



Pipeline and Hazardous Materials Safety Administration



Workshop on Advanced Coatings
R&D for Pipelines and Related
Facilities

June 9-10, 2005

Gaithersburg, MD - USA

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WELCOME

- WELCOME from “ Our” Steering Committee
- First (on-shore) Advanced Coatings Workshop
- Building on Past workshop and forum success
 - Consensus, Coordination & Collaboration
- Today’s Approach: Contest, Brainstorming, & Gap Analysis
- Safety and Comfort Announcements
 - Fire Exits, Restrooms, Cell Phones
- Show of Hands Please
 - Government, Industry, Vendors

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Steering Committee Members

Government Organizations

- DOT Office of Pipeline Safety (OPS)
- DOC National Institute of Standards and Technology (NIST)
- DOI Minerals Management Service (MMS)
- DOE National Energy Technology Laboratory (NETL)
- National Energy Board of Canada
- CANMET Materials Technology Laboratory

Private Organizations

- American Gas Association (AGA)
- Pipeline Research Council International, Inc. (PRCI)
- National Association of Corrosion Engineers (NACE)
- Gas Technology Institute (GTI)
- Interstate Natural Gas Association of America (INGAA)
- ASTM

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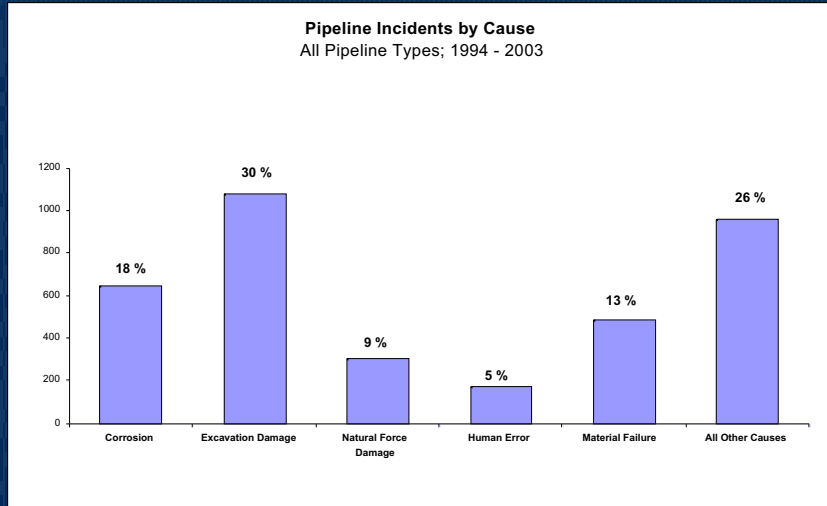
Why are we here?

- Corrosion still remains a major cause of accidents
- Coatings are important - Some consider coatings as the primary cathodic protection system
- Coating durability, application, and in-field assessment remains suspect
- Desire for solving coating issues usually ends up as low priority at larger events
- Problems with coatings are seen onshore, offshore & internationally

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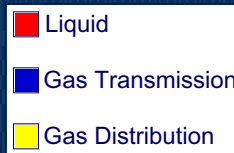
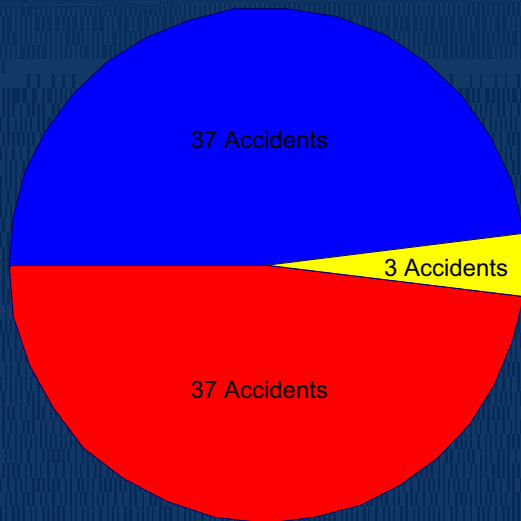
Historical Accident Summary



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Total Corrosion Accidents (External + Internal)



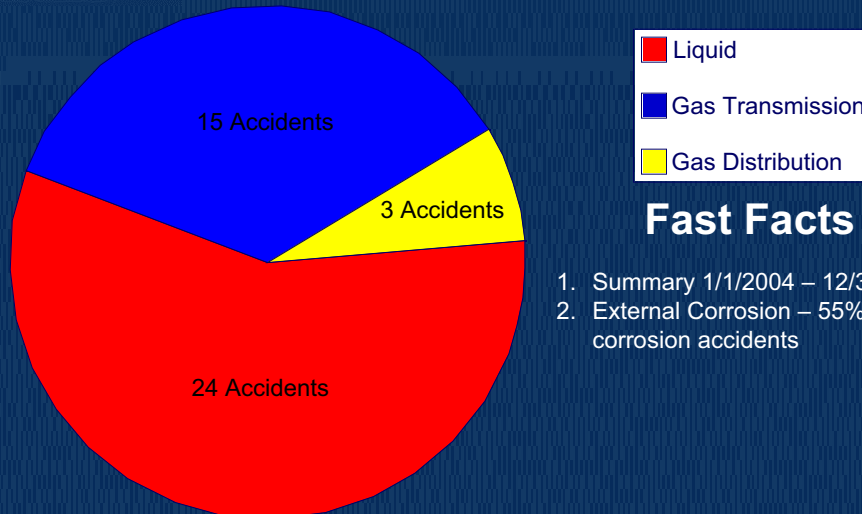
Fast Facts

1. Summary 1/1/2004 – 12/31/2004
2. Corrosion – 18% of all accidents
3. 3rd Party Damage – 20% of all accidents
4. Total No. of Accidents all causes is 429

