagtrammell.com)

BY ANGUS W. STOCKING, LS
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adopt it is going to be left behind,” says Cycle Construction Lead Man and Heavy Equipment Operator David L. Wilkinson. “Really, it saves an ungodly amount of time.”

But Cycle’s total experience with machine control prior to the Gardere Canal project was with bulldozers, which is a mature and well-understood grading technology. The Gardere Canal rehabilitation called for the exclusive use of excavators. This application is newer and trickier; the precise control of articulated digging arms, in three dimensions, is a major feat of engineering compared to grading with bulldozers.

Still, Cycle Construction was convinced that machine controlled excavation was the right technology for this project and would pay off handsomely in future projects. Accordingly, the company bought two Leica iCON excavate 41 Advanced 3D Excavator Control Systems from Haag & Trammell in New Orleans.

Installation was a “process” according to Wilkinson, who says that calibrating the position of the bucket was “tricky.” Preliminary attempts only achieved a positional accuracy (on the bucket) within about six inches—not good enough for the canal project. But with professional support from Haag & Trammell Sales Representative Joey Ferrara and Leica Geosystems Regional Sales Manager David Rowlett, both excavators—a Hyundai and a Caterpillar—were able to position the buckets reliably within about one-tenth of an inch. That’s close to the precision achieved in bulldozing, and more than sufficient for the canal excavation.

With this precision achieved, operators could get to work. Working from both ends of the canal, excavators removed accumulated silt to the Corps-specified profile, laid geotextile fabrics, then covered with riprap, again to Corps-specified elevations. Technically, what operators were working with was a model created in Carlson Takeoff by Cycle Construction staff, working from Corps plans. As silt was removed, excavators dumped it directly into hauling trucks, and truckloads were counted to verify quantities. Jefferson Parish used the silt as cover for local landfills.

Machine control made an enormous difference, with regard to time, for two reasons:

1. Excavator operators could see grading results as they worked. Basically, operators were looking at the iCON tablet in the excavator cab, which showed a 3D view of the bucket and profile, and used that feedback to make real-time adjustments as work progressed. This insight greatly reduced overwork and rework. And since bucket position was accurate to within specified tolerances, the excavator could even be used to establish final grade without a separate survey.

2. The previous measurement processes were avoided. There are two methods commonly used in canal work, and both are cumbersome. Sometimes, sections of canal are dewatered so surveyors can create accurate profiles...
Operators relied on feedback from the 3D view of the bucket and profile, which was shown on the iCON tablet in the excavator cab, to make real-time adjustments as work progressed.

As of December 2013, a mile and a half of canal rehabilitation had been completed, and Cycle Construction is on pace to complete work within 20 months at a price that works for Jefferson Parish. The reduced schedule and cost-effectiveness of the project are both a function of machine control. “If we had done this with conventional means, the dollar amount would have been crazy; machine control definitely saved money,” Wilkinson says, noting that he has been very impressed with the overall operation of the iCON systems.

And with the work done, Jefferson Parish will save for decades. “This is Louisiana—the whole state is sinking, so we’ll see some cracking in the concrete,” says Wilkinson. “But other than that, this improvement should last indefinitely.”

As the Gardere Canal project proves, machine control of excavators is now one more mature technology available to contractors, and will save time and money for cities, counties, and other agencies.

Angus W. Stocking, LS, is a licensed land surveyor who has been writing about infrastructure since 2002. For more information about machine controlled digging, grading and excavation systems, visit haagtrammell.com or www.leica-geosystems.us.