

INSIDE

TELEMATICS

Boosting fleet efficiency via remote management

COMPLIANCE

New radio broadcasting rules adopted by FCC

KINETIC MESH

Next-gen networks offer more capacity & flexibility

MACHINE CONTROL

THE MAGAZINE FOR MACHINE CONTROL AND POSITIONING

VOL. 3 ISSUE 3

VOLUMES FROM SPACE



iPad & Tablet Ready!





LaserMan, Inc.

As Mt. Shasta towers in the distance, Steve Gregory of Gregory Equipment (left), who donated rough grading oversight services, and Simpson University's Dave Holman, who oversaw the project for the university, make preparations to grade the ball field.

If You Grade It...

When a college student is being educated to work in a hands-on profession such as construction equipment operation, there is no doubt that simulations and labs are absolutely essential parts of the learning process. But contributing to building an actual utilized structure looks even better on the student's resume and allows the student to hit the ground running after graduation. That's very important in the construction field,

where labor shortages exist as the work gets increasingly technical and highly trained workers are in demand.

Students taking Advanced Equipment Operation at Shasta College in Redding, Calif., are earning credits while helping to construct a new baseball stadium at nearby Simpson University. The ongoing project began in spring 2012 and was delayed beyond the spring 2013 semester due to heavy rains, according to instructor John Livingston, who heads the

Equipment Operations & Maintenance program and has taught at the college for seven years. Work on the stadium was to continue over the summer and into the fall 2013 semester, with completion expected by the end of the year.

The project gave 22 students the opportunity to work with high-tech equipment, such as an automated grade control system and a GNSS receiver, both of which have begun to see greater adoption by contractors in recent

BY DON TALEND



LaserMan, Inc.

Matt Derrick, of Oroville, Calif.-based LaserMan, Inc., has provided Shasta College with ongoing technical assistance and training on the equipment.



LaserMan, Inc.

Shasta College's Komatsu 61 EX dozer uses Topcon's 3D-MC² high-speed automated grade control system—a tool that gives students highly marketable operating experience.

years. The students used the receiver to locate utilities on the site and assist a local land surveyor, Frank Lamon, with the official site survey; the automated grade control system is being used to fine-grade the field.

Recently, the university purchased a Komatsu D61 EX dozer equipped with a Topcon 3D-MC² grade-control system, a HiPer Lite+ base and rover, and an FC-250 data collector. The university worked through Topcon's Educational Partners Program (EPP), which is dedicated to providing

financial support and training for educational institutions. More than 500 educational institutions throughout the world, including more than 300 in the United States and Canada, are involved in the program.

Shasta College's local Topcon representative, Matt Derrick of Oroville, Calif.-based LaserMan, Inc., has provided ongoing technical assistance and training on the equipment. "Matt has been an outstanding supporter of our program, especially with the follow-up training and technical assistance,"

Livingston said. Derrick serves on the Equipment Operations & Maintenance Program Advisory Committee and has advocated the training of students on the latest technology to aid local employers.

Providing instruction on the latest surveying and grading tools is critical for schools such as Shasta College. Prior to purchasing the 3D-MC² system, Shasta trained—and still trains—students on traditional grade staking and grade checking tools and practices. Additionally, the college's Construction Surveying class teaches the students hands-on project layout techniques, how to check stake placement with a specialty ruler and hand level, and how to calculate cut/fill plans. Once the students understand the traditional methods, they progress to the more high-tech methods.

Different kind of spring training

The surveying and grading processes used on the four-acre project site promise to develop top talent for the local construction industry.

"The GPS receiver has been instrumental in the layout of the project features such as drain inlets, dugouts and a sediment pond," Livingston said.



LaserMan, Inc.

Students used the Topcon HiPer Lite + GNSS receiver to survey structures such as a sediment pond on the site.



LaserMn, Inc.

Shasta College student Adam Panabaker checks grade with a Topcon HiPer Lite + GNSS receiver equipped with a FC-250 Data Collector with Pocket 3D Software.

