

GPS for Earthmoving Productivity

Chuck Schaidle

Manager

Machine Control and Guidance

Cat Electronics

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Earthmoving In The Information Age

New High Tech Products Are
Revolutionizing The Way
Earthmoving Machines Are
Guided & Controlled

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**

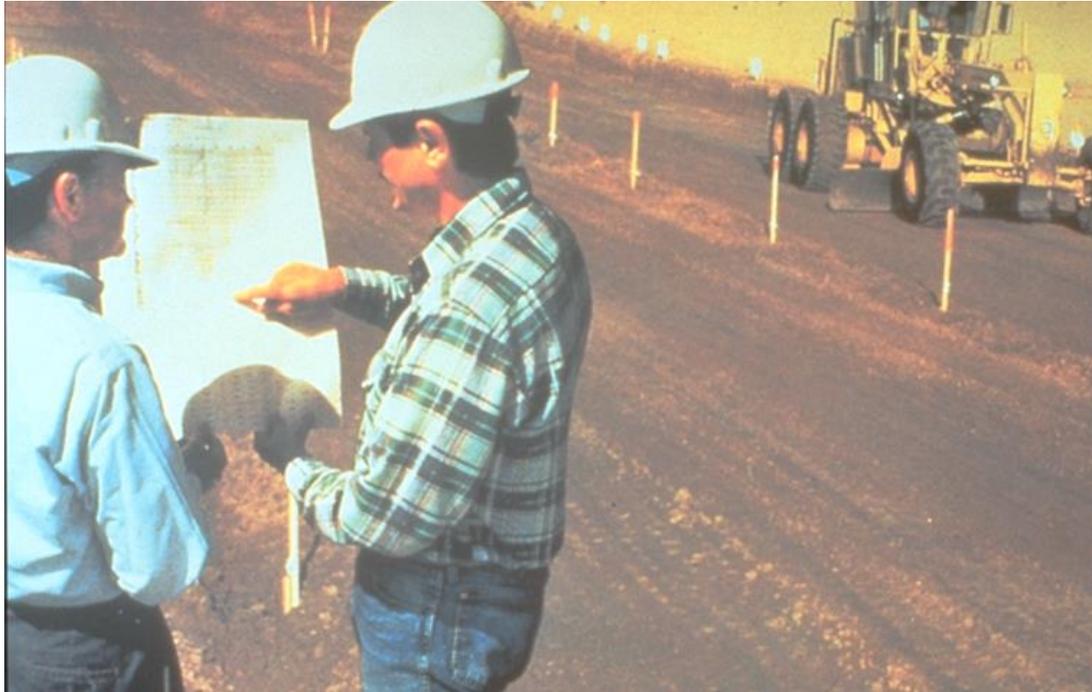
New Process

**GPS Positioning
On-machine Computers
3D Terrain Models**

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Earthmoving in the Information Age

Enablers

- On-Board Computers & Displays



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Earthmoving in the Information Age

Enablers

- On-Board Computers & Displays
- Real-Time Accurate Position - GPS





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Earthmoving in the Information Age

Enablers

- On-Board Computers & Displays
- Real-Time Accurate Position - GP
- Wireless Data Communications



CONSTRUCTION INDUSTRY – GRADE CONTROL

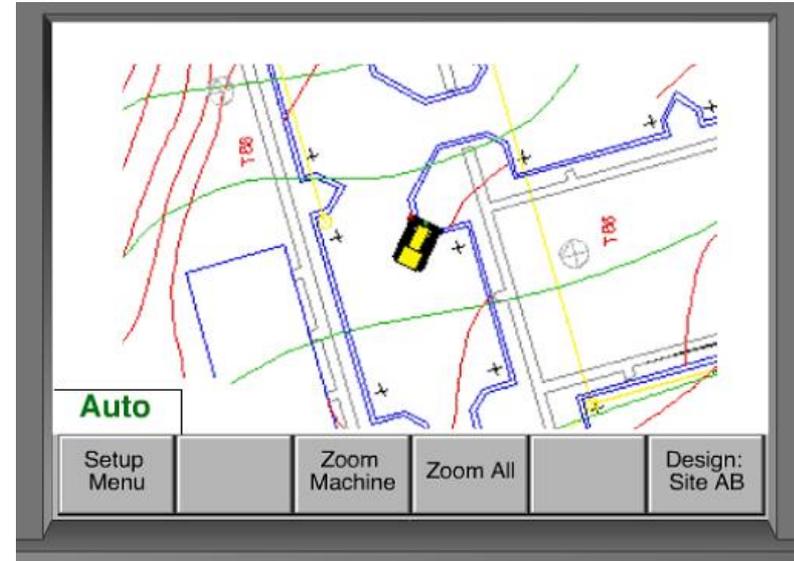


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AccuGrade® Grade Control System



