

The **SQATM** Program

CPS#14228

DE-FC36-04GO14003

Surface Quality Assured Steel Bar Program



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June 21 2004

Crystal Gateway Marriott

Arlington, VA

Project Summary

Goal: Develop and demonstrate an SQA prototype that enables efficient process control and surface defect handling for surface quality of hot rolled steel bars.

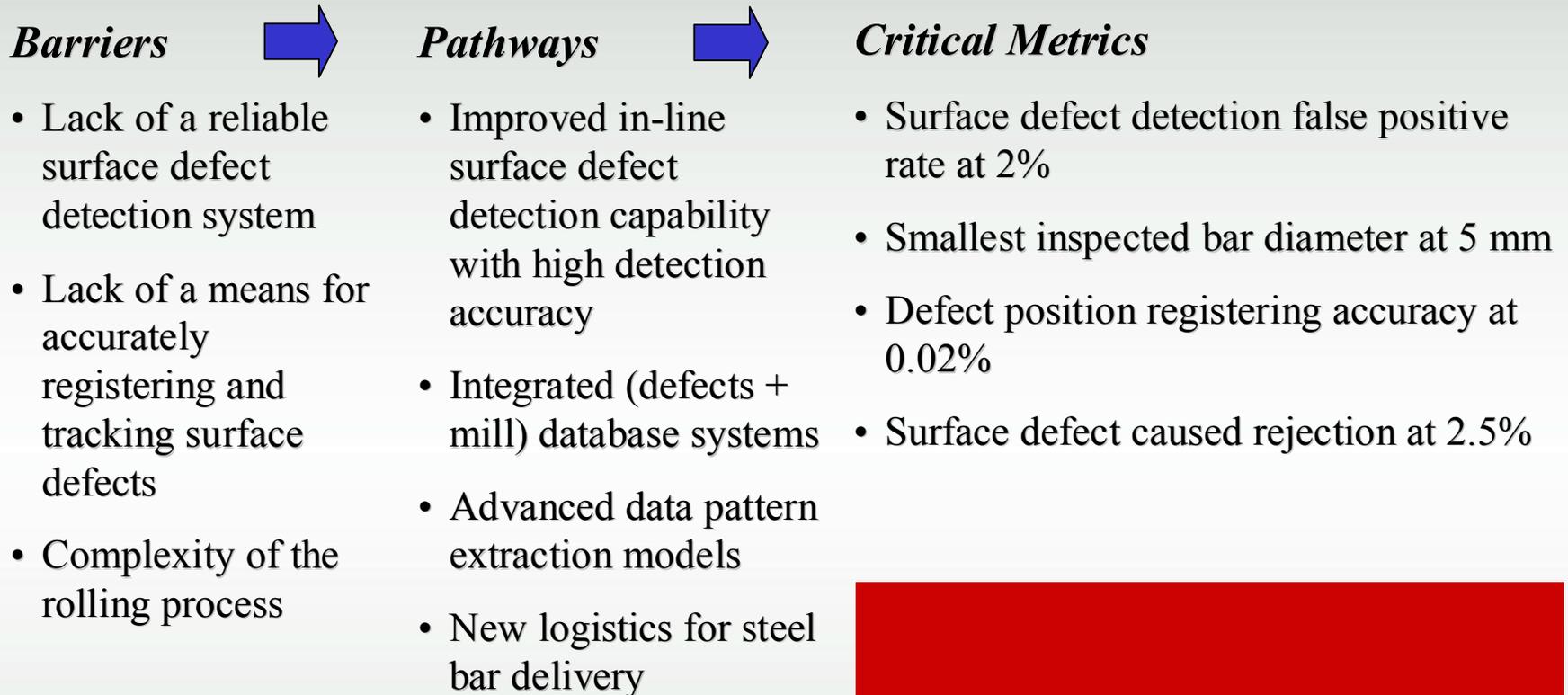
Barriers: Lack of (1) a reliable surface defect detection system, (2) a means for accurately registering and tracking surface defects, and (3) the comprehensive knowledge of the complex rolling process.

Benefits: An estimated 2.5% reduction in the productivity of the target industries and 6 trillion Btu/year in energy saving by 2020.

FY05 Activities: Accurate speed measurement, rolling process pattern analysis, process control strategy development, secondary market analysis.