The rover is mounted on a four-wheel ATV, which maximizes data collection efficiency. Lamson set the control points. The students obtained the locations of the boundaries and surveying monuments using the HiPer Lite+ to localize the project. They will also assist with the as-built survey of the stadium when it is completed.

The data from the official survey are stored in Topcon's Pocket 3D software that was loaded into the FC-250. Later, the data were exported into AutoCAD and Lamson developed the official survey, including the sediment pond.

Take-Off Professionals (TOPS), Peoria, Ariz., used the AutoCAD file to create a smooth 3D model to be loaded into the grading system. A local grading contractor has graded the site after the students have completed their work. Throughout the grading portion of the

Technologies boost students' marketability

Adam Panabaker of Millville, Calif., is in his second year at Shasta College and indicated gratitude for being involved in a "real live project." Panabaker is on track to obtain a certificate in heavy equipment and will continue his studies for the purpose of obtaining an Associate's Degree in Diesel Technology.

Once the site at nearby Simpson University was surveyed and the cut/fill plan and 3D model were developed, Panabaker was the first student to operate the automated grade control system. Actual operation took some getting used to, he recalled. "The blade will contour to what the plan requires it to," he said. "Basically, all you're doing is running the dozer and you're not using your right hand on the blade control at all. It takes a bit of getting used to because you're afraid the blade is cutting too much, but once you get used to it, it's almost like driving a car."

Going through surveying and equipment operations and pushing dirt and digging practice trenches on a practice field was a good primer for this project, Panabaker said. But, "To bring all of the skills we've learned onto a jobsite that has never been touched and turn that into something—that's an amazing feat!" There is a more tangible benefit to the ball field construction, though, as company executives have periodically observed the students' work and a few made a point of getting to know Panabaker. "I've gotten feedback from three or four companies that were interested in how I learned it and talked to me about future employment," Panabaker said.

As the first student to operate the dozer with the grade control system, he was "the head of the train," as he describes himself. "The ball field project was really good for me in a couple of ways," Panabaker said. "I got more than 100 hours' worth of run time with the equipment." That experience not only will look good on his resume but should also count toward learning time with the Construction and General Laborers Union Local 185, which Panabaker plans to join.

Another student who participated in the ball field project, California certified journeyman electrician Troy Frost of Martinez, Calif., is enhancing his construction skills at age 47, having gotten an opportunity to go back to school. Frost anticipates graduating in Spring 2014 with an Associate of Arts degree in Industrial Technology, including his heavy equipment certification.

The companies that Frost has worked for typically have been either general contractors or electrical contractors with large collections of construction equipment. In spring 2013, he was hired as an equipment operator by Redding-based Seward L. Schreder Construction, which specializes in school construction. His contact with his new employer has heard about the Topcon system from a few peers. "The main advantage he saw with the system is that, doing things the old way, if stakes get knocked down, currently he needs to call the survey team back out and they need to spend the time to reset those," Frost said. "With the Topcon system, being satellite-operated and -guided, you just go back to that spot, set the hub and you're good to go."

Using automated grade control was a bit of a technological epiphany, according to Frost. "It's really enlightening, seeing how accurately it cuts, how smoothly it runs and the kind of grading you can get, especially if you don't have a lot of experience with changing elevations. That was really neat for me, at age 47—when I started, they didn't even have screw guns," he said with a chuckle.

The GPS surveying was also a valuable skill to learn, Frost added. He helped to survey the drainage inlets and checked the depth and slope of a trench for the main drainage system. "It's definitely a lot faster," he said. "You don't have to keep moving your sight around, setting benchmarks that you always have to keep track of and making sure everything's at the same height—the GPS makes everything much quicker."

"I think the type of companies that I'll end up working for, if they have a system like this, it would definitely behoove me to have the skills and knowledge of how it operates," he said. "It's just another avenue to keep employed. That was my thinking when doing my welding and heavy equipment certification: the more avenues I can have to keep myself working, the better off I'll be. This economy is really tough, but learning the latest technology is key."

project, the students have continually taken the ATV out, collected more data and created a new map of the existing grade so that students can compare it with the model on the Topcon system and determine how much needs to be cut and/or filled.

