

The Three Main Challenges Facing Industry on Coke Drum Reliability

Mahmod Samman, Ph.D., P.E.
Houston Engineering Solutions, LLC
mms@hes.us.com

RefComm Global 2020
November 2020

Overview

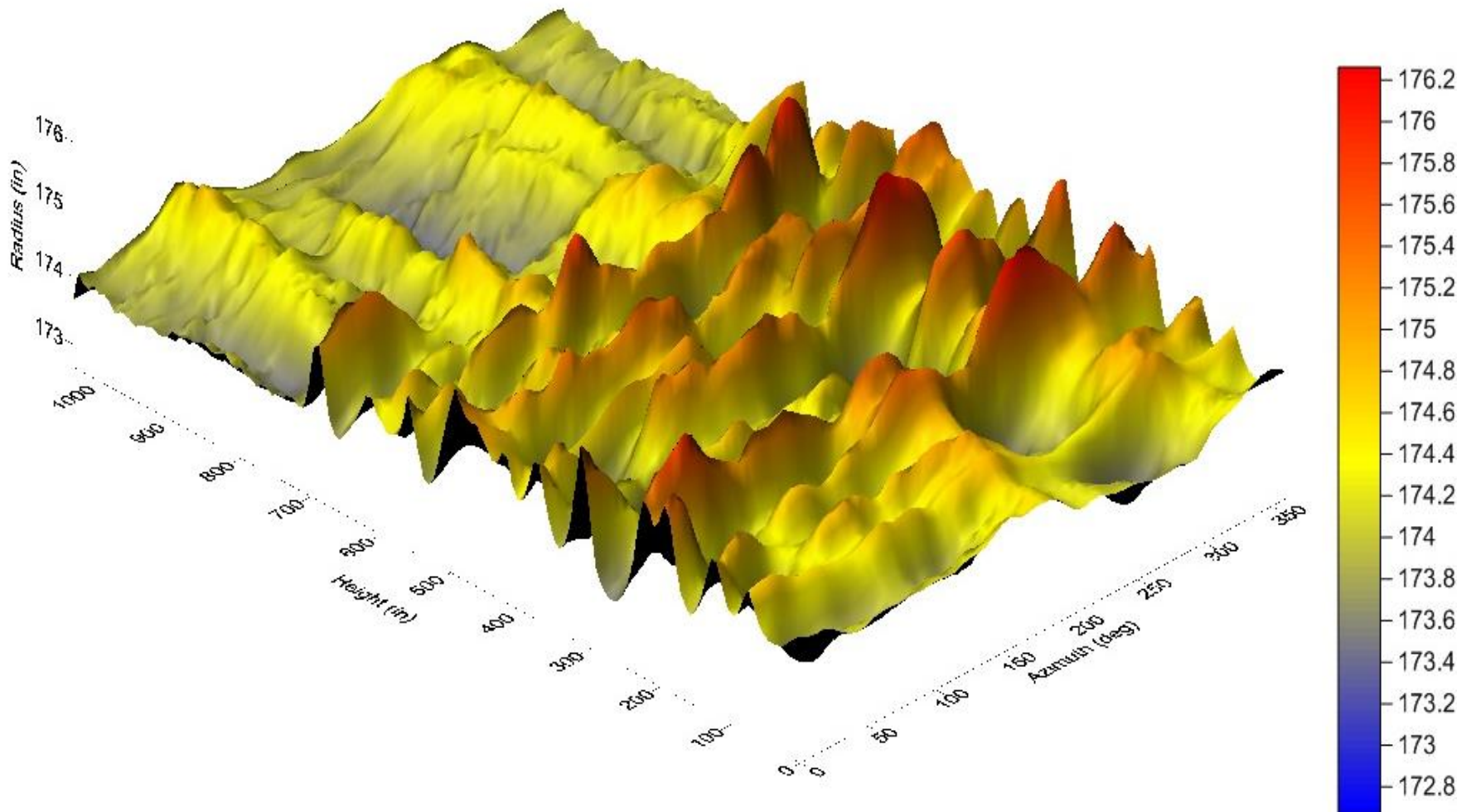
- The one-shot inspection approach
- Smoothing of laser scans
- Acceptance standard for weld overlay finish

The One-Shot Inspection Approach

Three Types of Cracks



Nine Types of Bulges



Inspection Toolbox

- Dimensional measurements:
 - Laser scanning

=> PSI assessment of bulges => Predict failures => Preemptive bulge repairs
- Crack detection:
 - Single-sided:
 - Visual
 - Liquid Penetrant
 - ACFM
 - Dual-sided:
 - Advanced ultrasonic testing
 - Acoustic emission testing

=> Find and size active cracks on both sides of wall => Crack repairs

Only One!

- Limitations:
 - Budget constraints
 - Limited down-time
- No one inspection method fits all
- Unpleasant surprises