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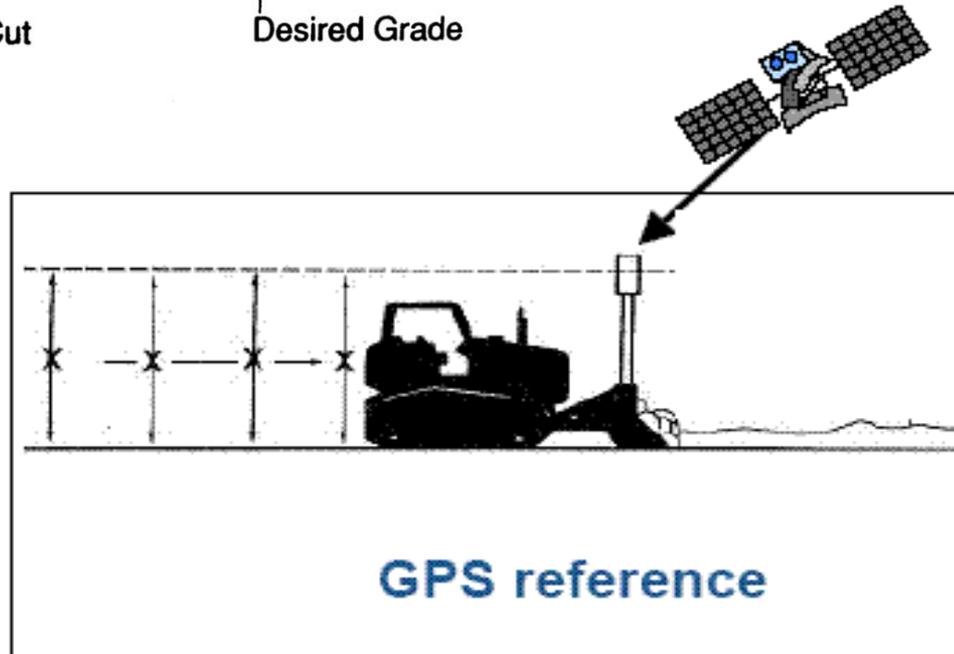
Impact of GPS Technology

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



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“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

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



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.

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WASTE MANAGEMENT INDUSTRY



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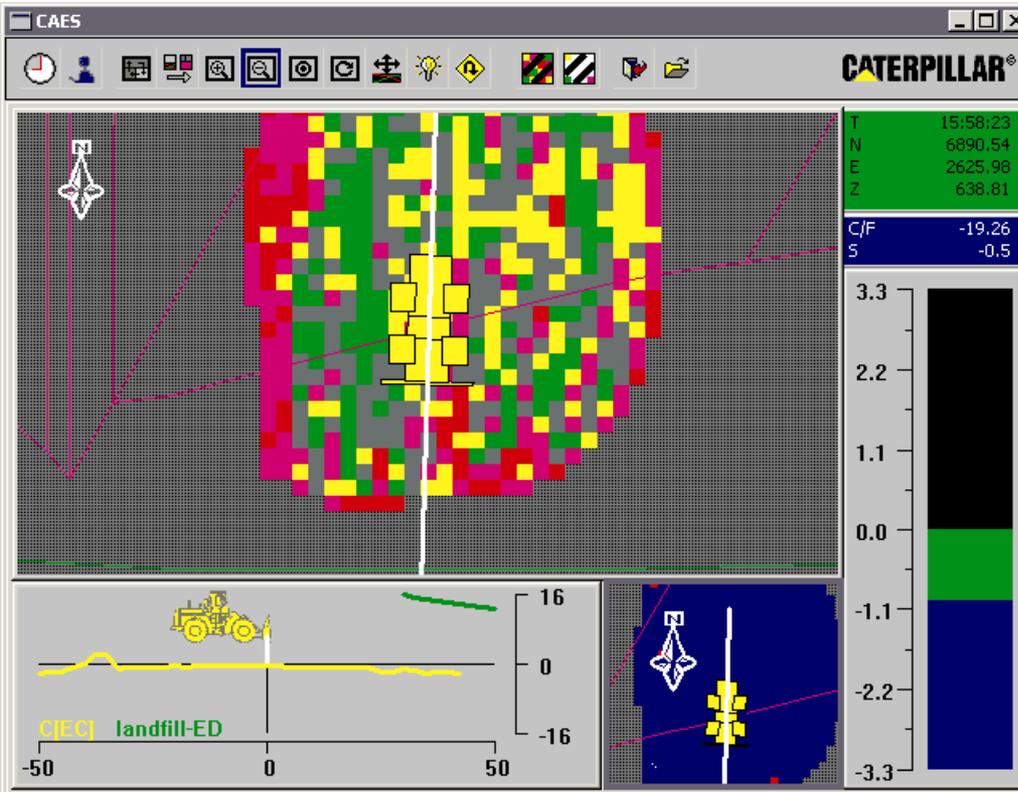


