

# Technology Speeds

## Excavator Work on Channel Project

By Daniel C. Brown

Anytime you can improve production by 10 to 15 percent you are cutting costs by an even greater margin.

A 3D excavator guidance system is helping the earthmoving subcontractor to boost excavating production by 10 to 15 percent on a channel repair project in Topeka, Kan.

Ebert Construction Co., Wamego, Kan., is using the guidance system on 2.5 miles of Soldier Creek, which is contained by two parallel levees spaced 300 ft. apart. A major flood in 2005 eroded the creek banks, and the project will repair that damage and help to prevent further flooding upstream of the repaired area.

“We’re increasing the volume of the channel, reshaping the side-slopes, and regrading the bottom of the channel,” says Jim Ebert, project manager for Ebert Construction. His firm is working under a subcontract to LaForge and Budd Construction Co., Parsons, Kan., which has a \$9-plus million contract with the U.S. Army Corps of Engineers.

Before grading started, Applied Construction Technologies used the Corps of Engineers’ plans to develop a Digital Terrain Model (DTM). The DTM is a three-dimensional digital model contained on a flash card; it shows the design slopes and channel for the entire length of the project.

Two Komatsu excavators, each fitted with a Power Digger 3D excavator guidance system from Leica Geosystems, were excavating the side slopes when we visited the project. Ebert had entered the DTM into a computer on-board each excavator. While the Leica Power Digger 3D systems do not automatically control the excavators, they display the bucket position relative to the design slope on a color screen.

Cuts and fills varied widely and ranged from 2/10 ft. to 20 ft.; fills ranged up to 10 or 12 ft.. In a typical design cross-section of each creek bank, a gently-sloped 10:1 bench lay between two 3:1 slopes, one at the top and one at the bottom of each levee. In some areas Ebert dug out a thalweg, or Vee, in the channel bottom; other areas had a flat bottom.

“For rough grading we cut the slopes to within a couple of tenths of a foot,” says Trent Ebert, project superintendent. “Then the operators go back and pull the slopes down and put them within three inches.

In some cases, the excavators work underwater. “The Leica systems are really nice for cutting or filling the channel when we work in the water,” says Trent. “We can reach out into the water-filled cut and tell where the finish grade is without sending a grade checker into the water. In fact, the systems eliminate a grade checker on this project, which would cost us about \$40,000 over a year.”

### How it Works

Each of the two Komatsu excavators, a PC400LC and a PC300LC, is fitted with a Leica Geosystems Global Positioning System (GPS). Ebert has a GPS base station at the job site, and it continually corrects satellite signals sent to the dual receivers on the excavators.

Each excavator has three sensors mounted on it – one each on the boom, stick and bucket. The sensors and the GPS system feed information to the on-board computer about the bucket’s location, and the computer compares the actual bucket location – in two, or three, dimensions – to the design template. Although the system can display the bucket position in three dimensions, Trent Ebert says the operators usually use the two-dimensional view.

“It’s like having an in-board GPS system in your car, so you don’t have to pull out the map all the time,” says Brian Phipps, president of Laser Specialists, the Olathe, Kansas-based Leica dealer for Ebert Construction. “The operators already know how to dig, so using this system is not a big deal to learn. It makes it easier to know where you’re digging.”



*Ebert Construction uses an excavator to load one of two articulated haulers on the north side of Soldier Creek.*

*This excavator is fitted with a Leica Power Digger 3D GPS guidance system, which eliminates the need for stakes on the project.*



This Komatsu excavator is cutting a slope along Soldier Creek with the aid of a Leica Power Digger 3D GPS system that displays the actual bucket position relative to the design grade.



*Jim Ebert: "We like the efficiency that the Leica systems bring to the job."*

The 10 to 15 percent additional productivity stems from the fact that no grade checking is needed, and there's no waiting for stakes. "There's no downtime," says Trent. "Nobody has to watch the operators; they can dig, back up, find the next place to cut and keep on going.

"The GPS system has taken the guesswork out of grading for the operators," he continues. "And there's no more calling us to say the stakes got run over by a dozer."

Phipps says Leica's Power Digger systems for excavators are very popular in Europe, but are not used extensively—yet, anyway—in the United States. "These are the first two Power Digger systems we have sold," says Phipps.

"We haven't even sold many two-dimensional systems in the U.S. yet," says Phipps. "But when the Ebert people saw how much more the 3D systems will do, they said that's the way we need to go."

"We get good support from Laser Specialists, our Leica dealer," says Jim Ebert. "Anytime we have problems they are quick to send somebody out, or to talk us through a fix."

## Major earthmoving

The Soldier Creek Repair Project is a fairly large earthmoving job. Ebert has engaged a fleet of earthmoving equipment to remove 350,000 cubic yards of material from the side slopes and take them to waste areas behind the levee. Some 170,000 cubic yards is being moved from cuts to fills on the slopes.

For the project Ebert is using three Caterpillar dozers: a D6H, a D6M, and a D6N with a Leica GPS system used in the "Indicate Only" mode to tell the operator where the finished grade is achieved. When we visited the project, three John Deere 9520 tractors were pulling scraper pans to strip topsoil and stockpile it for later use.

The Komatsu PC300LC excavator was top-loading two Komatsu articulated dump trucks (an HM400 and an HM350) which were hauling the soil to the waste area behind the levee. The CAT D6N was shaping the south slope of the levee, and the PC400 excavator was pulling a slope down on the north levee to fill in the bottom of the channel.

Ebert said specifications permitted the contractor to use an excavator to pat down the soil and compact it with tracks at a level of five ft. or less from the bottom of channel. That allowed Ebert to gain a solid working platform. Above five ft., a compactor was used, and the soil had to meet moisture and density requirements.

Once the project is graded, a layer of topsoil will be spread, and large areas of the slopes will be seeded with a mixture of grass and wildflowers. Areas that are vulnerable to erosion will get rip-rap hauled in from Lawrence, Kan.

It was a wet spring, and Ebert said production had reached about 6,000 cubic yards per day. "The wet conditions make it difficult to pull the trucks into position to get loaded," says Ebert. "In one case we were using one backhoe to pitch dirt up the slope to the next hoe.

"When it dries up we'll get more equipment in here and shoot for about 10,000 yards a day," says Ebert. "We'll have at least two, possibly three more excavators on site, and three more John Deere tractors pulling pans. We'll use three more trucks—two Volvos and a Komatsu. We've only gotten to work one full week since production started on April 6."

Completion is scheduled for February 2011, but Ebert hopes to beat that date. "We're heading into the prime working season, so we're optimistic that we'll get better weather and our production will increase," says Bernard Dougherty, a vice president with LaForge and Budd, the general contractor.

Ebert says the Leica Power Digger 3D systems will help beat the scheduled completion date by 10 to 15 percent. "We like the efficiency they bring to the job and we can work under water without having a grade checker in the water," he says. 🛡️

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