



BY HARRY O. WARD, PE

A New Text for Machine Control

I recently ran across a new textbook aimed at introducing machine control concepts. Titled “Make More Money with Construction Machine Control: A ‘How To’ Manual for Site Prep Contractors,” it is a well-developed 80-page book. Because I am unaware of anything like this on the market, I have reviewed the text for *Site Prep*’s readers.

Training the Industry

I learned about “Make More Money with Construction Machine Control” from one its authors, David V. Dow, vice president of TrenchSafety and Supply Inc. With offices in Tennessee and Arkansas, TrenchSafety serves the construction market in an interesting way. Although it is an instrument supplier, it also specializes in education and training services. TrenchSafety’s emphasis on safety education caught my eye, so I discussed its offerings in this area with Dow. He is recognized by OSHA as a 10- and 30-hour construction safety trainer, and he told me that in the past 15 years more than 10,000 people have attended TrenchSafety classes.

As safety concerns and machine control began to grow, TrenchSafety found that a huge training component existed for these pioneering products. “In the process of creating these classes, we researched the market for available books relating to the machine control industry and found that any reference materials were narrow and too focused,” Dow says. “We felt there was a strong need to have a vehicle such as a textbook that would outline and describe how the technology worked, so we assembled one. We wrote it to be a quick read, added graphics and pictures for clarity, and developed it for anyone who has an interest or need to know [about the technology].”

Targeting Readers

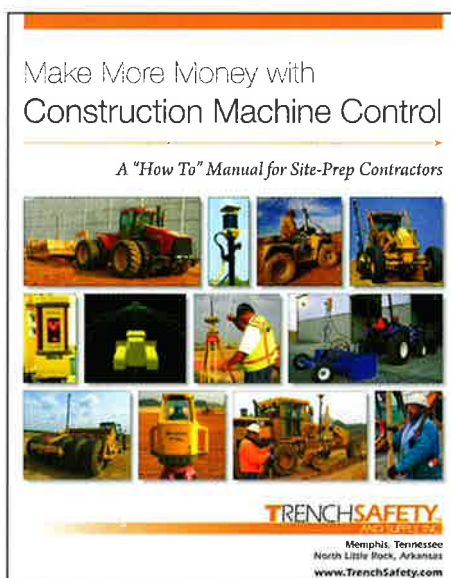
Keep in mind that “Make More Money with Construction Machine Control” is not an operator’s manual. Rather, the idea behind this book is to introduce the technology to someone unfamiliar with machine control.

“Say you have an inspector on your project that is unfamiliar with machine control technology,” Dow says. “Of course, the contractor will want to use this technology on the project and insists that it will add productivity to the project. To help bring the inspector or developer some familiarity of the process, this is a book they can obtain that will provide an overview of the industry with a fairly broad brush.”

The book provides laymen with a basic understanding of machine control technology, and it provides construction staff with an overview of how all the pieces fit together. The target market for this book involves several types of construction professionals, including:

- owners considering an investment in the technology;
- superintendents, project managers, inspectors, engineers and machine operators who want to learn more;
- and new employees.

Since machine control is a new technology, adopters sometimes struggle with team members who are resistant to change. These people would be well served to obtain and read this book so they better understand the workings of a project using this technology. If employees are intimidated or embarrassed about their lack of knowledge, there are currently few resources on the market to assist them. However, TrenchSafety’s text is now available to assist those seeking a nicely written source of information on the tools of the trade.



Chapter by Chapter

Chapter 1 is titled “Why Should You Consider Machine Control?” and begins with an explanation of traditional grade staking along with using grade-setting crews and blue tops for finish grading. These traditional methods are contrasted with machine control techniques to highlight the advantages and benefits of using machine control.

According to the text, some of the benefits of machine control include:

- precise spreading of material;
- reduced surveying costs;
- increased production due to reduced wait times, faster and fewer cuts, no extra passes to check grades, lower fuel costs, less inspection time and the ability to work around the clock;
- and aid to improve the skill levels of operators.