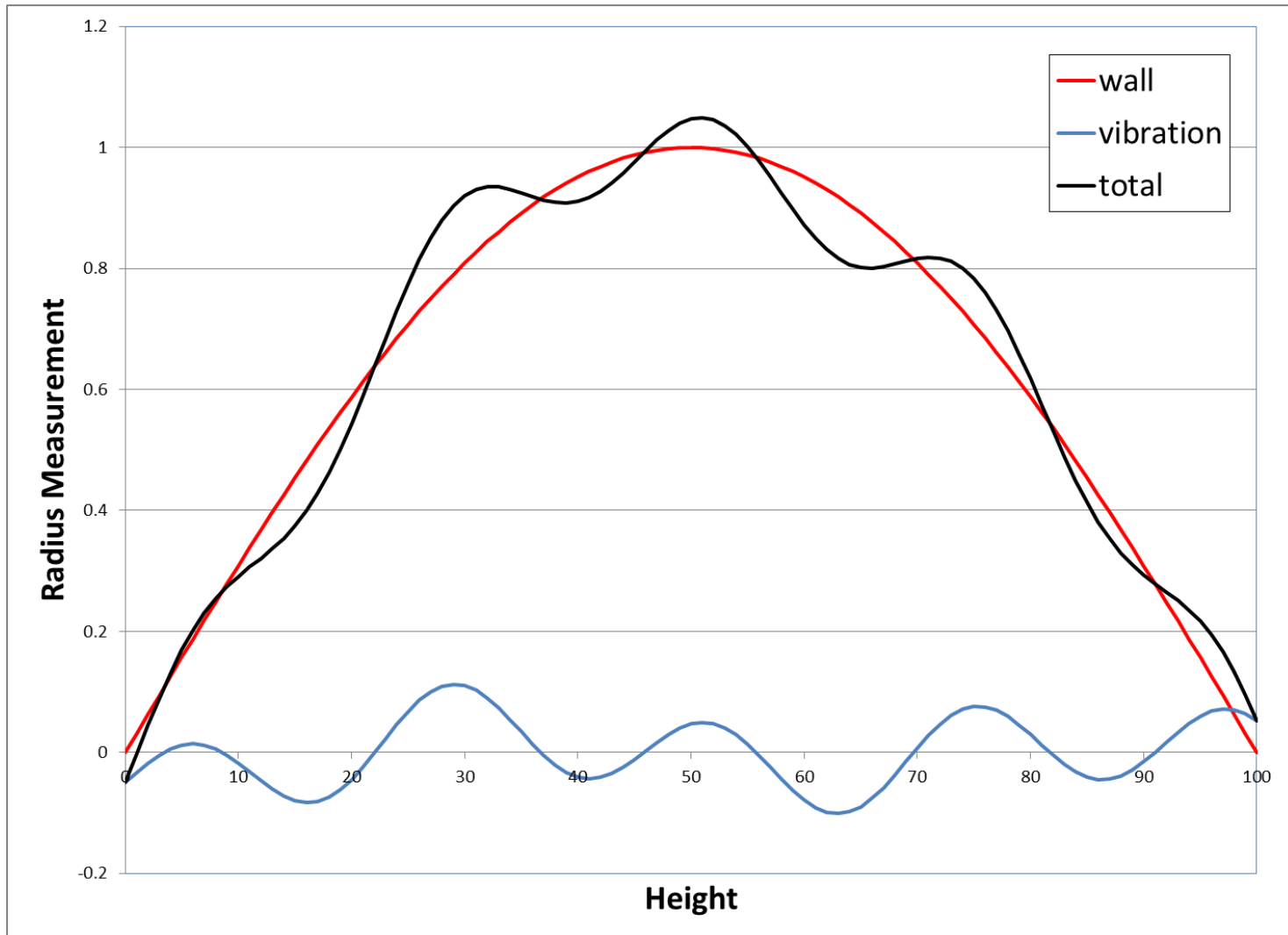
Smoothing of Laser Scans

Data Smoothing

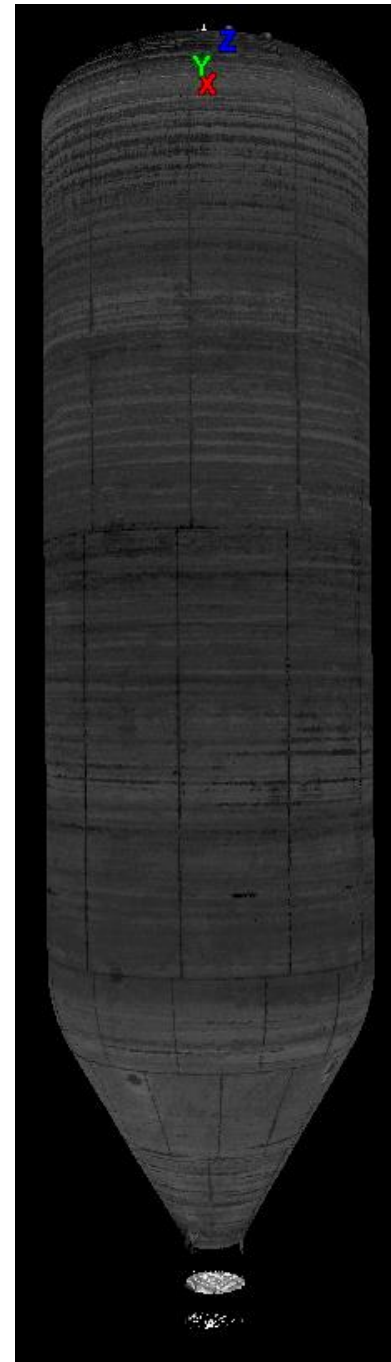
