How Cycle Construction Excavates Canals in Record Time

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.

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.

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.
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 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 bucket reliably within about one-tenth of a foot. 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.

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**Benefits of ICON Excavate 41**

- Work directly from CAD models
- Switch between 2D and 3D view with the touch of just one button
- Full guidance with rich 3D graphics – see the job how you need to, see cross-section, profile and 2D/3D view
- Simple & intuitive user interface – allows users to become confident and highly productive quicker
- Construct complex geometries, profiles and grades in a fraction of the normal time. Handle “blind” and underwater excavation with ease
- Work without boundaries - increase machine productivity by reducing dependency on site survey teams
- Eliminate over excavation and costly material overruns
- Upgrade easily from 2D to 3D in the same control box.
- Create simple terrain models directly on the screen
- Compatible with most makes and models of excavators on the market – even dual boom excavators supported
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 of new work with conventional survey tools. More commonly, surveyors take to boats and use long prism poles to get necessary shots. In both cases, the process is slow and shuts down excavator work. Eliminating this phase of work was a significant source of savings on the Gardere Canal project.

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An Efficient Base Station Setup

Because excavators were working toward each other from opposite ends of a long canal, a single GPS base station wouldn’t be sufficient for both.

Survey control for the project was provided by the Army Corps of Engineers; all Cycle Construction had to do was tie in to provided coordinates and monumentation. But there was one challenge: Because excavators were working toward each other from opposite ends of a long canal, a single GPS base station wouldn’t be sufficient for both. One approach would be to take time each morning to set up two base stations, but of course there would be breakdown time at the end of the day as well.

To avoid this process, Cycle asked Ferrara to set up a permanent reference station onsite. Ferrara used a GPS receiver and 35 watt SATEL radio to set up a continuously functioning base station that saves several hours every week by eliminating setup times. According to Wilkinson, this was another of many examples of Haag & Trammell’s outstanding support throughout the project.

As of December 2013, a mile and a half of canal rehabilitation has 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.

Eliminating the use of boats and prism poles provided a substantial savings on the project.