Another valuable part of this chapter is an example of how machine control can provide savings. Three areas for savings are described: material savings, engineering savings and production savings. The book provides a sample analysis for all three of these conditions on a 1-mile roadway construction job. The computations evaluate how material is saved, how surveying costs are minimized and how production time is saved. The cumulative savings resulting from this analysis add up to a whopping total of \$16,916 per mile of roadway. The numbers are all shown, and readers can use this algorithm to feed their own geographically derived values for the analysis. Additionally, the text hypothesizes that, with savings like this, it would not take too many miles of construction to pay for the machine control equipment.

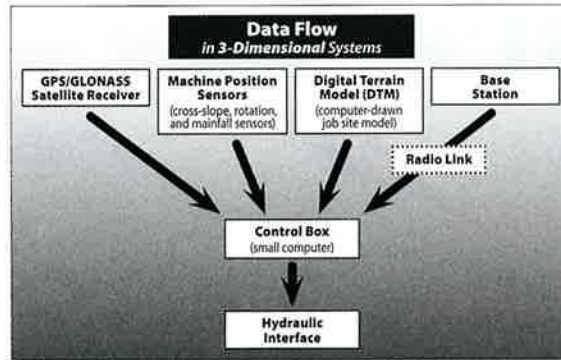
Chapter 2, “Lasers as Building Blocks,” commences by describing laser-based machine control. It discusses three types of laser transmitters and their applications to flat pads, sloped slabs and dual sloped pads. I was particularly interested in a chart indicating laser accuracies differentiated by distance. Other parts of this chapter include an explanation of the setup process needed for laser control, as well as a section on costs for lasers. The chapter concludes with answers to frequently asked questions (FAQs) about laser control, such as:

- Why are some laser beams visible and others not?
- Is the beam of a laser transmitter dangerous?
- What maintenance is required for lasers?
- Can environmental factors affect laser accuracy?
- What are the differences in laser tripods?

Chapter 3, “Simple ‘Indicate’ Systems,” shows the scalable nature of the machine control technology and discusses indicate systems. This chapter also includes FAQs on this topic.

Chapter 4, “The Mainstay: 2D Automatic Systems,” provides information on two-dimensional automatic systems. It describes the four key components of a 2D system: grade reference sensors such as sonic tracking and laser receivers; machine position sensors comprising cross slope, mainfall and rotation sensors; the control box; and the hydraulic interface. Also included are typical costs for 2D systems and a procedure identifying the setup process. Once again, this chapter concludes with an FAQ section on the topic at hand.

Chapter 5, “The Next Step: 3D Automatic Systems,” describes the four key components of a 3D system: GPS antenna and receivers, Digital Terrain Models (DTMs), the control box and base stations. Pictures are provided throughout the text to illustrate the basics of machine control, and this chapter is no exception. A simple graphic



This process flow chart from Chapter 5 illustrates the functionality of a 3D system.

illustrates the basis for the 3D system’s functionality.

Another timely subject is addressed in Chapter 6, “The Role of GPS in Surveying, Layout and Construction.” It identifies how GPS is involved in topographic map creation, the layout of the project and the performing of surface checks. The rover hardware is discussed and related to grade checking. Because TrenchSafety sells Topcon equipment, there is also a final chapter about Topcon technology.

Building Acceptance and Understanding

I prefaced this review by noting that I haven’t seen a text like this up to this point. Dow hopes this book will aid the success of the technology adopters. If their clients have an understanding of the technology and how it works, the entire process becomes a win-win situation. The contractor will perform the job more efficiently, more precisely, earlier and with less cost. This will ultimately lead to reduced costs for developers who hire contractors using this technology.

At press time, pricing for the book was not established. The ISBN number for the text is 978-0-9799267-1-6. It can currently be purchased by contacting TrenchSafety and Supply at 901/346-5800 or makemoremoney@trenchsafety.com. It is anticipated that the book will shortly be offered on Amazon.com and AECStore.com. **SP**

Harry O. Ward, PE, is a registered professional engineer, a state licensed contractor and certified in machine control. He is a vice president of Carlson Software and directs the Civil Engineering Division and Carlson College. He has more than 20 years of experience using CADD/CAE in the field of civil engineering, surveying and construction and has been a member of the engineering faculty at George Mason University since 1997.