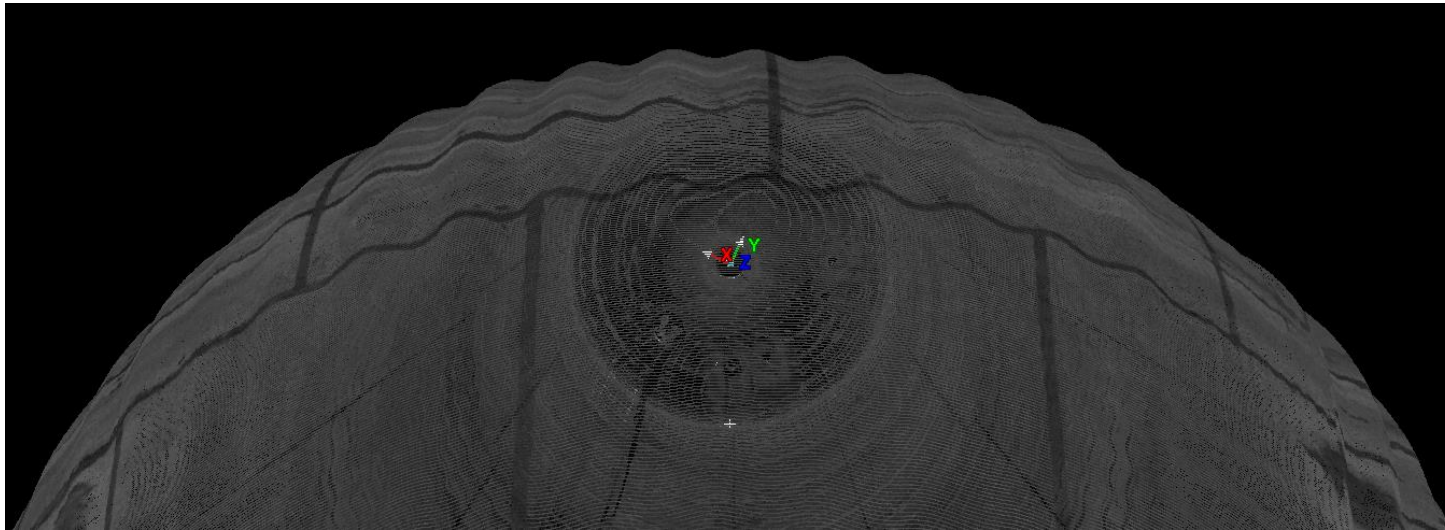
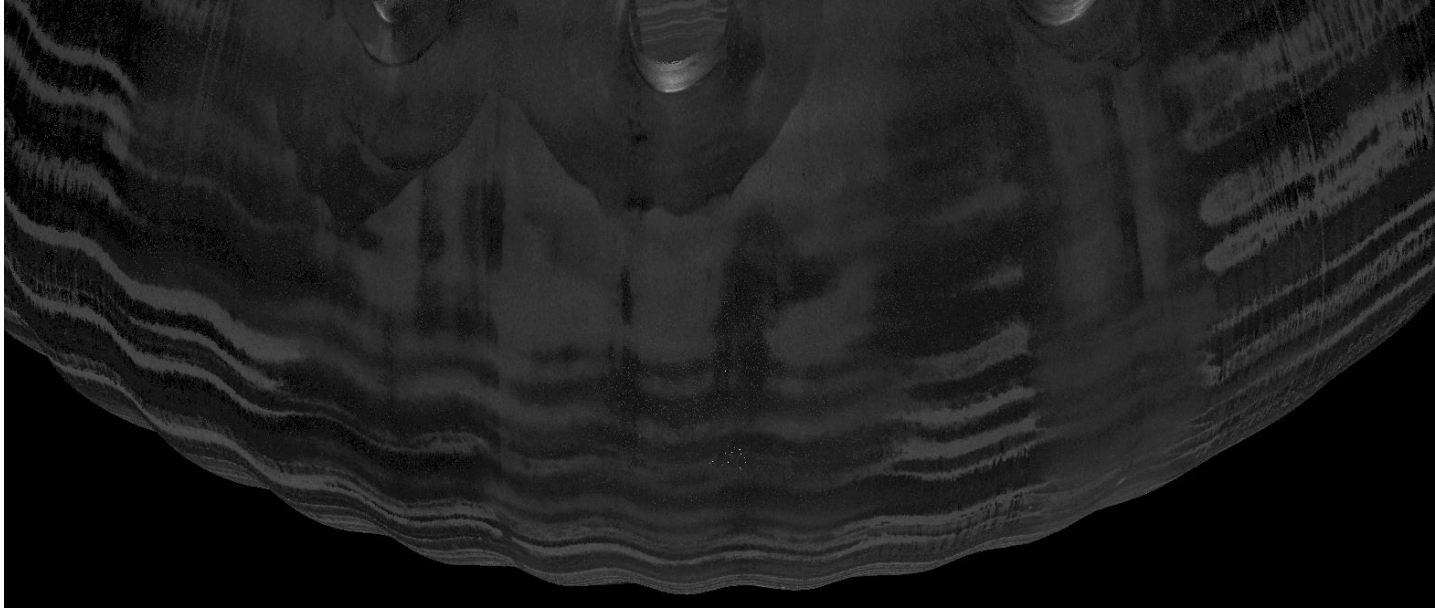
- Drill-stem vibrations
- Digital noise



