



# PHMSA RESEARCH & TECHNICAL PERSPECTIVES



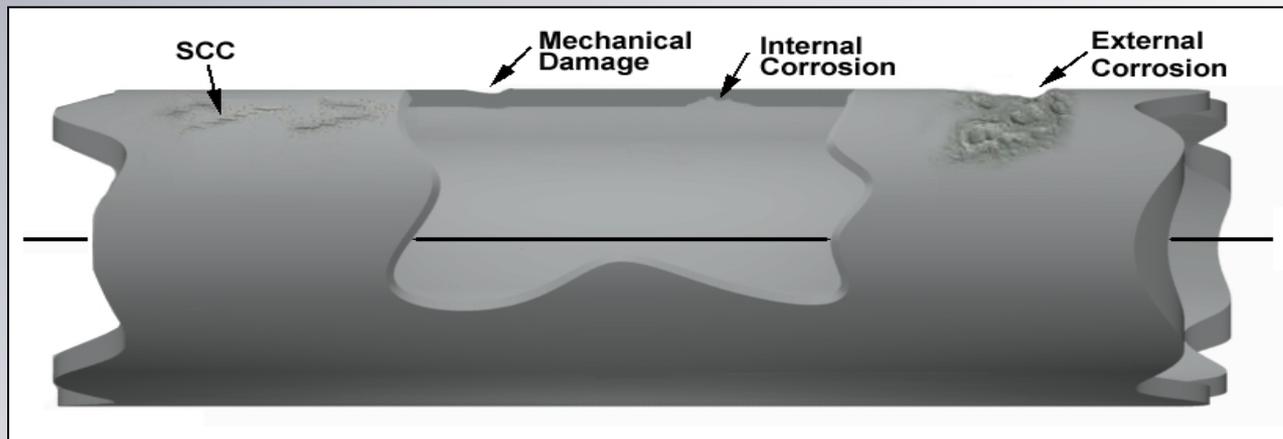
**Working Group 3 – Anomaly Detection/Characterization**  
Gov/Industry Pipeline R&D Forum

July 18, 2012



# Anomaly Detection/ Characterization Research

- Stakeholder input sought/generated for detection/characterization research at 4 Pipeline R&D Forums and other public events
- Solicited for related topics in 7 research solicitations since 2002
- Related Investment: 76 tech development, product development & Direct Assessment improvement projects using \$7.1M (PHMSA)





# Notable Outputs/Impacts

## Software/Hardware improvements to guided wave used to inspect cased crossings

- Farther inspection distances
- Improved accuracy in characterizing defects



## First ever In-Line Tool to map cathodic current demand

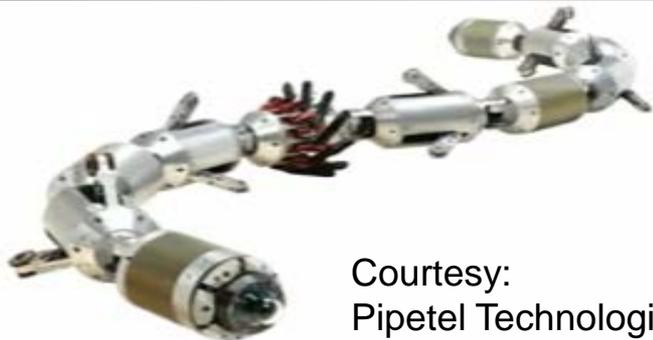
- Key in finding complex corrosion defects and coating disbondments



Courtesy: Baker Hughes

## Innovative tool to inspect unpiggable natural gas pipelines

- Untethered, 6"-8" up to 750 psi



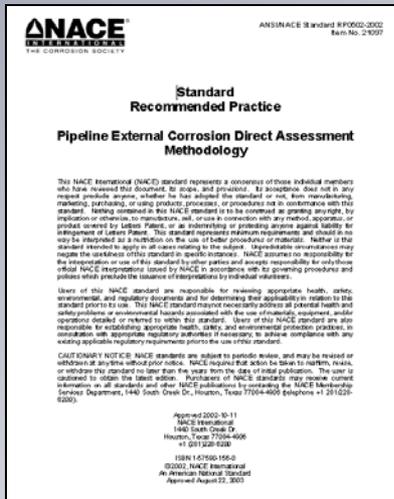
Courtesy:  
Pipetel Technologies



# Notable Outputs/Impacts

Strong focus toward Direct Assessment in all threat areas. Influencing several NACE DA standards beginning with External Corrosion Direct Assessment.