Livingston noted that the project requires more than 30,000 cubic yards of cut-and-fill work. Once the fine-grading is complete, the grading contractor will install an irrigation system and infield dirt.

Students catch on quickly

The 3D-MC² system is an evolution of machine-control technology that broke the last barrier to productivity: speed. System components include an MC-R3 GNSS controller that works in conjunction with multiple sensors; a

One of several vendors that donated services to the project, Take-Off Professionals, Peoria, Ariz., built the 3D grading file for the ball field.

Local stadium advocates hope to raise city's baseball profile

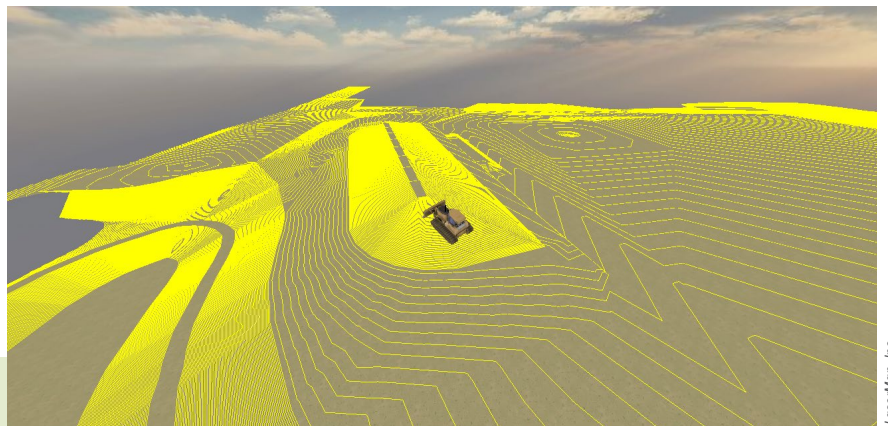


LaserMan, Inc.



Line drawing of the new stadium.

LaserMan, Inc.



LaserMan, Inc.

Starting in 2008, Simpson University in Redding, Calif.—a private Christian school—worked to raise money to tear down and reassemble the former Nut Tree Stadium, also known as Travis Credit Union Park, located in Vacaville, Calif., about two hours to the south. A local nonprofit organization, Add Some Color Inc., pulled off the deal to move fences, lights, stadium seats and other equipment to the Simpson campus. The plan was to have an operational stadium by June 2009, but fundraising during the recession proved difficult and field construction did not begin until spring 2012.

The stadium promises to be utilized by several teams, including Simpson's baseball and softball squads. The Redding Colt .45s, a summer collegiate wood bat team and youth summer baseball teams in the Redding Vipers organization sponsored by Add Some Color, will use the new stadium. Colt .45s manager Greg Cadaret, who pitched for the Oakland A's from 1987–89 and is a member of the Colt .45s' board, has been a major proponent of constructing the stadium so that his team can attract top talent. Ultimately, Cadaret and the advocates of the new stadium hope to attract a minor league baseball team to Redding as well.

The newly graded field will utilize equipment from a baseball stadium that previously was located about two hours to the south. Advocates of the new stadium hope that it will ultimately attract a minor-league team.

Shasta College prioritizes local industries' equipment operation needs

The Equipment Operations & Maintenance program at Shasta College in Redding, Calif., offers a two-semester Heavy Equipment Operations and Maintenance Certificate totaling 22.5 semester units. Combined with general education classes, the certificate can be part of a two-year Associates of Arts degree in Industrial Technology. Some students also pursue Commercial Drivers Class A licenses, American Welding Society certifications and Watershed Restoration Certificates. The college is also adding a National Certified Crane Operators (NCCCO) certification and Rigger I and II and Certified Signalman certifications.