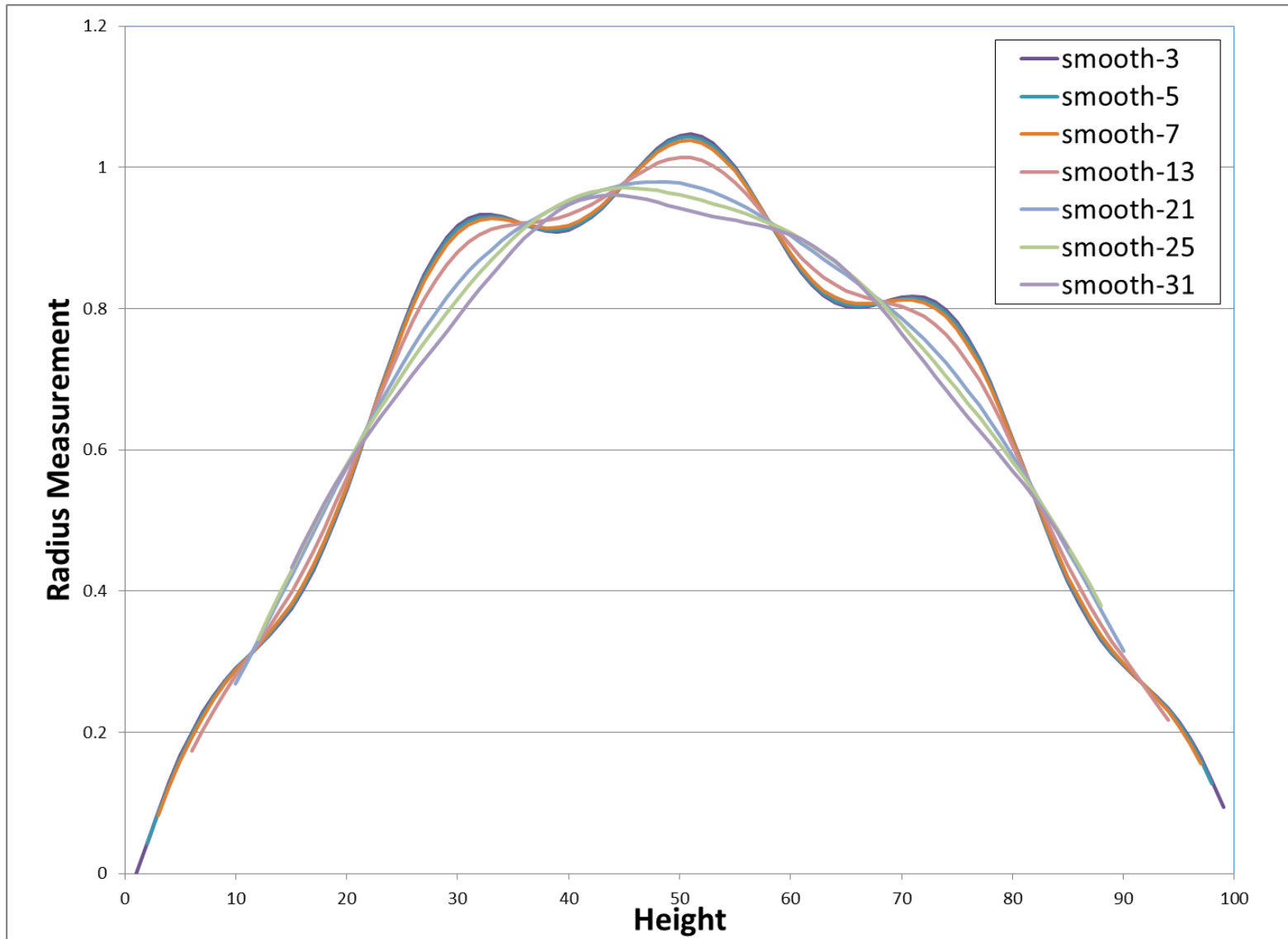
Signal Distortion



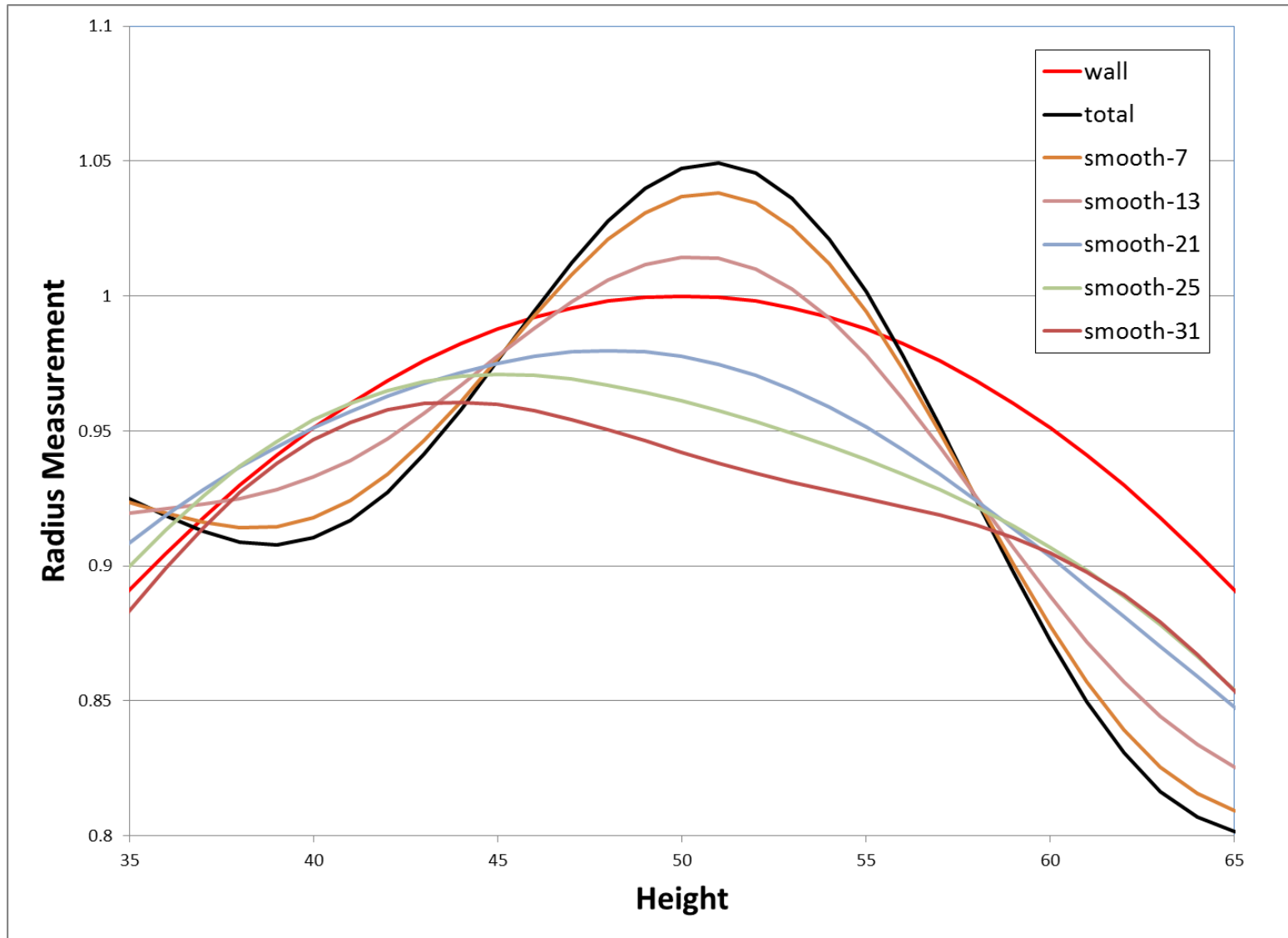
Vibration Effect



Signal Smoothing

