

business & labor

EQUIPMENT

3D Grade Control Puts Designers Right in the Operator's Seat

Automation is rocking traditional earthmoving and project teams have to make changes

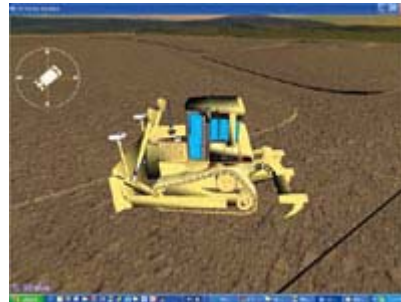
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By Tudor Hampton

Thirty years ago, when Jack Padgett first wrapped his hands around the levers of an earthmoving machine, he never dreamed that the vehicle one day would tell him what to do. Today, the 51-year-old operator sits in the air-conditioned cab of a hydraulic excavator, gripping two control joysticks like a kid in a video arcade. His guide is not a set of paper plans, but a tiny computer screen that displays a three-dimensional model of the jobsite. It guides him in real time as he shapes the earth.

More jobsites are using global positioning systems to pinpoint survey stations and guide machinery with millimeter accuracy. But automation is putting everyone to the test. "The attention to detail needs to be a lot higher than what some firms are used to," says Jeff Schug, COO of McClure Engineering, Ankeny, Iowa. Until the industry gets used to automation, the cost-savings won't be seen, probably for several years, adds Mike Coleman, project manager for Minnesota Dept. of Transportation.

GPS, which guides automatic grade controls on earthmoving machines, is well on its way to becoming an industry standard for survey, design and construction. But there are many hoops to jump through before that happens. Automation is closing the precipitous gap between the drawing board and the field. It is changing the way engineers design infrastructure, just as much as it is changing the way operators drive dozers.



Rendered. Contractors can simulate an earthmoving job on a computer, increasing the accuracy of estimates. (Photo courtesy of McAninch Corp)

Owners encouraging GPS-based construction see a huge potential for speed, quality and cost improvements, and they ultimately are in the driver's seat for its adoption. "With the motoring public asking the departments of transportation to deliver projects quicker, this is certainly a step in the right direction," says George Ryan, a project implementation engineer for Illinois DOT.

It appears that more owners are writing GPS into project specifications. "Our goal is to have 100% of our jobs machine-controlled" in the next two years, says Lou Barrett, who heads MNDOT's computer engineering team. Those who are less ambitious are at least starting to address GPS in project manuals, should contractors choose to use it.

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Software writers are scrambling to update design logic to accommodate the change. Because three-dimensional plans are uploaded into the machines, designers are hindered by software conflicts and a high level of detail required to model a project. "Modeling for machine control is very complex," says Dean Bowman, director of civil product development for Bentley Systems Inc., Exton, Pa. He adds: "The sole driver heretofore has been plan sets. People more and more are saying, 'Hey, we need models!'"

Software Glitches

Midwest contractor McAninch Corp., Padgett's employer, uses GPS to grade more accurately, get paid faster and reduce claims. The West Des Moines, Iowa, company has invested \$7 million in electronic surveying equipment since 1999, when it first decided to go GPS. Digital construction now is an integral part of the business. "I don't care if you have one dozer and a pickup truck, you need this technology," says Patrick Ruelle, director of business development.



Precision. Operators like GPS dozer control to guide them for rough grading and go fully automatic for fine grading. (Photo courtesy of McAninch Corp)

But using GPS is not easy for firms like McAninch, which have to navigate a minefield of data to use auto-grade control. As elated as contractors are about stakeless grading, they are equally frustrated about file preparation. "The design is where it all starts," says Tim Tometich, GPS manager [▶ Click here to view chart](#)

Tometich works closely with Brian Van Pelt, an in-house technician who spends much of his time crunching design files. For a 10-mile road project, it may take someone like Van Pelt six weeks or more to process plans before earthmoving machines can mobilize. That's because contractors can't just upload paper plans, or even digital 2D documents, into the onboard computer of a GPS-guided dozer. The computer needs a 3D model in order to tell the operator where to dig, or in some cases, move the machine's blade on its own.

Not having 3D models upfront from designers is a major sticking point for contractors. "The barrier to market penetration is this conversion process. You get a digital file, big deal, you still have to build a 3D model," says advertisement Ruelle. And when contractors are forced to build their own digital models, ... engineers say they lose out on updating their original plans into true as-builts, the "holy grail" of construction documents.

Ask civil designers about these hangups, and they say that they need more help from software companies. "We saw this coming several years back," Bowman says, "We are beefing up our modeling capabilities." Civil software utilities like Geopak, InRoads and MX are due for major updates by the end of the year, he notes. That will make it easier for designers to convert 2D plans into machine-compatible, 3D files.

When that happens, it will take far less time to survey land and stake out earthwork. Because of the labor and time savings of GPS, roadbuilding contractors who...

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