Threat	Pipeline Type	DA Method
External Corrosion	Natural Gas Hazardous Liquid	ECDA
Internal Corrosion	Dry/Wet Natural Gas & Hazardous Liquid	ICDA
Stress Corrosion Cracking	Natural Gas	SCCDA
Excavation Damage	Natural Gas Hazardous Liquid	MDDA

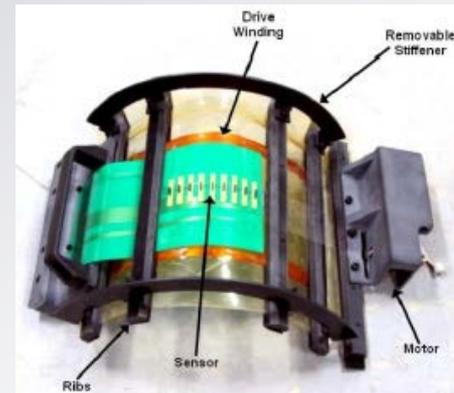




# Current Research

## MWM-Array Characterization of Mechanical Damage and Corrosion

- This ongoing program is aimed at advancing JENTEK's magnetic field-based eddy current technology to provide **quantitative assessment** of damage – mechanical damage and corrosion – in pipelines. There is also limited focus on SCC and weld inspection.
- For mechanical damage, the focus is on quantitative characterization of geometric variations and multidirectional residual stresses, as well as crack detection at mechanical damage sites.
- For corrosion, the focus is on enhanced high resolution imaging of both external and internal corrosion through coatings/insulation and weather protection.
- JENTEK is building on demonstrated magnetic field-based eddy-current detection capabilities to deliver substantially enhanced characterization of damage and practical means of inspection.

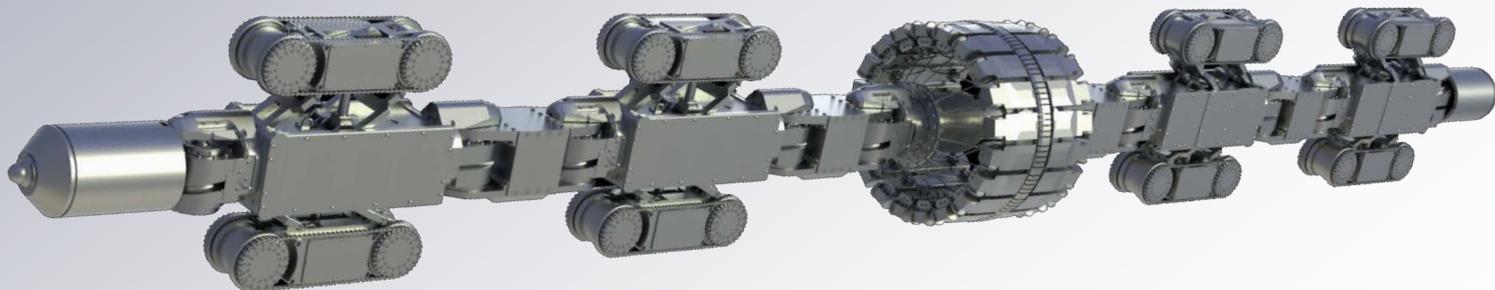




# Current Research

## Completion of Development and Commercialization of Robotics Systems for Inspecting Unpiggable Transmission Pipelines

The focus of this program is the completion of the development of these two systems (Explorer II for the inspection of 6" and 8" pipelines (with an RFEC sensor), and TIGRE for the inspection of 20" to 26" pipelines (with an MFL sensor).) for the inspection of unpiggable transmission natural gas pipelines and their introduction into the market. Market penetration in late 2012.





# Data Capture & Retrieval

- Need for technologies to improve data collections, tracking, traceability, and analyses.
- Ability to capture data
- Ability to take the captured data, retrieve it, and analyze it
- Tools to reduce human error in capturing data and transferring data
  
- Barcoding is a tool that has been used in the VA DP program for all sorts of data gathering and traceability.



# Interactive Threats and Crack like defects

- Noted from NTSB Conclusions –
  - Analysis mischaracterized crack defects, which resulted in not evaluating them as crack-field defects
  - Corrosion fatigue cracking from SCC, which had initiated in areas of external corrosion beneath the disbonded polyethylene tape coating
- R&D has looked mainly at the single threat and not multiple threats while focused on technology detection/characterization
- B31G and RSTRING is quiet on this subject and complex loading situations in general



# Interactive Threats and Crack like defects

(NTSB to PHMSA) Revise Title 49 CFR 195.452



# Interactive Threats and Crack like defects

(NTSB to Enbridge) Revise your integrity management program to ensure the integrity of your hazardous liquid pipelines



# Interactive Threats and Crack like defects

NTSB to the Pipeline Research Council International, Inc.:

- Review of various in-line inspection tools and technologies:
  - Tool tolerance
  - Probability of detection
  - Probability of identification
  - Provide a model with detailed step-by-step procedures to pipeline operators for evaluating the effect of interacting corrosion and crack threats on the integrity of pipelines



# Risk Ranking

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