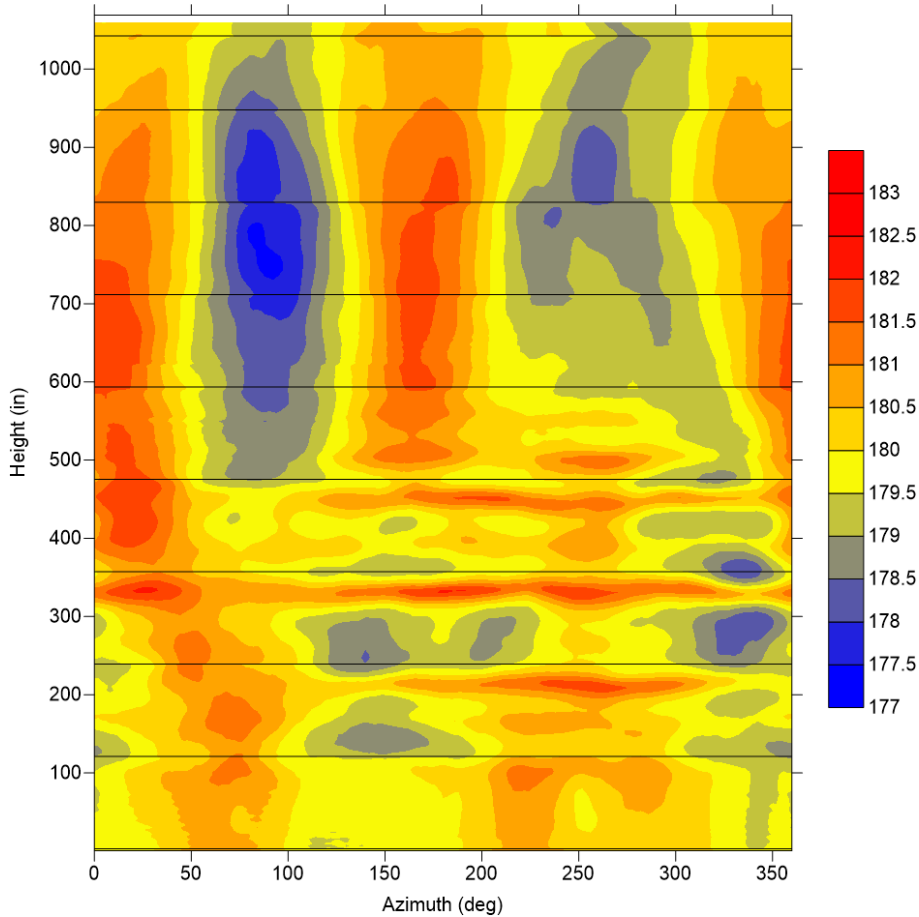


Signal Zoom

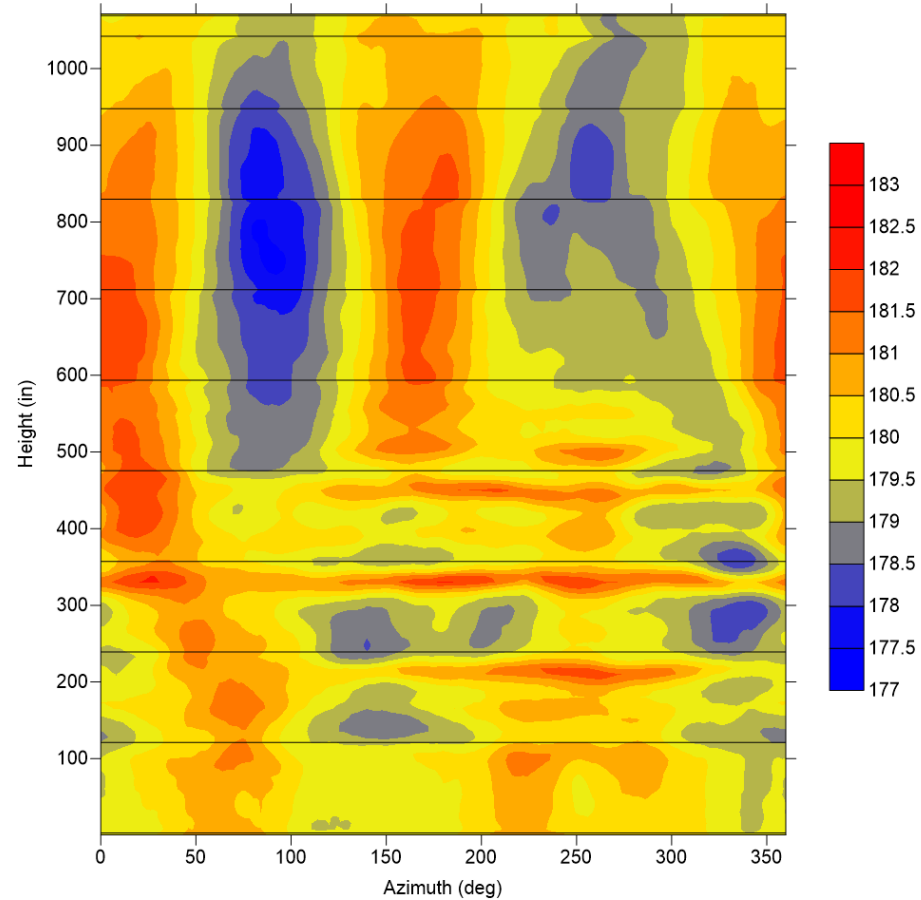


Case Study

Radius map



Less smoothing

