

## 3D GPS Earthmoving Equipment Controls

Dwayne McAninch, chairman and CEO of McAninch Corp, Iowa's largest earthmoving contractor is not your typical contractor. He is responsible for the successful marriage of Trimble Navigation Ltd.'s surveying/GPS technology and Caterpillar Inc.'s earthmoving equipment nearly a decade ago. McAninch facilitated testing, development and refinement of prototypes on his own equipment, set out on a campaign to educate the construction industry on the benefits of GPS-based digital earthmoving and shared his own performance data to demonstrate significant productivity and safety improvements.

McAninch adopted GPS in 1999 when Trimble Navigation introduced the dual-antenna Site Vision system that employs guidance and machine control. McAninch was the first earthmoving contractor to employ Trimble Site Vision GPS receivers on his equipment and currently has almost seventy receivers on scrapers, trucks, excavators, graders and dozers.

For decades, equipment operators took their instructions from stakes in the ground that had to be moved and reset as the work unfolded. Grade stakes will soon be obsolete, thanks to 28 Global Positioning Satellites that send radio signals to earth. Onboard GPS receivers allow scrapers, dozers, and graders to plot accurate courses with little or no reference to in-ground markers. Light bars mounted in the operator's field of vision signal proper blade angle as the machine moves, while a video display shows the proper cut or fill on the job site. Equipment operators work with a computer screen inside their cabin and know where their blades are within a fraction of an inch. The immediate benefits are speed and extreme accuracy. Productivity is improved by at least 30% with higher quality results. Grade tolerances are between 0.1 and 0.01 feet.

With GPS, supervisors and foremen no longer have to reset stakes, instead, they can concentrate on monitoring the work, haul routes and cycle times. At the end of the day they drive their GPS-equipped pickups and send progress data to the home office so that estimators can check actual progress and productivity against the original schedule. Real-time information allows for more effective monitoring of the job, detailed and accurate management of individual pieces of equipment and more precise cost analysis. Earthmoving operations are safer because less time is spent on the job and less people are involved. In short, all earthmoving tasks and management functions are improved by GPS and this more than offsets the cost of the technology.

The technology has been used on several projects in the United States and in Australia. For the future, McAninch has expressed interest in seeing GPS used for "intelligent" soil compaction and streamlining digital data between designer/consultant, contractor and operator.

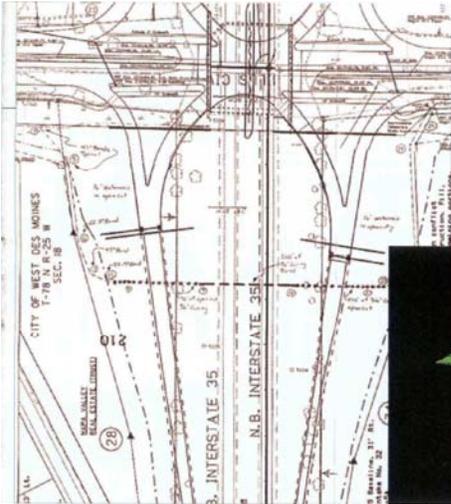
Engineering News Record selected McAninch as recipient of the 2005 Award of Excellence in their April 6<sup>th</sup>, 2006 issue. According to the magazine, "the pioneering and persevering work of J. Dwayne McAninch is set to revolutionize design and construction in the field." The 69-year-old McAninch has spent years perfecting and advocating the use of global positioning system technology in his industry, bringing earthmoving into the digital age.

The innovation nominated here for the Nova Award is 3D-based earthmoving equipment controls for construction, from invention to implementation. Obvious prime movers were Caterpillar and Trimble who together developed the first GPS system for a bull dozer. However, that dozer's instruments were not well fitted to construction. McAninch was the third prime mover, for construction, because he brought to Caterpillar and Trimble the need for more accurate and practical controls for construction equipment and worked with them using his own construction equipment fleet to develop the tools construction needed. Therefore, primarily responsible for the innovation are Caterpillar, Trimble, and McAninch.

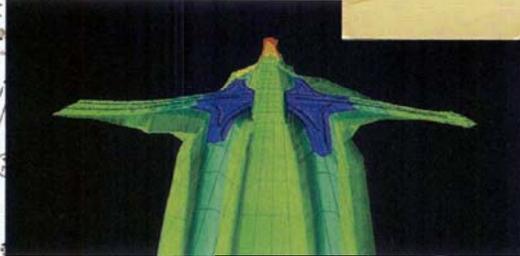
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# 3D GPS-BASED EARTHMOVING EQUIPMENT

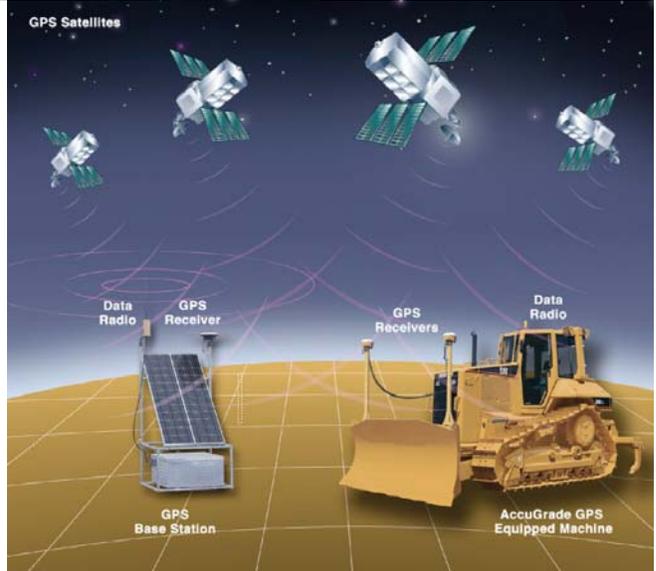
# 2006 Nova Award Nomination 30



**Transformation.**  
McAninch converts plan (left) into a digital model (center) so it can grade the finished product (right).



**AccuGrade®**  
GPS Grade Control System  
**CAT**



**GPS 101**  
FOR EARTHMOVING CONTRACTORS  
72 page book provided by McAninch Corporation

