

# Root Cause Analysis Methodology Columbiana County, Ohio

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# Our Purpose



Provide natural gas and related energy products in a safe, efficient, and dependable manner



# Vision & Values

the **place** to work

Employees  
Safety

the **neighbor** to have

Compliance  
Facility integrity

the **company** to own

Reliability  
Profitability  
Customer Service



# Agenda

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- TGP Incident on Line 200-4 ~MP 214+11.5
- Why conduct a Root Cause Investigation?
- How to conduct a Root Cause Investigation
  - Steps
  - Methodology
- Conclusion



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# TGP 214-4 Incident and Root Cause Analysis

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# TGP Line 200-4 ~MP 214+11.5

## Incident Facts

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- Incident Date – February 10, 2011
- 36 -Inch Line #200-4 (Line #4)
- Location – Columbiana County, near Hanoverton, Ohio
- Pipeline constructed in 1963
- 36” O.D. x 0.344” w.t., Grade X60, DSAW, National Tube
- Operating at ~733 psi at time of failure
- Line MAOP is 790 psi

# TGP Line 200-4

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- In-Line Inspections on TGP
  - Specific line involved inspected in 2005
    - No actionable anomalies at or near the failure site
  - TGP has 11,724 miles of pipeline that can be inspected by in-line inspection (ILI) tools
    - Completed first ILI inspections on 98% of those miles
    - Re-inspected approximately 62% of those miles
- Strong integrity management program
  - Aerial Inspections – Monthly
  - Completed review of MAOP and pressure test records on TGP 200 Line System
- Had very effective emergency response at this incident
  - Meetings with First Responders
  - Mock drills and Incident Command Structure

# Root cause analysis and external actions

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- Root Causes Analysis is complete
  - Pre-existing crack failed by tensile overload from combination of interacting stressors
- Cooperating fully with PHMSA Central Region and Ohio PUC on a IVRP (Integrity Verification and Remediation Plan)
  - Conducting more digs for additional data
- Continuing to support industry research efforts to improve ILI tools to better detect Girth weld anomalies
  - Independent and in conjunction with PRCI

# Additional internal improvements

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- Improve thoroughness of project management construction field notes
  - Changes to Computer Based Training
  - Training for Inspectors
- Process for creating an index of past editions of company standards and manuals
- Initiative begun to scan and electronically file historical construction files

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# Why Conduct a Root Cause Analysis ?

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# Root Cause Investigation

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- Root Cause Definition
  - Fundamental reason for the incident/condition
  - If removed will prevent recurrence
- Why conduct a root cause investigation?
  - Learn as much as possible about the event
  - Prevent or reduce the probability of recurrence
  - Manage or improve the consequences should there be a recurrence



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# Root Cause Analysis Methodology

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# Root Cause Investigation Steps

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- First step: Determine significance of event
  - Dictates level of resources allocated
  - Aids in determining the correct number
    - Too many = increased costs
    - Too few = missed lessons learned
  - Many factors to consider
    - Injuries, property damage, likelihood of litigation
    - Opportunities to learn

# Root Cause Investigation

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- Standards used to judge a root cause analysis
  - Thoroughness
    - Historical Content
  - Fairness
    - Data gathered before conclusions reached
    - Absence of punitive considerations
  - Efficiency
    - Resources are scaled to situation
    - Continuous improvement of organizational learning

# Root Cause Investigation Steps

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- Preserve Evidence
  - Photos, surveys, chain of custody
  - Need for security?
- Establish the team of Analysts and Investigators
  - Single or team
  - Subject matter expertise
  - Independence / No Conflict of interest
  - Training in RCA development
- Determine Methods – Analytical tools
  - Help formulate questions to be researched/answered
  - Organize information to develop patterns and draw conclusions

# Root Cause Analysis Methods

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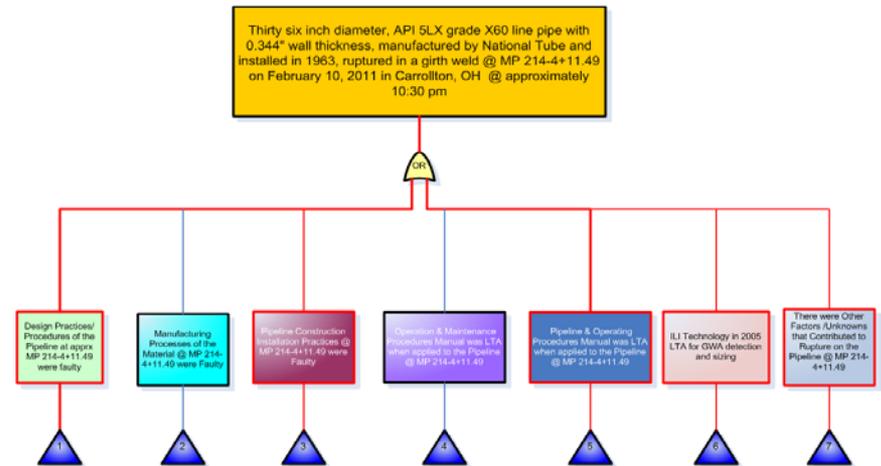
## ● Conger & Elsea, Inc.

- Events & Causal Factors Analysis
  - Timeline, focus on facts, conditions
- Fault Tree Analysis
  - Hardware, shows multiple possible failures
- MORT (Management Oversight and Risk Tree Analysis)
  - Programmatic, personnel and procedural issues
- Change Analysis
  - Comparison
- Hazard-Barrier-Target Analysis

# Root Cause Analysis Methodology

## ● Fault Tree Analysis

- Focus on a particular fault
- Scope range of possible failure scenarios
- Investigate possibilities
- Determine critical path(s)
- Analysis could take you back to more fact gathering



# Conclusion

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- Why conduct a Root Cause Analysis?
  - Use the opportunity to learn from incident
    - Prevent reoccurrence
    - Share lessons learned
      - Internally
      - Across the industry
  - Part of TGP's commitment to continuous improvement of pipeline safety and integrity