

Integrity Management

Internal Corrosion

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Pipeline and Hazardous
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GOALS

FOR REMAINDER OF WORKSHOP

- Panel discussion on causes and history of internal corrosion accidents
 - This topic:
 - How IM handles Internal Corrosion (IC)
 - Discussion of current experience with IC
 - General conclusions of the state of IM findings

CURRENT REGULATIONS INTEGRITY MANAGEMENT

195.452 Pipeline integrity management in high consequence areas

- Applicable if could affect HCA
- Consider all threats including IC
- Identify locations of greatest risk
- Implement mitigative actions for threats
- Periodically assess condition of pipeline

INTEGRITY MANAGEMENT AND INTERNAL CORROSION

- Pipeline segments that can affect high consequence areas directly covered
 - Nearly 73,000 miles
 - 45 percent of total miles
- Activities often include additional mileage
 - Assessments include non-HCA pipe
 - Mitigative actions often affect non-HCA pipe
 - Repairs outside HCA subject to operator criteria

INTEGRITY MANAGEMENT AND INTERNAL CORROSION

- Risk analysis
 - Should address entire pipeline
 - Requires consideration of all factors affecting internal corrosion
 - Should be reviewed/updated periodically, in coordination with periodic assessments
- Updates should consider information from assessments

INTEGRITY MANAGEMENT AND INTERNAL CORROSION

■ Assessments

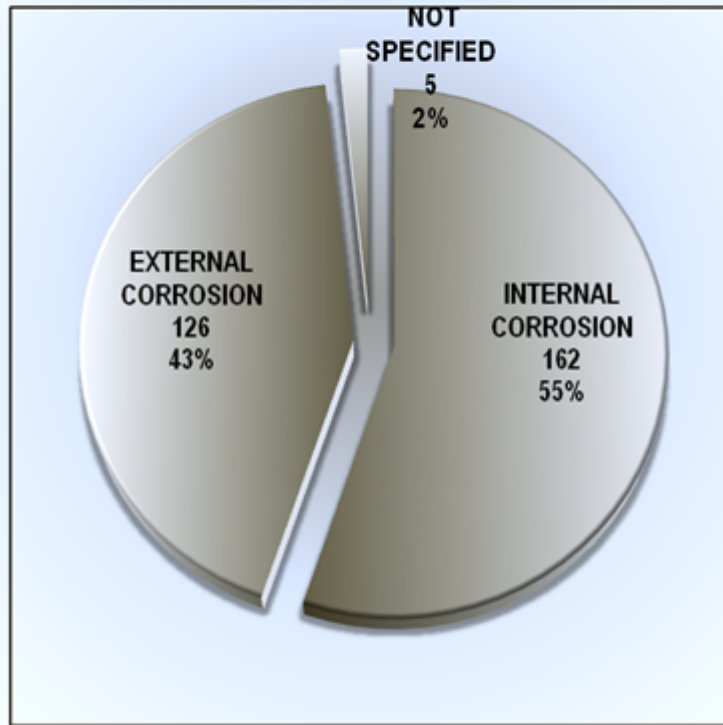
- Key element of IM; direct inspection of pipe condition
- Most use inline inspection (ILI)
 - ILI detects metal loss, whether internal or external
 - High resolution ILI can specifically identify wall loss from internal corrosion; used by most operators
 - ILI assessments often include more than HCA pipe
 - Cleaning the pipeline is a key to ILI inspection



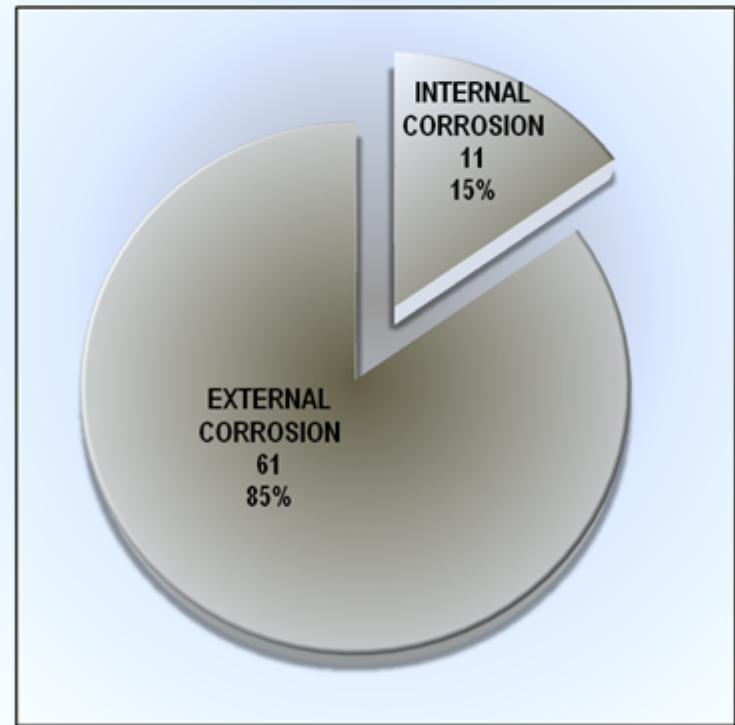


HIGH RESOLUTION MAGNETIC FLUX INLINE INSPECTION

CORROSION ACCIDENTS 2002-2008
NO HIGH RESOLUTION MAGNETIC FLUX INLINE
INSPECTION PERFORMED



CORROSION ACCIDENTS 2002-2008
HIGH RESOLUTION MAGNETIC FLUX INLINE
INSPECTION PERFORMED



IM and Internal Corrosion

- Preventive and Mitigative Measures
 - Evaluate risk analysis results
 - Evaluate internal corrosion data
 - Identify and implement additional preventive and mitigative measures to address internal corrosion threat

PHMSA EXPECTATION

“Investigate” Corrosive Effect

- Any significant change in risk factor should result in re-investigation of potential for internal corrosion
- Investigation results should be
 - Valid for current state of pipeline internal corrosion risk factors
 - Documented in accordance with 195.589(c)
 - Available for inspection

PHMSA INSPECTION EXPERIENCE OPERATOR INVESTIGATION OF CORROSIVE EFFECT

- Undocumented
- Weak or nonexistent technical analysis
- No consideration for internal corrosion risk factors
- Does not consider ILI results that identify internal corrosion anomalies

IM and Internal Corrosion

- IM Findings to Date
 - Internal corrosion control program weaknesses
 - Poor or non-existent integration of internal corrosion data in risk analysis Such as:
 - Foreign material: water, contaminants, microbes
 - Impurities: sulfur, salts, acids, H₂S
 - Pipeline design: flow, topography, low points

IM Findings to Date (Continued)

- Operating environment not properly considered:
 - Flow rate/ velocity
 - Operating pressure
 - Topography
 - Temperature
 - Pipe configuration, design, and material specifications

IM Findings to Date (Continued)

- Operating environment not properly considered (cont.):
 - Steady state
 - Slack line
 - Upsets (in pipeline and in upstream facilities)
- Not considering other circumstance or condition that could cause, promote, or increase the likelihood of internal corrosion

Additional IM Issues

- Continuing Changes to Crude Oil Characteristics
- Low Stress Rule Implementation
- Additional Emphasis on IC in General



Questions?

- Thank You