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On-Machine Compactor Screen



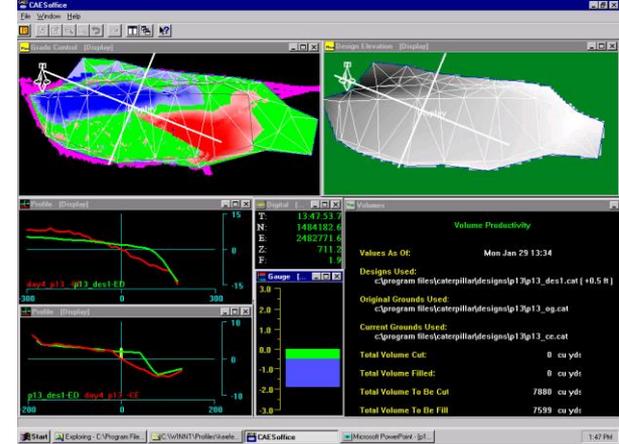
- Compaction passes
- Thick lift detection
- Landfill design display
 - Boundaries
 - Outside Slope Toe & Crest
 - Avoidance Zones
Eg; Gas Lines
- *All in Real-time !*

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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**

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- More effective compaction
- More efficient cover soil management
- More machine productivity

= More
Landfill
Life

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MINING INDUSTRY



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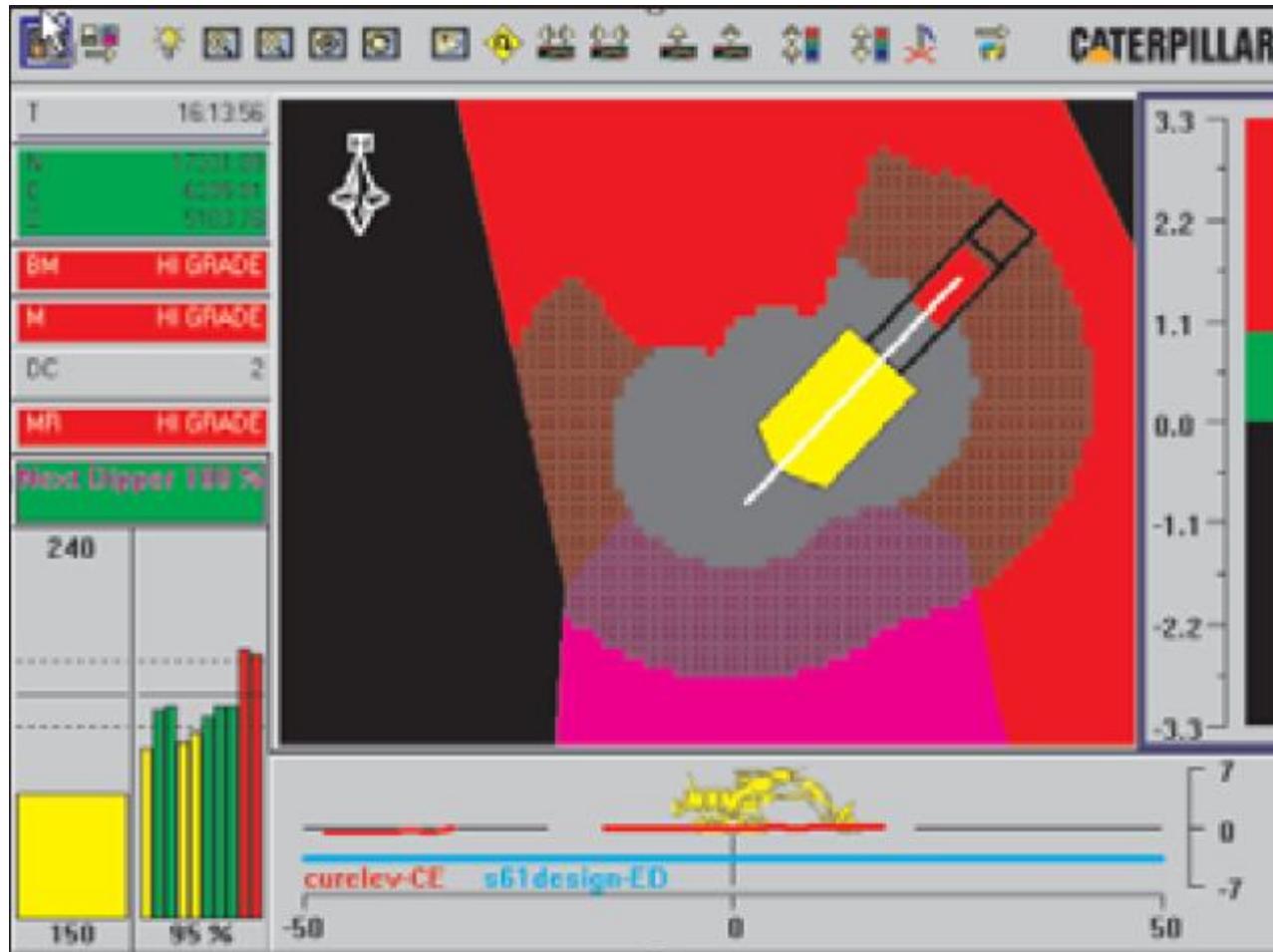


