GPS for Earthmoving Productivity

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Machine Control and Guidance
Cat Electronics
Earthmoving
In
The Information Age

The Perpetual Challenge – Increase Productivity and Reduce Cost

The Opportunity - Re-Invent the Planning and Production Process Using GPS & Information Technology

**Current Process**
Surveying and Staking
Paper Plans
Extensive Supervision

**New Process**
GPS Positioning
On-machine Computers
3D Terrain Models
Earthmoving in the Information Age

Enablers

- On-Board Computers & Displays
Earthmoving in the Information Age

Enablers

- On-Board Computers & Displays
- Real-Time Accurate Position - GPS
Earthmoving in the Information Age

Enablers

- On-Board Computers & Displays
- Real-Time Accurate Position - GP
- Wireless Data Communications
CONSTRUCTION INDUSTRY – GRADE CONTROL
Impact of GPS Technology

Current Grading Process

GPS Grading Process

- No staking
- Puts design surfaces, grades, and alignments inside the cab
- Enables operator to cut and fill to precise grade
- Speeds Grading
Dewayne Cox of Cox & Sons Contracting Company in O'Fallon, IL said, "Three-dimensional machine control is becoming the standard," says Cox. "If you're going to be doing any kind of commercial work, you've got to have it." Garrett thinks contractors will have to have it or they'll be going out of business. "It's going to be like going from cables to hydraulics." – Grading and Excavating, October 2003

"According to Tom DiGiampaolo, operations manager, an operator on the company's Cat D6M was grading two building pads per day following stakes. But after fitting the machine with an automated GPS system, the operator cuts six pads per day, minimum, with no stakes and no rework." – Construction Equipment, April 2004

Patrick Ruelle of McAninch Corporation of Des Moines, Iowa commented earlier this year, ‘‘It’s the difference between building houses with hand tools and power tools,’ he says. ‘Today the question is how much more productive and efficient are you by using the tools you have?’’ – Site Prep Magazine, March 2004.
WASTE MANAGEMENT INDUSTRY
On-Machine Compactor Screen

- Compaction passes
- Thick lift detection
- Landfill design display
  - Boundaries
  - Outside Slope Toe & Crest
  - Avoidance Zones
    Eg; Gas Lines
- All in Real-time!
### CAES for Landfills

- Uniform lift thickness
- Plan visible at all times
- Redundant passes eliminated
- Accurate heights = less rework / improved airspace usage
- Accurate slopes / toes / crests = better airspace use / improved drainage
- Eliminate overspreading at cell perimeter
- Accurate / uniform cover = Less cover material
  - Cell capacity extended
- Faster start-up overnight & during inclement weather / no waiting for survey
- Operator empowerment/feedback
- Grade stakes & paper maps eliminated

### Arizona Landfill

- **Airspace Savings**
  - **12%+** Density Increase
  - More uniform lifts
  - **$1.4 Million/Year savings**

### Midwest Landfill

- **14%** Density Increase
- **$2,391/Day Savings**
- Daily Density Tracking
- More effective compaction
- More efficient cover soil management
- More machine productivity

= More Landfill Life
MINING INDUSTRY
ORE SELECTION and ELEVATION CONTROL
Computer Aided Earthmoving System (CAES) on cable shovels paid for itself in 1 year through improved ore recoveries. Improved bench elevation and reduced machine maintenance provided additional economic benefits. Errors in ore control dropped from 17% to 7%.

CAES provides a 30% productivity improvement in track-type tractor handling of material for draglines in coal operations.

CAES pays for itself in less than 1 year by providing track-type tractor productivity improvements of greater than 30% in coal operations. We have seen additional benefits of less re-handle, improved operator view to cut/fill elevations, and a reduction in survey costs.
GPS impacts Caterpillar’s core machine business
GPS Impacts:

- Many Machines
  TTT, BHL, WTS, Compactors, MG, WTL, HEX
- Many Markets
  Mining, Construction, Landfill
GPS Based Products Are Delivering Exceptional Value

30% Improvements

- Fewer Mistakes
- Higher Machine Utilization
- Improved Job Quality
- Better Documentation
- Improved Efficiency
- Reduced Human Effort
- Night Operation
- Improved Safety
The *Revised* Technology Adoption Life Cycle

*From Crossing the Chasm* by Geoffrey A. Moore
The *Revised* Technology Adoption Life Cycle

We are now across!!!

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THANK YOU