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Total External Corrosion Accidents



- Liquid
- Gas Transmission
- Gas Distribution

Fast Facts

1. Summary 1/1/2004 – 12/31/2004
2. External Corrosion – 55% of all corrosion accidents

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Coating System Failures Are Not Totally Understood

Some failures are caused by:

- Poor surface preparation
- Poor application
- Poor selection criteria
- Cathodic protection

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Poor Surface Preparation

Various contaminants remaining on the metal surface such as salts, moisture, old coatings, hydro carbons and various other “dirt” on the surface, inadequate profile or improper heating of the surface

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Poor Application Technologies

Different coating types have particular application methods that must be followed:

- FBE's require several critical steps for proper application to take place
- Liquid coatings must be mixed and applied using the proper techniques
- Use of the correct primer for a particular coating system is critical

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Poor Application Technologies

- When using tape type coatings, proper tension and overlap are very critical
- Application of Shrink Sleeves must include proper heating of both the metal and the sleeve
- Proper curing is critical to many different types of coatings before handling or back filling

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Poor application techniques



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Poor Coating Selection Criteria

- Choosing high dielectric strength coatings that will shield CP currents if the coating fails may not always be the best choice
- Soil stress must be considered when choosing a coating system. Many types of coatings are affected by soil stress, especially coatings that stretch easily

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Coatings failure caused from soil stress



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A poorly applied shrink sleeve on a 10" products line



 **PHMSA**
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Some Coatings Crack & Move Because of Soil Stress



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Mechanical damage may start the water Penetration & the shielding process



Cathodic Protection

- Cathodic protection is blamed for many coating failures
(The real reason for coating failures are many times overlooked)
- Many think that a high pH under the coating indicates that coating has failed because of cathodic protection
(This may simply mean that you have a “fail safe” coating system)
- Too many worry over meeting certain criteria when failed coatings that shield CP are the main reason for corrosion problems



Cathodic Protection

- As CP increases, we may be causing more coating damage, (*CP interference with other systems and wasting money on excessive power use, extensive surveys and equipment to meet this demand*)
- If we use properly selected and applied coatings we will start seeing that meeting a certain CP criteria is not the most important issue in solving our corrosion problems on coated structures
- CP causes electrolyte around the protected structure to become more alkaline and drives water toward the metal being protected

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Cathodic Protection

- CP will protect exposed substrate and will sometimes penetrate partially under disbonded coatings at an opening or holiday depending on many variables
- “**Fail Safe**” coatings allow some CP current to protect the substrate even if there is no opening or holiday. CP requirements may increase for some “**fail safe**” coatings systems, but the benefits usually **OUTWEIGHS THE CORROSION PROBLEMS**

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Future of Collaborative Research

- Plenty of incentives for any pipeline company
- Collaboration Maximizes value of input
- Collaboration means targeting technology gaps
 - knowledge, Tools and or Standards
- Industry determines needs
- Almost always needs are common
(everyone has problems whether they admit to them or not)
- Collaboration provides new answers to old problems

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Future of Collaborative Research

- We must remind members of our industry (*owners, consultants, contractors, service providers*) that they must manage their risks
 - Failure to supply, Public risk Litigation, Fines, Loss of revenue, Loss of share value
- Obligations to their shareholders and the public
- Collaboration research is the best way of mitigating risks
- Research is for the betterment of the industry
- Industry & Government Agencies must partner on research

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Incentives for Research

- We don't want a catastrophe as a catalyst –but:
- Some failures or near misses concentrate the mind
- Research & its application to solving real world problems provide best defence against:
 - Failure to supply
 - Public risk
 - Litigation
 - Fines
 - Loss of revenue
 - Loss of share value

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What did the recent R&D Forum report?

2005 Government and Industry Pipeline R&D Forum
Houston, Texas March 22-24, 2005

http://primis.phmsa.dot.gov/rd/mtg_032305.htm

Report-Out on Design/ Construction/ Materials/ Welding

Issue

- Coatings are relied upon for corrosion protection of pipelines. There is a need for more effective short term testing methods to predict long term performance – wear and penetration, coating soil interactions, etc.

Action Required

- Series of research programs relating to gaps in knowledge.
- Intended out come of this Workshop is to establishing specific project needs

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Conclusions

- Government supported Research is critical to filling the gaps in **Knowledge**, developing new industry **Tools** and improving **Standards**
- There must be a balance between a coatings overall performance and the CP system
- Continued government/industry partnership in evaluation and testing will provide the information needed to continue to make the best coating choices to protect the pipeline infrastructure