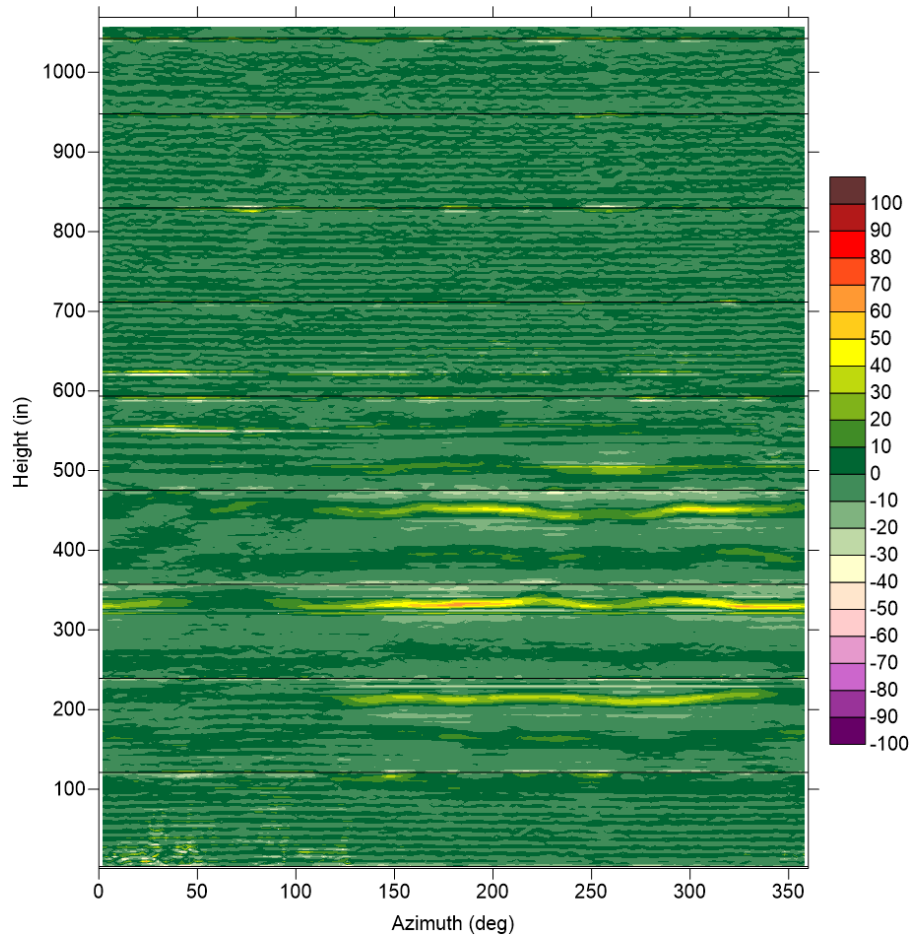


More smoothing

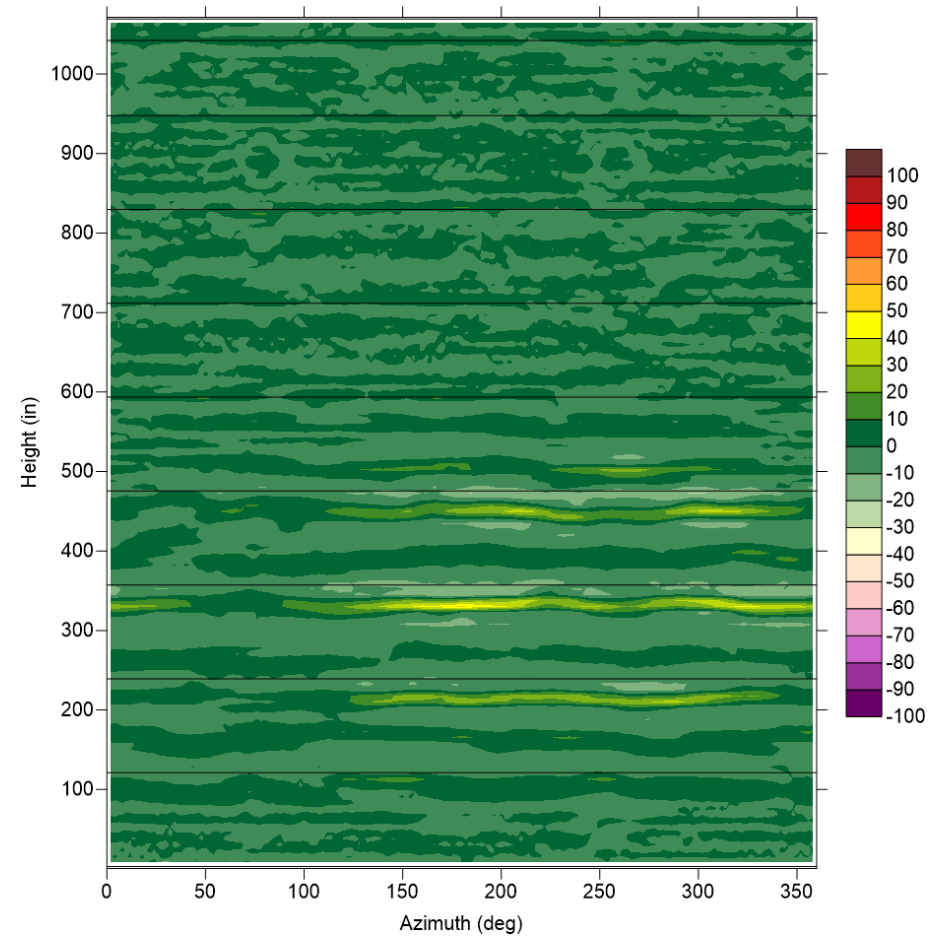
Case Study

Bulging Severity (PSI)