Participants: OG Technologies, University of Michigan, University of Wisconsin, Charter Steel, Inland Steel, Timken, TXI, Nucor, REP, and Metaldyne.

Barrier-Pathway-Metrics



Background Info

- *Needs from the industry*
 - Surface defect is significant, ~%50 of rejects
 - Surface defects tend to be sporadic
 - Uncertain defects increase cost of processing
- *Technology sources*
 - OGT: *sensing, integration, commercialization*
 - University of Michigan: *identification/APC*
 - University of Wisconsin: *data mining*
 - Industry: *experience/in-sights*

Year 2004 Objectives

- *False positive rate reduced to 2% or lower*
- *Vibration suppression demonstrated*
- *Built prototype for speed measurement*
- *Collected mill data, analyzed with 6 out of 8 proposed approaches*
- *Complete market analysis for one of the 6 identified secondary targets*
- *Signed subcontracts by April 30, 2004*

Current Status

- *Defect Detection Algorithm*
 - Two more rolling installations
 - Generating about 20GB images per month
 - 5% false positive rate based on recent in-line results
 - Verification of detected defects
- *Vibration Suppression*
 - Developed computer model for wire rod
 - Verification of model with real mill observation
 - Design of non-contact vibration suppression mechanisms
- *Speed Measurement*
 - In the process of preliminary design and test planning
 - Tested one technology experimentally on site

Current Status (cont.)

- *Data Analysis*
 - Started on June 1, 2004
 - Established mill & HotEyeTM data collection channels by June 14.
- *Marketing*
 - Formed a team with Michigan Economic Development Corporation and Michigan Small Business Technology Development Center
 - Information collection on the identified potential target industries
 - Met with major rolling line equipment providers
- *Management*
 - Entered into subcontracts with Univ. of Michigan and Univ. of Wisconsin
 - UM & UW started on June 1, 2004

HotEye™ RSB @ Inland

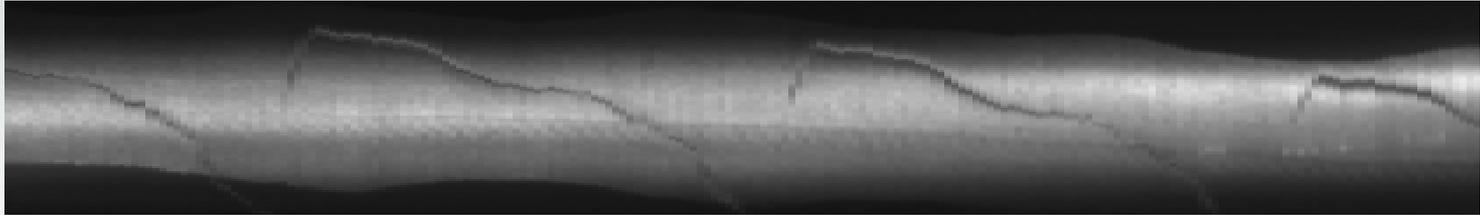


- Installed in November 2003.
- Commissioned in March 2004.
- For bars from 0.25” to 1.5” Dia.

