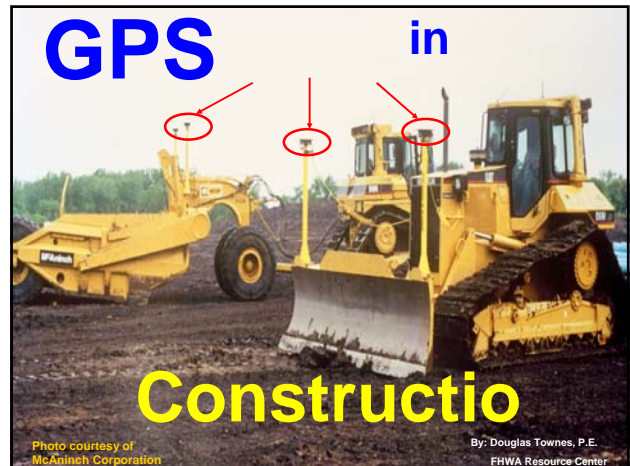
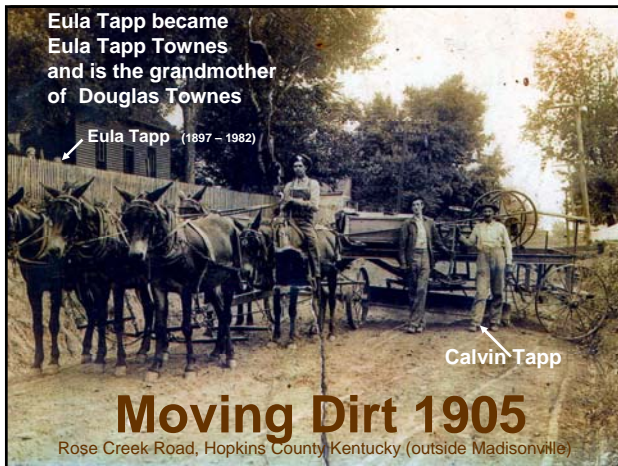
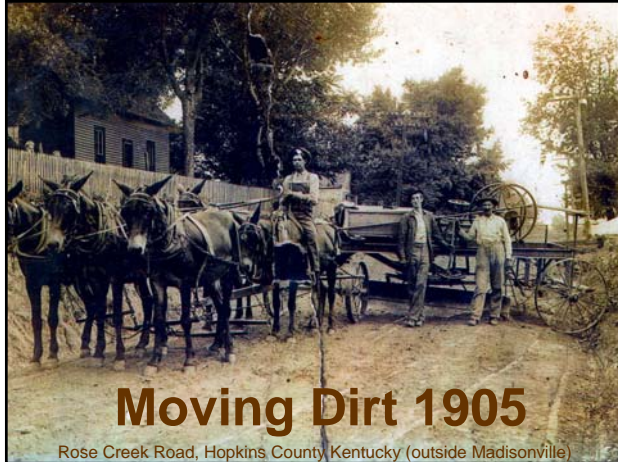


SEAUPG 2005 CONFERENCE - NASHVILLE, TN



During this session

- You will:
 - Hear about the history of GPS in Construction
 - Hear about the advantages of using GPS on a construction project
 - Hear about the impediments that block implementation of GPS technology
 - Here how members of SEAPUG can become a part of the solution

History of GPS in Construction

- 1982 Trimble bought technology and began incorporating into surveying instruments
- 1988 first GPS survey instruments sold
- 1993 first strip mining machines began using GPS for "location"
- 1998 first product to have GPS and cellular on a single board for fleet management

History of GPS in Construction

(Continued)

- 1999 first GPS grade control system for the construction market
- 2000 Contractors begin using "Stakeless" grading
- 2002 GPS machine controls are installed on Caterpillar excavators and motor graders

