



## CONSTRUCTION EQUIPMENT

# Side By Side: Lasers vs GPS

Jun 12, 2007

Laser guided machines have been in use in construction for decades and in agriculture even longer. Then in the late 1990s global positioning systems that use satellites to send positioning information to moving equipment gave contractors a new, powerful tool to increase earthmoving productivity.

Both lasers and GPS systems are used to guide equipment but each has distinct differences and advantages. To help sort out the pros and cons we asked Murray Lodge, construction sales manager for Topcon and an 18-year veteran of this industry to tell us which applications and conditions are best suited for each.

### Lasers pro

**Accuracy.** A laser beam rotating around a jobsite can give you vertical positioning accuracy of 5 arc seconds or a couple hundredths of a foot at a thousand feet. This is more than enough to do rough grading where specs are typically plus or minus 1/10th of a foot and also sufficient for final grading for a road or runway.

**Cost.** Laser systems are relatively inexpensive, having been on the market for three decades.

### Lasers con

**2D only.** Since a laser is a beam of light projected in a flat plane, it can only guide your equipment in that plane – either a perfectly flat building pad or a continuous slope that doesn't change.

**Limited horizontal distance.** Lasers only go about 500 yards for a basic model and 1,500 yards for a high-end unit. And as your distance increases accuracy starts to degrade, so for extremely tight tolerances you may not be able to use the full range of a laser transmitter.

**Limited vertical range.** A laser transmitter communicates with a receiver that's mounted on a mast on your machine. If the mast is only 10 feet high, that's as high or low as you can guide the machine with that laser, unless you reset the elevation of the transmitter.

Interference. Any laser beam can be disrupted by dust, fog, wind, heat, refraction or the vibration of big machines driving past.

### GPS pros

3D positioning. Since GPS receivers collect and triangulate positioning information from satellites in orbit above the earth, they're not limited to a single flat or sloped plane. Hence a single GPS base station can guide machines through superelevated curves and complex topography that would require multiple repositionings of a laser transmitter.

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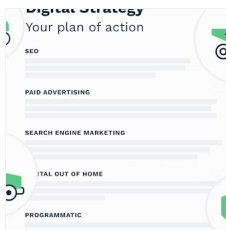
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Reduced staking. "You still need some stakes, typically around the edges of a project," Lodge says. "You want to mark a few things when they're rough grading. But all those multiple hubs and stakes that used to be there so everybody could see it, those are gone."

Reduced survey costs and wait times. Surveying is still needed to set a hub, or known point for the GPS transmitter/base station, Lodge says. And, as mentioned above, a few stakes as rough indicators are a good idea. But since you don't have a lot of stakes in the field, you don't have to wait for surveyors to redo a site because somebody ran over the stakes. And the few stakes that might get run over can be quickly reestablished with a GPS rover on a backpack.

Boosts productivity. Lodge uses the example of a motor grader operator doing a finish grade. "They can't look at both sides of that blade at the same time," he says. "So they'll focus on the leading edge and leave the trailing edge a little high. Then

they'll go back and lower the trailing edge to bring that side down to grade. So they only work half the moldboard at a time. When you go to GPS you're leading with the leading edge and the trailing edge is automatically cutting the right slope. You're able to do it in half the passes as before."

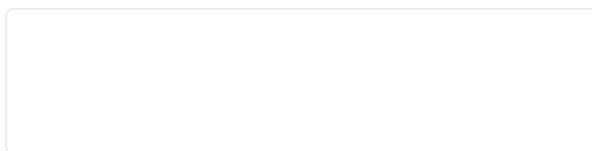
Makes operators better. "If you have an operator who's not very good and he's trying to make it to a hub that's 50 feet away, he might be putting too much dirt in or leaving too much out," Lodge says. When he goes to the 3D control system, not only does he know where he is at each hub, he knows where he is between each hub."

Unlimited vertical reception. Unlike lasers that can only work as high or low as the receiver's mast allows, a GPS system lets you work as high or low as the base station's radio signal will reach. The base station can broadcast to a machine up on a hill or down in a valley.

### GPS cons

Accuracy. GPS is not as accurate as laser in the vertical plane and is usually spec'ed at plus or minus 1/10th of a foot. "You can get better than that," Lodge says. "We see 6/100ths or less and some people grade to within a couple hundredths. It's all based on where you're working and where the satellites are in the sky. Accuracy goes up according to the number of satellites you can see. More is better."

Satellite availability. There are times and places where your GPS receivers may not be able to receive sufficient satellite signals to deliver workable results. You generally need a clear line of sight to the southern sky for best results, although systems using Glonass satellites (a constellation put up by the Russians with more northerly orbits) are less dependent on southern exposures. But mountains, tree lines and tall buildings may impede your ability to get signals.



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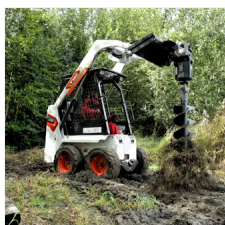
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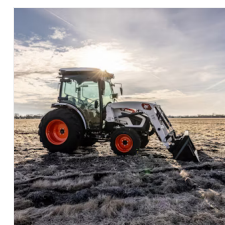
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