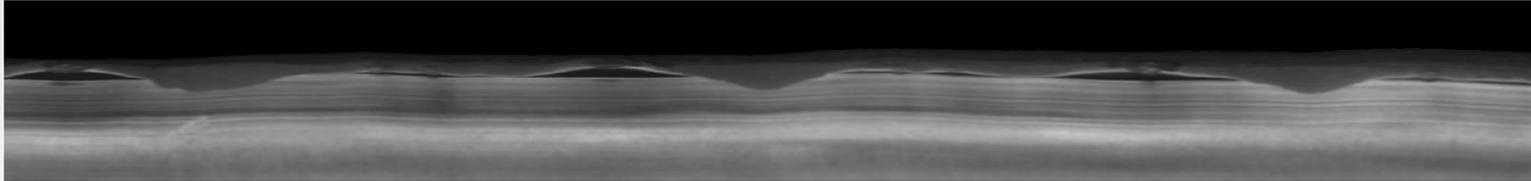
System supported by ITD/NICE³



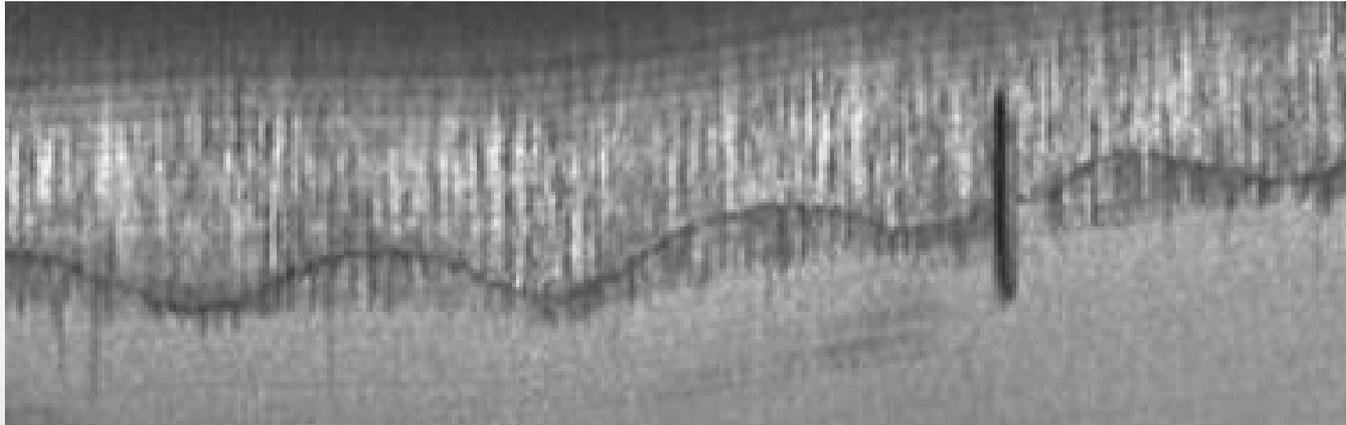
Roll Crack Detection



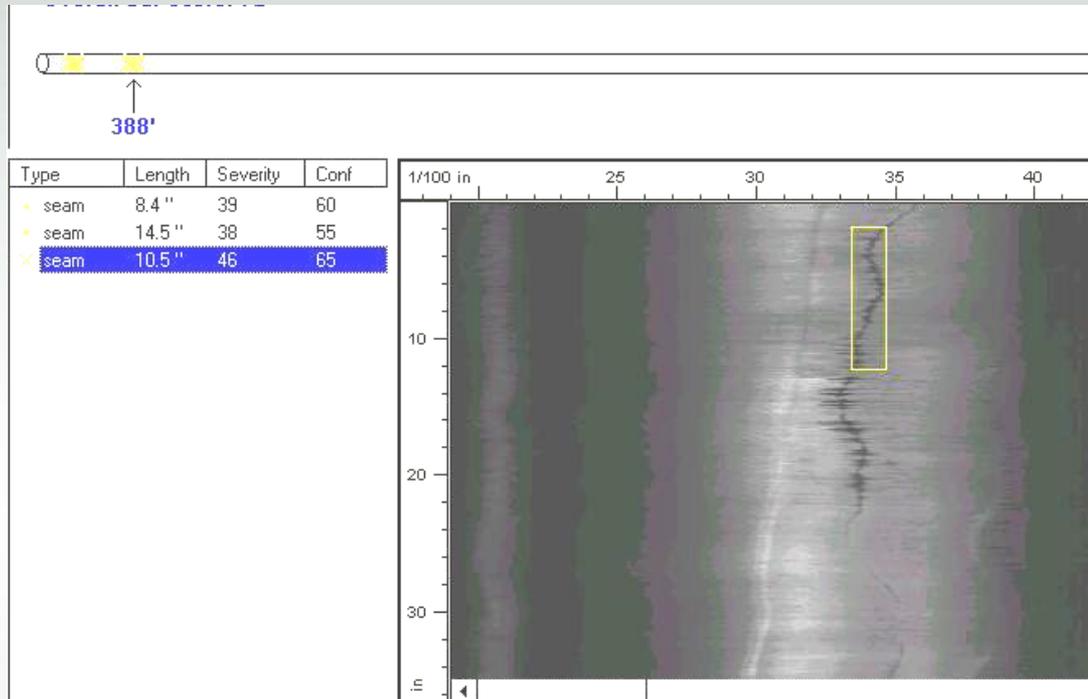
Overfill



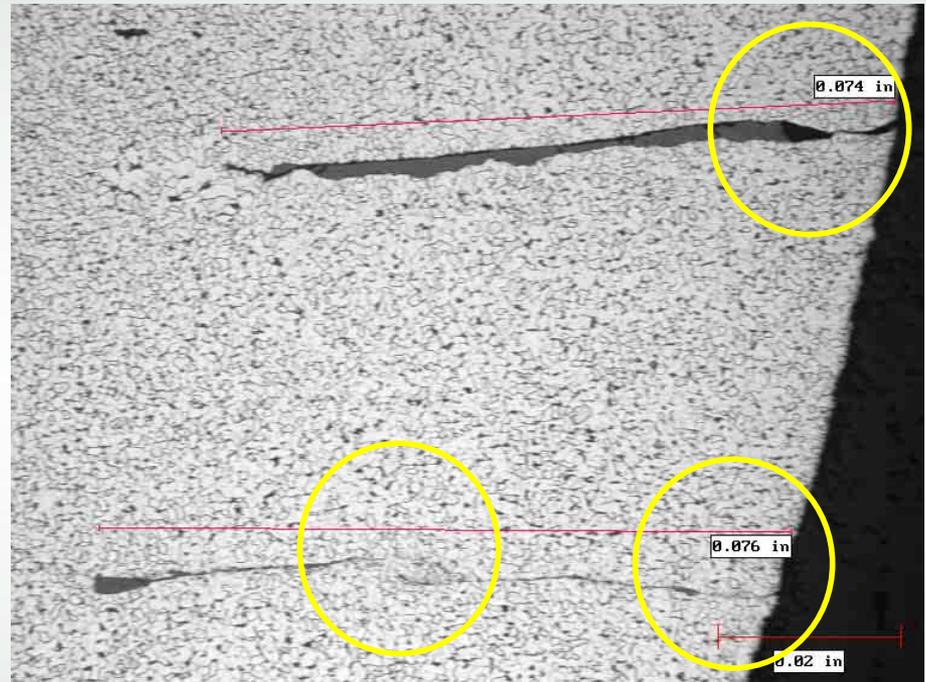
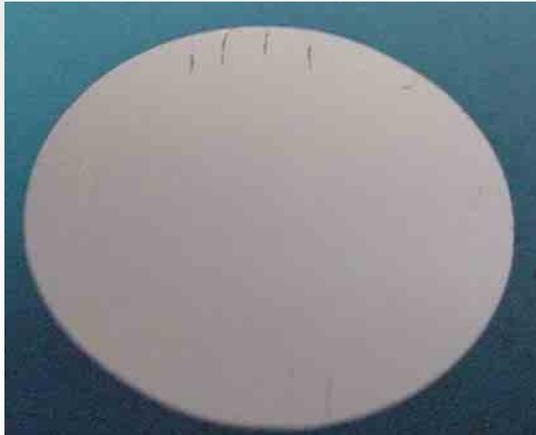
Transverse Defects



HotEye™ Detection



Seam Verification



Year 2005 Objectives

- *Demonstration of 0.02% accuracy in speed measurement*
- *Demonstration of off-line process diagnosis for rolling process faults that result in surface defects*

Year 2005 Tasks

- *Development of an accurate speed measurement device*
- *Surface defect pattern analysis of the rolling processes*
- *Development of the process control strategy for surface quality*
- *Market study of two more secondary targets*

Marketing

- *Current market status*
 - Steel industry is in its best period for years
 - No competing imaging technology in the long product sector
- *Marketing objective*
 - Solution provider to long product rolling mills for surface quality
- *Marketing activities*
 - Four steel companies visited since March 2004
 - Engaged two rolling equipment providers
 - Three outstanding business proposals
- *Current market position*
 - The only proven in-line seam/overflow detection system
 - Close cooperative relation with most US SBQ mills
 - Seeking worldwide patent protection

Summary

- *Program working closely with the target industry*
- *On track to deliver the FY 2004 targets*
- *FY 2005 tasks are as planned in the original proposal*
- *Establishing market position in surface detection systems*
- *Actively exploring additional applications of the technology*