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# 3D-MC Three Dimensional Machine Control

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## 3D-MC THREE DIMENSIONAL MACHINE CONTROL

### THE NEED

Construction equipment using laser control technology cannot perform curves on a road construction project. The guiding of road construction equipment in curving contours requires references such as hubs, staking, or elevated string lines. These benchmark limits productivity, because their installation is slow, subject to human errors, and require skilled operators to steer accurately the machine using rudimentary control methods. Attempts to guide equipment in curves using radio communication have been tried but this solution is still slow and unreliable.



FIGURE 1 GRADER WITH TOPCON 3D-MC

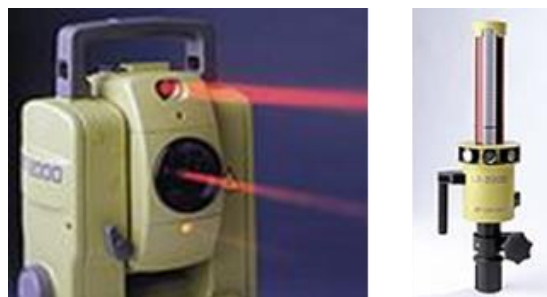


FIGURE 2 COMPUTER AND TOTAL-STATION (LEFT) RECEIVER (RIGHT)

### THE TECHNOLOGY

The 3D MC system uses three modules to control the piece of equipment:

- The survey plans are uploaded in a total station using a computer notebook. The total-station converts the digital information into an infrared laser beam.



- A receiver, mounted on the blade of the equipment, intercepts the laser beam emitted by the total station and continuously determine (20 up-grades per second) the blade's current position and grade with respect the theoretical ones defined by the designer plans.
- The interface between the positioning information and the actual steering of the equipment is performed through the use of a control system device, which converts the digital data into machine hydraulic valve pulses.

## THE BENEFITS

The main benefit of the 3D MC system is the obvious gain of productivity generated by this innovation. According to some research carried on by manufacturers of the guiding systems, the 3D MC device can triple the productivity of equipment on highway projects as well as drastically increase their levels of precision and performance. The 3D MC system is the next generation of equipment controlling devices bringing an alternative to the existing slower and unreliable radio communication systems.

## STATUS

This laser technology was first commercially introduced in the construction industry three decades ago. It was first used for underground pipes and other straight-line positioning applications. However, the use of laser technology for curve application is a novelty. The 3D MC is currently starting to appear on highway projects in the United States, Australia, France, and Germany. This technology was honored as one of 1999 [Nova Award Finalists by Construction Industry Forum](#).

## BARRIERS

The main shortcoming of the 3D-MC system is the distance between the total-station and the equipment being guided, which is limited to 300' (100m), and hence requires to re-set the total-station frequently when the equipment pass that limit.

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## REFERENCES

1. Topcon Laser Systems: [www.topconlaser.com](http://www.topconlaser.com)



## **REVIEWERS**

Peer reviewed as an emerging construction technology

## **DISCLAIMER**

Purdue University does not endorse this technology or represents that the information presented can be relied upon without further investigation.

## **PUBLISHER**

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