Show Caterpillar Video

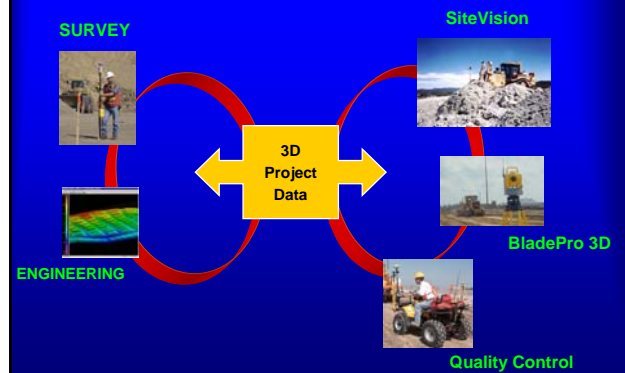
(1 minutes, 30 seconds)

"Stakeless" Grade Control



BladePro 3D-ATS

TOTAL SOLUTION



TOTAL SOLUTION



Projects are being surveyed and designed in 3-D for the DOT's but the Contractors are not allowed to get a copy of those same electronic files when the project is awarded.

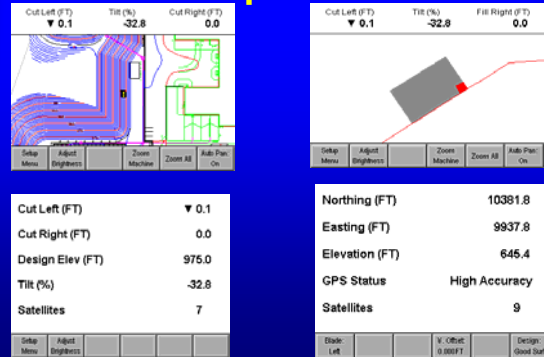
Applications of 3D Machine Control and GPS Survey Systems

- BladePro 3D (BP3D)- Total Station Based
 - Finishing Subgrade
 - Knockdown and placing of materials in various zones
 - Finish Grading
 - Phased Construction
 - Erosion Control
 - Bridge Structures
 - Drainage
 - Signs, Guardrail
 - Location of test results

The Global Positioning System (GPS) is used to...

- Accurately position the grading machine **BLADE**, on the 3D digital model of the project
 - Within 1cm in X and Y
 - Within 1-3 cm in Z = 1.18 of an inch
 - Old school one tenth = 1.2 of an inch
- This puts the blade on the design, precisely located in 3D

Four screens available to the operator



I-4 Lakeland Florida



I-4 Lakeland Florida



Scaleable Lightbars



Dozers D3-D11 with GPS Controls



Two Antennas

Gives You:

- Most Accurate Solution!
- Cuts/Fills calculated along the entire blade cutting edge, from the right tip all the way to the left tip (no matter how the blade is tilted or rotated)
- Always know which way the machine is facing and moving. (operator must tell the system which direction with single antenna)
- No need for rotation or tilt sensors that are affected by vibration (especially on dozers)
- No daily/weekly/monthly calibration of sensors



TWO ANTENNA'S

Grading on slopes or flat area



Considerations when using GPS Technology

Advantages

- Places the design in front of the operator.
- Unlimited machines possible on one base
- Line of sight not required
- Dramatically increases production
- Dramatically reduces labor costs-layout, stakes
- Not effected by fog, dust etc.
- Operators love to use it!

Disadvantages

- You need a clear view of the sky
 - Tree canopy
 - Tall buildings
 - Blocking terrain
- Requires a local "champion" to manage-
 - Data and site Cal
 - Radio coverage
 - Proper application requiring attention



GPS Technology

GPS technology	Compared with	Estimated savings
Grade Checking	Manual method	Up to 66%
Reduction or Elimination of Stakes	Using stakes	Up to 85%
Improved material yields/select fills/undercutting	Overruns using manual methods	3% to 6% in volume
Un-interrupted earth moving production under any weather conditions (24/7)	Daytime / fine weather operation only/night work	30% to 50%
RTK, robotics stakeout	Traditional suney stakeout	More than 100% in speed and 66% in staffing

- Other savings from:
 - Improved utilization of equipment/30%
 - Lower skill level required realize over 100%
 - Erosion control as you go
 - Accurate location of testing for QAQC

How to get up and running faster

- Fully committed to the process
- Draw upon experienced resources
- Stay the course and be willing to follow through the learning curve
- Job planning
- Do not panic!



