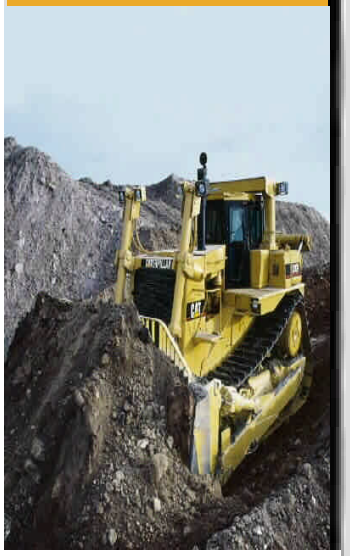
Simposio de Metrologia

May 2001

Metrology Challenges for the 21st Century

Dean Beutel
Caterpillar, Inc.



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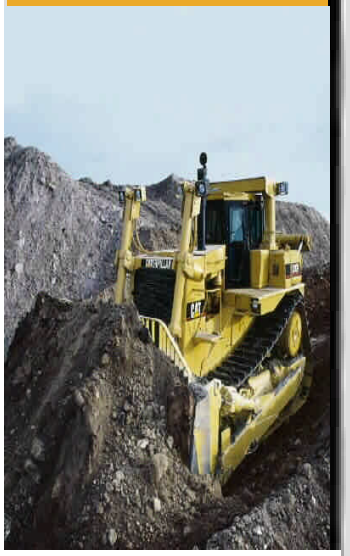

Outline

- Metrology Challenges for the 21st Century
  - Temperature Variation
  - Open Architecture Controls
  - Throughput vs. Accuracy
  - Large Scale Metrology
- Future Vision
- Questions/Answers

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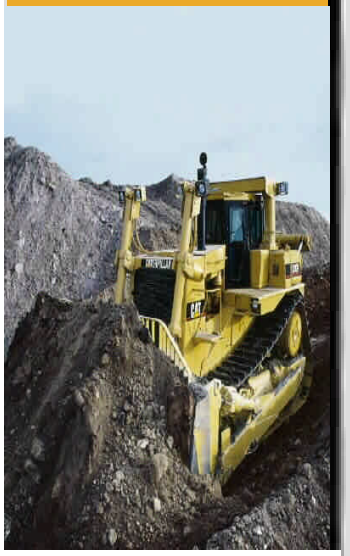
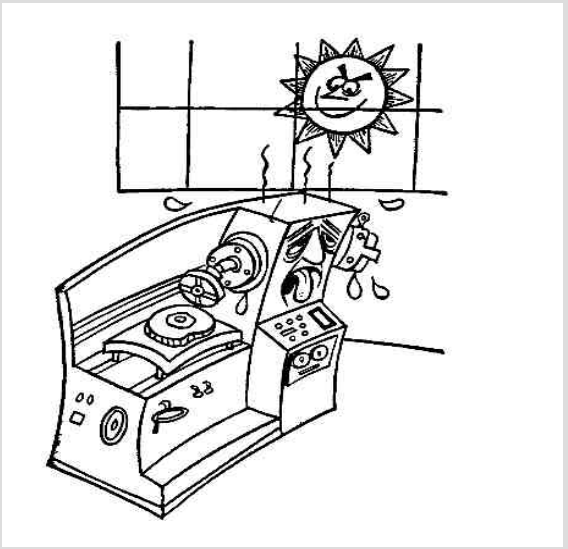


Temperature variation is the largest source of non-repeatability and inaccuracy



- Need - Measure parts immediately after they are machined to control mfg. process
- Current Status
  - Use of temp. controlled labs & enclosures
  - Compensate for the part temperature variation with a single sensor
  - Ignore temperature variation in the part
  - Adopt thermally optimized factory concept
- Challenge - A real time temperature compensation system transparent to the operator

