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## 3-D GPS Best Answer For Rolling Terrain


MAILING LABEL AREA

# *Flattening The* OZARK HILLS

**Topcon 3-D machine control helps Cox Construction defy rainy weather to complete Heber Springs Athletic Complex**

By David V. Dow,
TrenchSafety and Supply, Inc.

Cox Construction initially purchased a Topcon GR3 Base Station and Survey Rover to outfit their Champion Motor Grader for this project in Heber Springs, AR.

Larry Cox walks the 45-acre job site inspecting the last couple of days of work. His crews have finished about 90 percent of the work on this multi-sport athletic complex in Heber Springs, AR, and he looks pleased.

This is a big project for his company, Cox said. He has been in business since 1972, and like the start of every other job, he was nervous about this one. As always, he wanted to complete the job on time and within his cost estimate. The solution was to invest in 3-D GPS+ Machine Control from Topcon Positioning Systems and TrenchSafety and Supply.

Cox smiles. Despite all the recent rain, the job has gone well.

Heber Springs is a small town in north-central Arkansas, with a population of 7,000. The town lies in the foothills of the Ozark Mountains, about 60 miles north of Little Rock. Cox says he is a farm boy at heart, growing up in Wynne, AR. He had always planned to be a farmer, but turned to construction when he had difficulty finding suitable land to farm. That was in the late 1960s. He first worked as a dozer and grader operator, and later launched his own business, Cox Construction Company.

Cox is patriarch of the family-owned operation. Wife "Miss Connie" works as the company's bookkeeper and office manager. All three of their sons, Lance, Matthew and Jason now work full-time in the company.

## A BIG Project

The athletic complex is projected to become a showcase for the entire community, where families can spend time together for many years to come. For starters, it's big. All total, the owners – the city of Heber Springs and Heber Springs High School – say it will cost $4.5 million, including the eight baseball fields, five soccer fields, multiple concession stands, and four large parking lots.

Cox also wanted to lay the groundwork for his three sons' future in the business. This project has been an opportunity to involve his three sons in the details of running of Cox Construction. All three have been around the business since they were toddlers, and as time has passed, Larry and Connie have encouraged their boys to assume more and more responsibility.

## The Project Challenges

The complex sits on a relatively compact site, with lots of grade changes. Prior to this project, the land was rolling pastures. Larry will ultimately alter almost every square foot of the land's surface.

And if the terrain wasn't enough of a challenge, the weather, of course, has added to the complications. Cox Construction started work on the site in August 2007, and the rains came

# How Three-Dimensional Machine Control Systems Works

Many contractors are familiar with two-dimensional (2-D) machine control technology, which has been around for more than 30 years. Two-dimensional systems are particularly well suited to surfaces that are relatively flat. The concepts behind two-dimensional and three-dimensional machine control are actually very similar. However, the fact that 3-D systems can accurately handle constantly changing elevation and slope often makes them the system of choice. With both systems, information is displayed for the machine operator on a screen in the cab. The operator can then manually send correction information directly to the hydraulic cylinders that control the position of the dozer's or motorgrader's cutting edge, or the operator can let the system make needed adjustments automatically. Note, however, that adjustments are often best made by the operator manually in small increments, especially when there is a lot of material to be removed to reach the desired grade.

A two-dimensional system measures the distance between a grade reference and the cutting edge, and indicates any needed adjustments. That grade reference can be a stringline that is "read" with a sonic tracker sensor, or a beam from a laser transmitter that is "seen" by a receiver.

Three-dimensional systems are similar, except that they use GPS and GLONASS satellites, and display a Digital Terrain Model (DTM) as the grade reference for the operator. Three-dimensional systems measure the distance from the satellites to the machine's cutting edge, then compare that information with detailed DTM, and display the needed corrections to the operator. Again, the operator can choose to make the needed changes to the cutting edge manually or let the system make them automatically. And because detailed positional information is also displayed on the screen, the operator knows the machine's precise position, relative to grade, at all times.

almost immediately. In the time since, the area has received heavy rain for more than 130 days. In fact, the Heber Springs area has experienced record rainfall over the past 11 months. And when working with dirt, frequently several consecutive days of dry weather are needed following a rain before crews can get back to work.

Two months into the job – in October 2007 – Cox decided that the key to completing the project on time and within budget, and helping Lance, Matthew and Jason succeed in the family business, was to invest in 3-D GPS+ machine control technology.

Cox said he already had some familiarity with the technology. He had used lasers for years, he noted, on tractor-pans and graders.

Son Lance said, "Laser systems are great on a good, flat surface. But on this job, we have constant changes in elevation. Nothing's level. The ground is up and down everywhere."

Cox met with representatives from TrenchSafety and Supply Inc., the Topcon Master Distributor in northern Mississippi, western Tennessee, and most of Arkansas, and learned that 3-D technology could help reduce his costs while increasing his daily production. That win-win combination proved to be the conclusive factor in his ultimate decision.

First, Cox purchased a Topcon GR3 Base Station and a Survey Rover, and outfitted a Champion motorgrader with a Topcon automatic system. He has since purchased a second automatic system for his Case 9390 tractor with pull-behind pan.

The Topcon Survey Rover allows Larry Cox to check grade anywhere on the site and perform layout work.

## It Would Be Hard to Go Back

"I can't image going back to the days of 'blue topping' a site, with stakes every 10 feet in all directions," Cox said. "It would take a three- to four-man survey crew three to four days to stake this project. And then the job would have to be re-staked again and again as material was moved. This technology has virtually eliminated the need to set grade stakes."

Son Lance added, "I just sleep better. Seriously, 3-D is a great stress reliever. I don't wake up in the middle of the night wondering how I am going to get back on grade in the morning. Now, I just set up the system, and check the screen. Instantly, I know exactly where I am, relative to the finished grade."

The technology has given Cox Construction a competitive edge it didn't have before. Cox said that contractors who don't take advantage of the technology will have higher costs. He went on to say that he now has the ability to cut to grade faster and more efficiently, and that will help Cox Construction win more jobs and make more money. ■

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The control box mounted directly in front of the operator shows the precise position of the motor grader cutting edge, relative to finish grade, at all times.