Incorrect assessment of
severe bulges



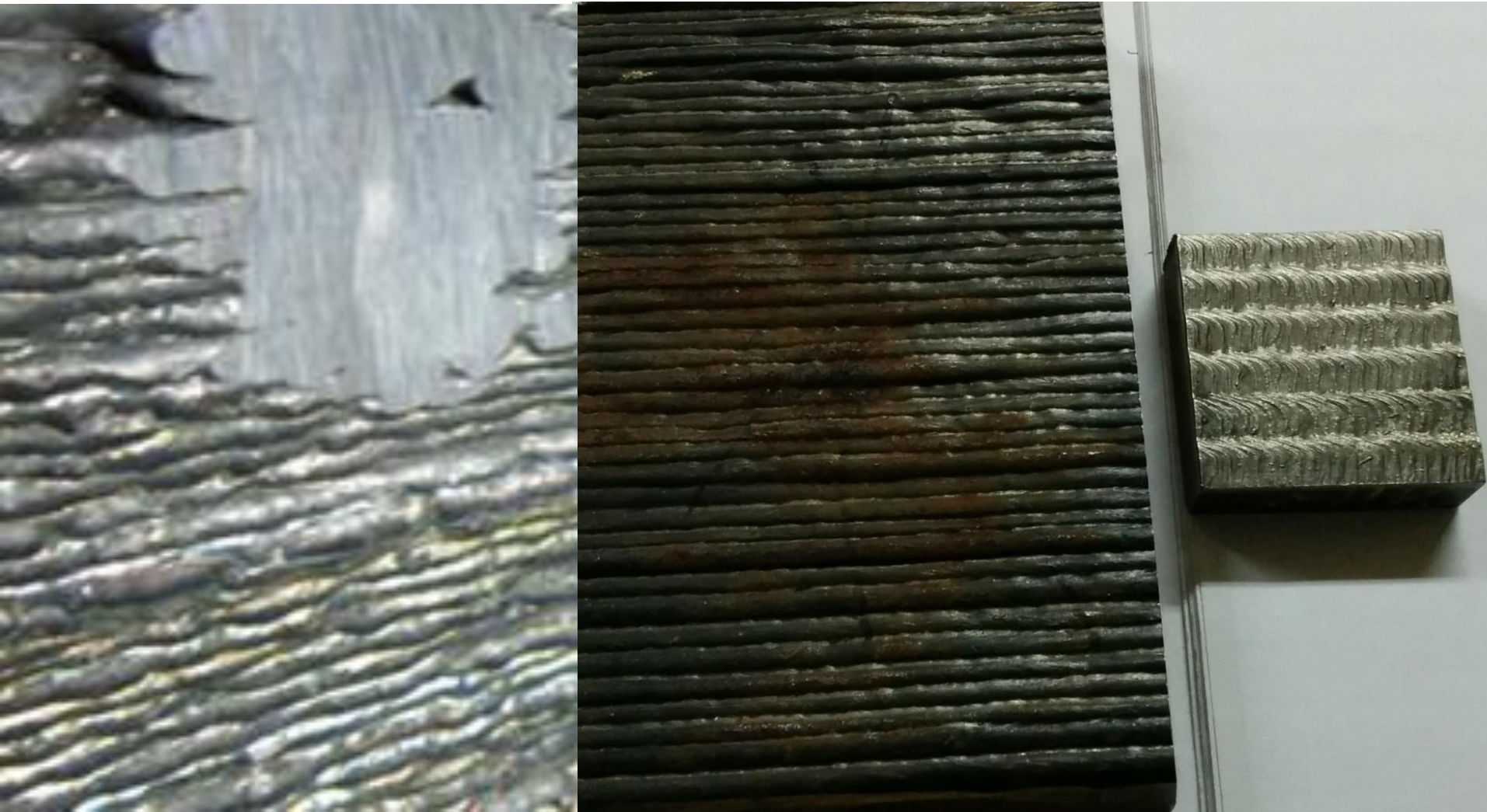
Less smoothing



More smoothing

Acceptance Standard for Weld Overlay Finish

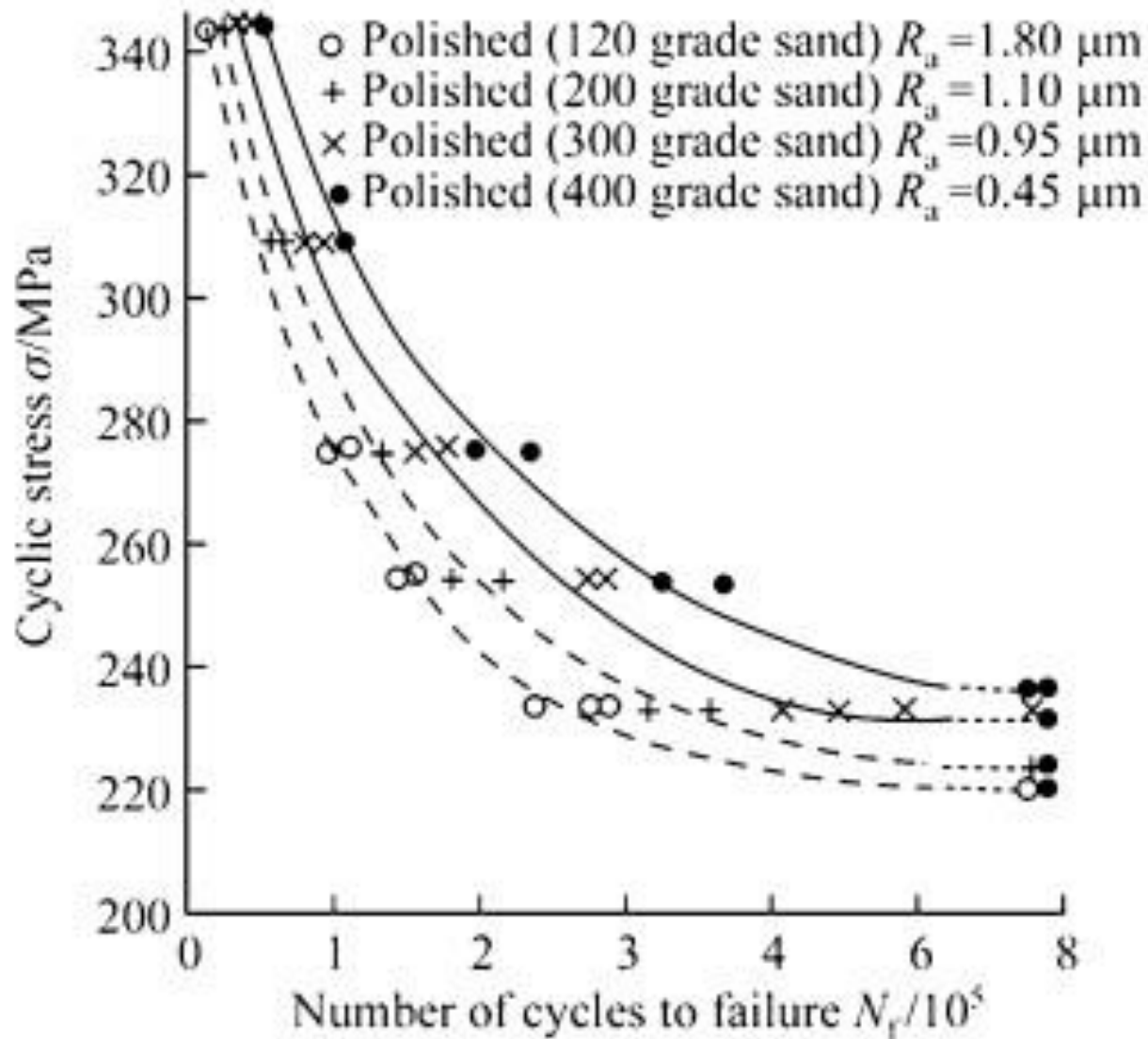
As-Welded Finish



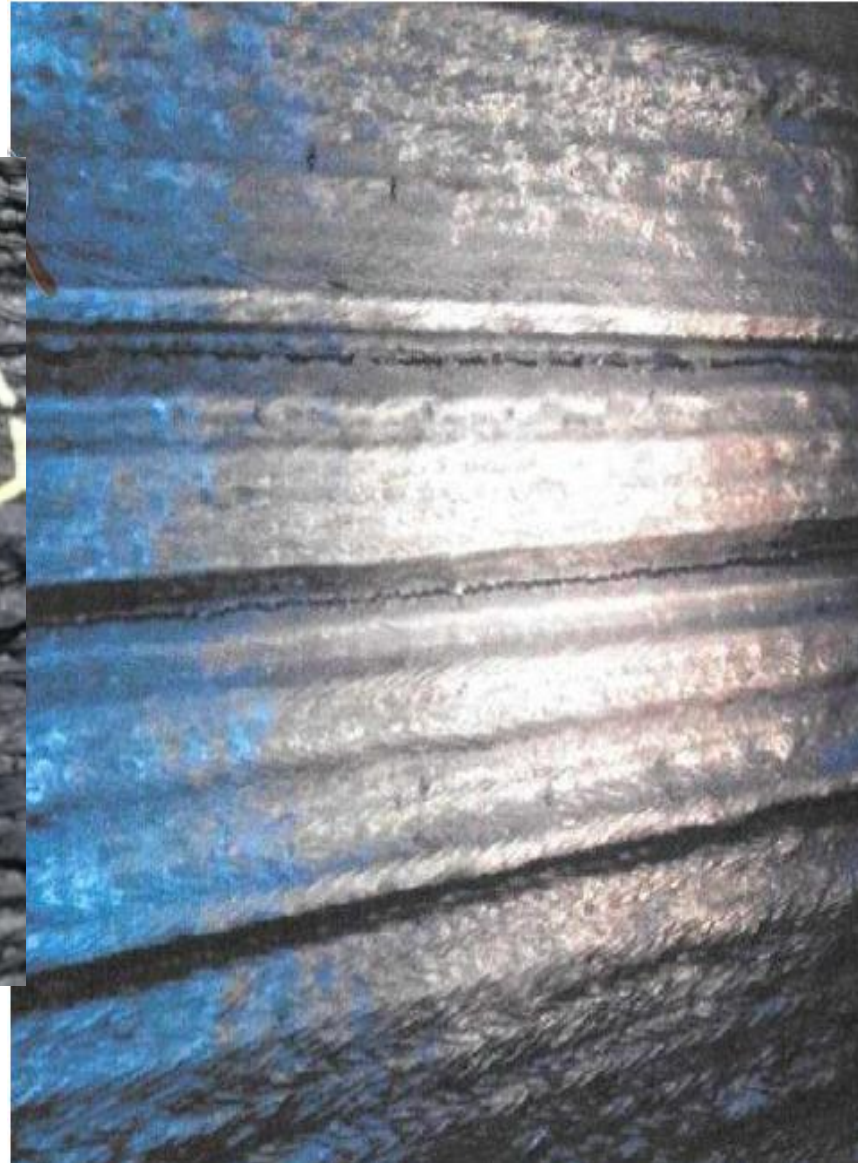
Surface Grinding



Effect of Surface Finish



Weld Overlay Failures



Surface Finish Challenge

- No surface inspection tool
- No acceptance criteria

Options

- Grind
- Standardize

Recap

- The one-shot inspection approach
- Smoothing of laser scans
- Acceptance standard for weld overlay finish

Questions?