Open Architecture

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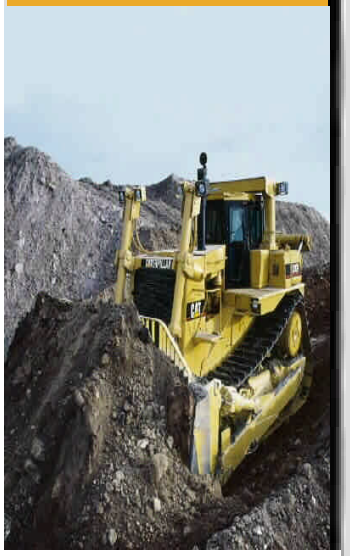

- Need - To have a common interface in controls
- Current Status
  - No commonality
  - Proprietary (rigid) interfaces
  - OEM's have started opening their controls
- Challenge - Integrate any software with any hardware and to have seem-less integration with a desired CAD package

Throughput with Accuracy

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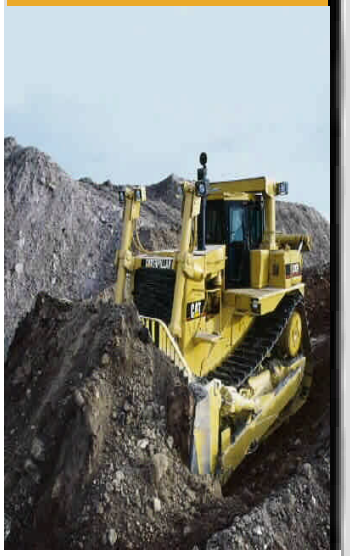
Double click to play the movie



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Advanced Production Technologies

TSD Technical Services Division

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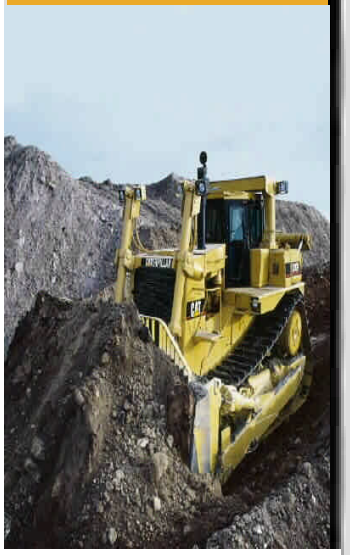
Throughput with Accuracy

- Need - faster real-time feedback for process control
- Current status
  - Post-process measurements
  - Time lag
- Challenge to OEM's
  - Keep up with the speeds of machine tools without losing accuracy
  - Move metrology equipment from lab to shop-floor



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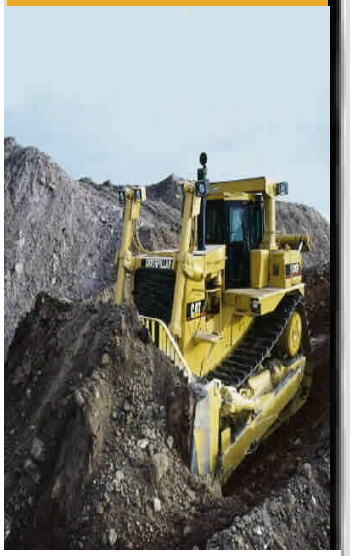

Large Scale Metrology
(Measurements on the scale of one meter or larger)

- Need - Measure large parts accurately and cost effectively
- Current Status
  - Large metrology equipment (CMM's) are expensive
  - Low throughput
  - Laser trackers and articulated arms do not meet accuracy and throughput requirements
- Challenge - Come up with a measurement system that can meet the requirements

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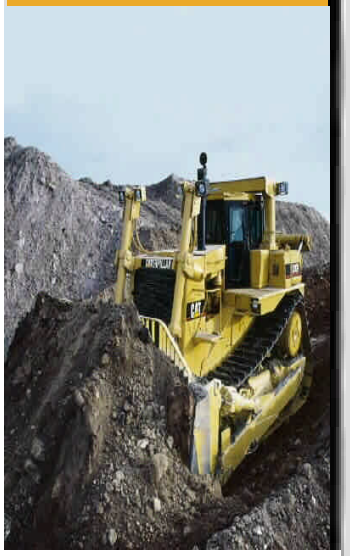

Future Vision

- More advanced machine designs
- New sensors that expand measurement capability
- Software enhancements to increase the usefulness
- Temperature variation will play a predominant role
- Accuracy improvements