Graduates move into a wide range of areas relating to heavy equipment operations. Because Northern California has an extensive forestry industry, the college places students in the heavy forestry industry including heavy fire equipment operations. Other students work in the transportation sector hauling freight. Many go to work in the Operating Engineers, Local 3 Union—most of whom are heavy equipment operators and construction workers—and many others work for non-union local construction companies. The program is also trying to cater to all types of students such as military veteran students, many of whom already have in-demand skills, especially engineering skills.

The program prioritizes instruction on increasingly high-tech equipment, as well as conventional techniques. A perfect example is the use of Topcon's high-speed 3D-MC² automated grade control system, which students learn to use in addition to doing conventional staking.

"Automated grade control is the area where we're seeing that the industry folks really want to see our students trained," said John Livingston, an instructor who also heads the program. He added that the local construction market badly needs qualified operators of automated grade control systems. "I am receiving requests from local businesses for students trained in the 3D-MC² system," he said. "These students are going to be in demand."

"It's going to make future employees more efficient," Livingston continued. "Technology like this system is the wave of the future. A lot of older operators don't want to learn it. They figure, they're almost done working and they don't want to mess around with this new stuff. That's going to open up huge opportunities for new operators coming in to pick up some really good jobs. But, also, they're going to be able to do more work faster and more accurately than their predecessors."

touchscreen, GX-60 control box; and a conventional GNSS antenna mounted on the dozer blade. The MC² sensor combines three electronic gyroscopes and three inertial measurement sensors to measure the X, Y and Z position as well as the roll, pitch, yaw and acceleration of the dozer blade.

The technology gives the system the capability to provide blade position readings up to 100 times per second—or roughly five times that of conventional systems. Additionally, extensive testing and jobsite data indicate that the system yields about three times the grading smoothness of other machine-control systems.

Chris Pope, a paraprofessional instructional aide in the Shasta program, said that the use of the HiPer Lite+ for surveying and grade checking has been a valuable addition to the students' instruction on conventional surveying techniques. "Control points are important; they have to know how to locate them," he said. "Also, we give the students an understanding of grade checking—they need to know the fundamentals."

Pope said that students picked up the system quickly. "Where it really separates itself from everything else is its accuracy," he said. "It was tested on this project and the project superintendent wasn't sure that a drain inlet was at the correct elevation. He had us check it with his rover. We checked it against the plans and they came back within 1/1,000th of a foot. That proved to him how accurate this equipment is."

Held in February 2013 in Anderson, Calif., the Sierra Cascade Logging Conference gave Shasta College the opportunity to promote several programs, including its Equipment Operations & Maintenance program.



LaserMan, Inc.

With the local construction economy facing labor shortages, Livingston credits the Topcon EPP for giving his program a much-needed technological infusion. “Topcon substantially reduced the cost to our program so that we could afford to install the system on our dozer,” he said. “Our advisory committee is very excited about the partnership and pushed us to add a second system on our new Komatsu GD655 motor grader. That will provide students with additional opportunities to learn.”

Livingston said that the first time a student grades a site by viewing the GX-60 monitor, they begin to develop an affinity for the grading system. “They think, ‘Wow, I don’t have to have all of the stakes out there—everything’s in the cab,’” he continued. “There is a learning curve. People do have to be willing to sit down and be trained on it, but I’m seeing students who really want to learn it—they’re picking it right up.”

Pope echoed Livingston’s sentiment about automated grade control. “For dirt moving companies to be competitive in the bid process, they have to have this technology,” he said. “They rely on it heavily now because their bids are so tight that if they don’t have complete control and accuracy of the job, they can lose a lot of money. Of course, there will always be the same argument—cost—but the return is quick. Contractors can bid these jobs and they can take an average operator or grade checker and make them a pro.”

Don Talend of Write Results Inc., West Dundee, IL, is a print and digital content producer specializing in covering geospatial topics.



LaserMan, Inc.

The Topcon 3D-MC² system provides readings roughly five times as fast as conventional machine-control systems and yields about three times the grading smoothness of other systems.



LaserMan, Inc.

The high-speed automated grade control system is a tool that gives students highly marketable operating experience.