Common Errors when Conducting Cracking and Bulging Inspections of Coke Drums

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Bio Slide

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• 30+ years
• Coke Drums, FFS, FEA
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• API 579, 439G&J – Coke drum class
Common Errors when Conducting Cracking and Bulging Inspections of Coke Drums

- Inspection of cone side of skirt attachment
- Smoothing of laser data
- Internal inspection of seam weld cracks
Inspection of Cone Side of Skirt Attachment
In-Line Skirt

API 1996 Survey
Shear Wave Ultrasonic Testing

GROUND SMOOTH ALL CORNERS (INSIDE & OUTSIDE) (SEE NOTE BELOW)

555 APPROX

9±1

500

224

6-10 BACKING STRIP

8

9±3

FULL PENETRATION CONTINUOUS WELD COVER PASS TO BE MADE AS REQUIRED OR AS PRIOR

B.T.L

BOTTOM CONE

B.W.

25.4 MM MIN

02.01

C16

C15

61A 61B 61C

60C 60B 60A
Smoothing of Laser Scan Data
Why?

- Drill-stem vibrations
- Digital noise
Signal Distortion

![Graph showing signal distortion](image)

- **Radius Measurement**
- **Height**

- **Lines**:
  - **Red**: wall
  - **Blue**: vibration
  - **Black**: total
Signal Filtering

![Graph showing signal filtering results with various smoothness levels.]
Error Magnitude

Normalized Error at Peak vs. Degree of Smoothing (moving average points)

- Blue line: magnitude
- Red line: first order
- Green line: second order
Case Study

Radius map

Less smoothing

More smoothing
Case Study

Bulging severity

Less smoothing

More smoothing
Internal Inspection of Seam Weld Cracks
Classic Tri-Metal Joint Cracks

- Base Metal
- Circumferential Weld
- Clad
- Restoration Weld

Clad Metal

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Common OD Cracks

- Restoration Weld
- Circumferential Weld
- Clad
- Base Metal
Case Study

ACFM

Restoration Weld

Circumferential Weld

Clad

Base Metal
Recap

- Inspection of cone side of skirt attachment
- Smoothing of laser data
- Internal inspection of seam weld cracks