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ORE SELECTION and ELEVATION CONTROL



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Mining Customers' Comments

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



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GPS Is Important To Caterpillar

GPS Impacts:

-Many Machines

TTT, BHL, WTS, Compactors, MG, WTL, HEX

-Many Markets

Mining, Construction, Landfill

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GPS Based Products Are
Delivering Exceptional
Value

Fewer Mistakes
Higher Machine Utilization
Improved Job Quality
Better Documentation
Improved Efficiency
Reduced Human Effort
Night Operation
Improved Safety

30% Improvements

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The *Revised* Technology Adoption Life Cycle



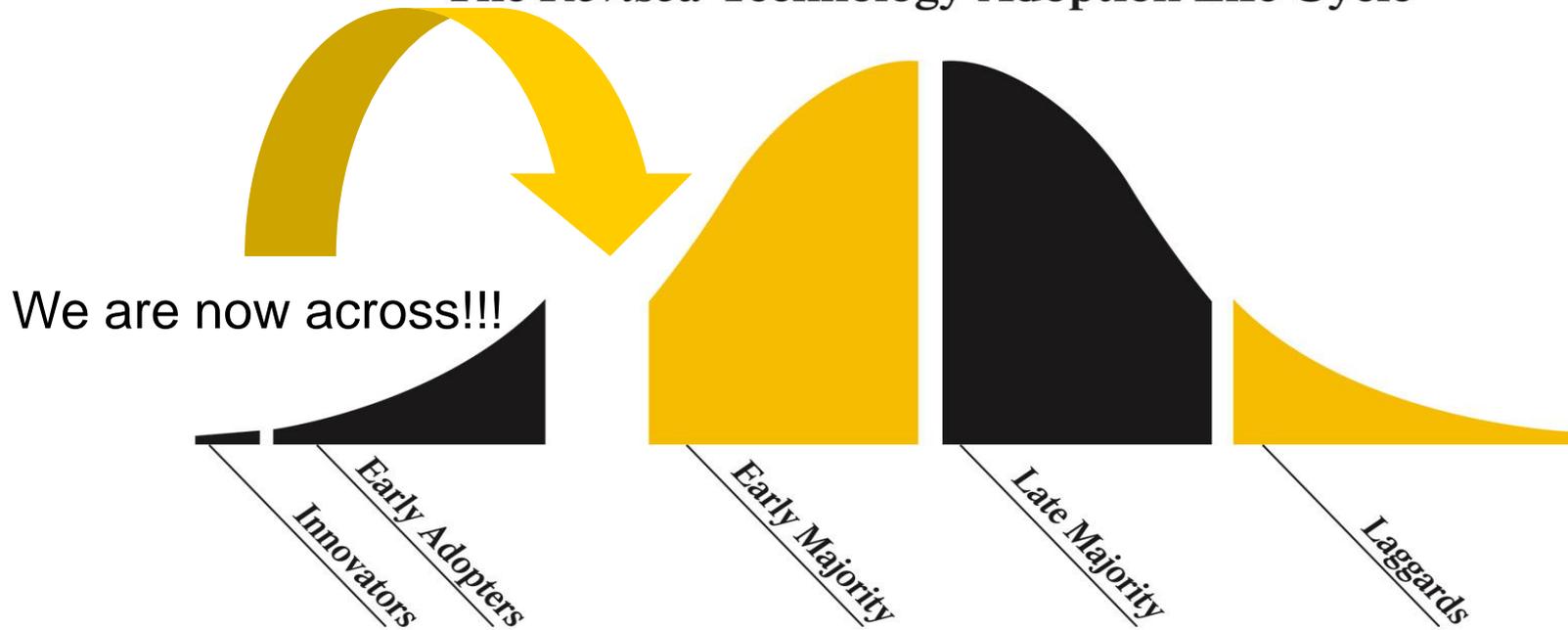
*From Crossing the Chasm by Geoffrey A. Moore

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The *Revised* Technology Adoption Life Cycle



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THANK YOU

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