The use of GPS Technology in Construction provides:

- More accuracy in setting grades and control points
- Reduces construction time for the Contractor
- Provides higher quality grading with GPS controlled machinery

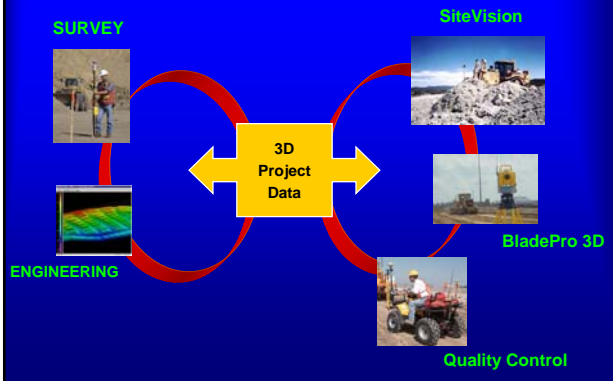
What is happening in DOT Construction Today?

- According to this subcommittee's Technology Implementation Group's (TIG) 2002 survey:
 - Only 9 of 36 States reported contractors were using GPS controlled machinery
- 6 of 17 reported GPS use in Construction in the SOC "Technologies Used in Construction" 2004 survey

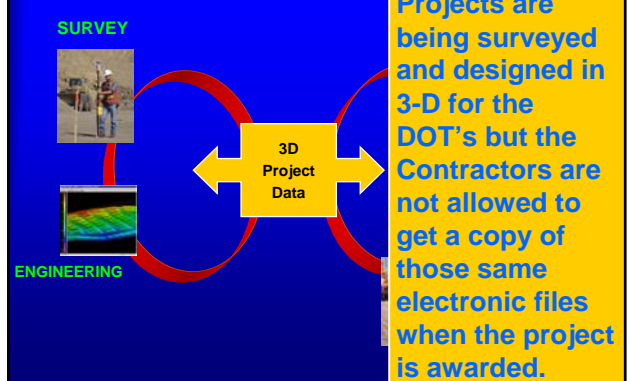
So why isn't GPS Technology being used in more State transportation construction projects?

- State DOTs are reluctant to give electronic survey data with contract documents
 - Fear of misuse or misapplication
 - Procedure for QC does not exist for stakeless grading
 - Current plans are 2 dimensional and leave a paper trail
 - Due to the initial high cost of the equipment, smaller contractors will be at a disadvantage

TOTAL SOLUTION



TOTAL SOLUTION



We are surveying a DOT project in 3 dimensions and Contractors are building projects in 3 dimensions. Designers produce plans for construction in 2 dimensions (on paper) because this has been the standard since roads were first designed.

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We need to find a way to embrace latest technology and begin producing 3-D electronic plans along with paper plans that facilitate the production of transportation construction projects of highest quality by the most economical means.

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What was done in 2005 to help promote GPS technology in Transportation?

- NCHRP project 20-05 Technologies for Construction Delivery has been appointed.
 - Report is due out next year and will highlight some of the impediments to implementing this innovative technology.

Help Needed With GPS Machine Control

- Provide 3-D electronic data along with 2-D paper plans during bid process and at contract award
- Revise standard specifications tolerances to allow stakeless machine grading
- Quality control guidelines for stakeless construction need to be implemented by DOT's
- DOT's need to add Machine control as an option in their Bid packages
- Provide training of the entire Team involved with the project (certification by Level of Training)
- Have Contractor return paper and electronic "asbuilt" files when Project is complete

Many thanks go to the following:

- Jones Brothers Construction (Brett Alsobrooks) for providing slides on the advantages of GPS from the Contractor's perspective
- Caterpillar for providing the video and the brochures in the back of the room

Questions?