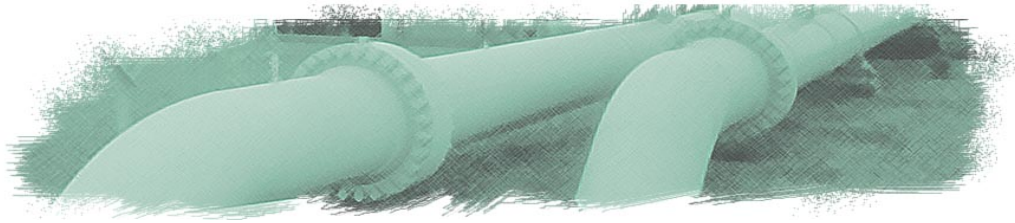
2004

An Overview of PRCI's Research Program

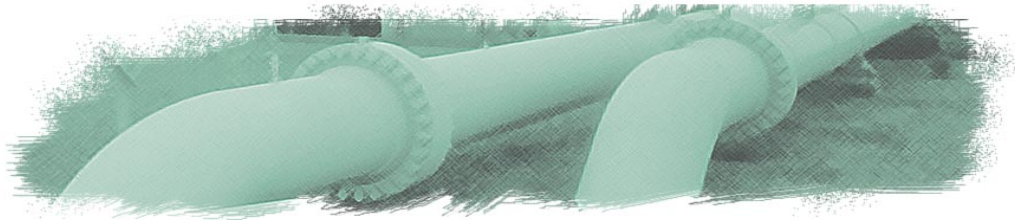
Christina Sames
Pipeline Research Council International, Inc.



An Overview of PRCI's Research Program

Christina Sames
Pipeline Research Council International, Inc.
API 2004 Pipeline Conference

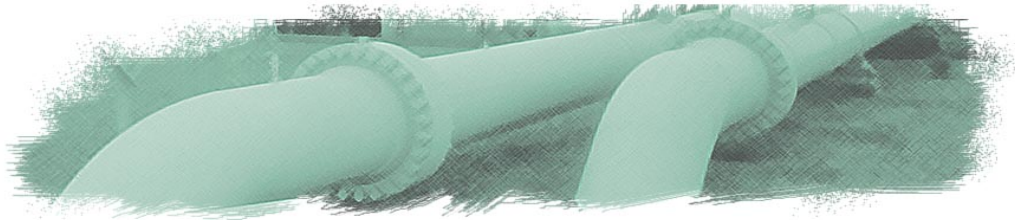
PRCI
Technology for Energy Pipelines



Today's Briefing

- Overview of PRCI
- 2003/2004 Focus
- Project Highlights
- Future Focus

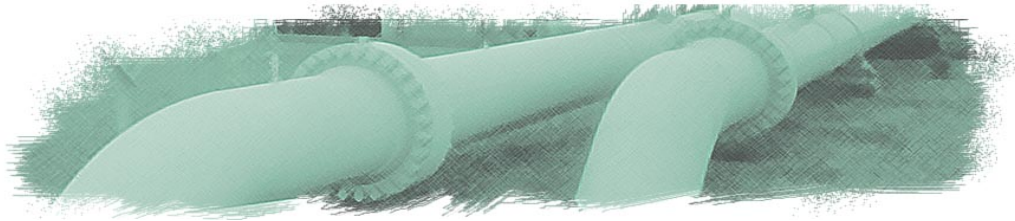
PRCI
Technology for Energy Pipelines



Pipeline Research Council International, Inc. (PRCI)

A collaborative technology development organization
Of, By, and For
the energy pipeline industry

PRCI
Technology for Energy Pipelines

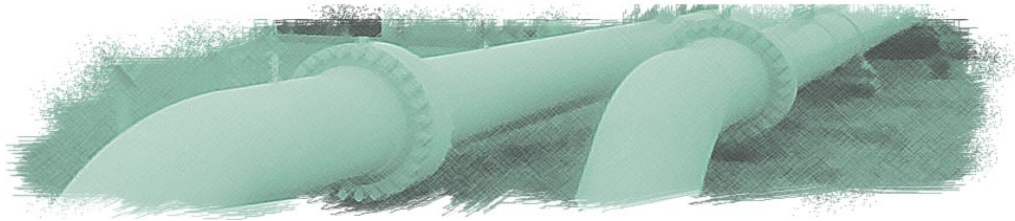


A PRCI Snapshot

- **Established in 1952 by 15 North American natural gas companies to address long-running brittle fractures.**
- **Not-for-profit corporation since 2000**
- **Current membership:**
  - 33 national & international pipeline companies
  - 300,000 miles of natural gas & hazardous liquid pipelines
  - AOPL
  - GTI

PRCI

Technology for Energy Pipelines



Who We Are

Southern California Gas Company

Transco
Piping gas for you

TransCanada

Williams

TEXAS GAS TRANSMISSION, LLC

TEPPCO

EXPLORER PIPELINE COMPANY

Gasum

bp

Gasunie

CenterPoint Energy

MARATHON ASHLAND
Pipe Line LLC

GULF SOUTH PIPELINE

ConocoPhillips

Columbia Gas Transmission
A NiSource Company

ChevronTexaco

ENBRIDGE

ExxonMobil

gti

Buckeye Partners, L.P.

AOPL

elpaso

Panhandle Energy

Dominion

GASSCO

National Fuel Gas Company

Consumers Energy
Count on Us

Duke Energy

Foothills Pipe Lines Ltd.

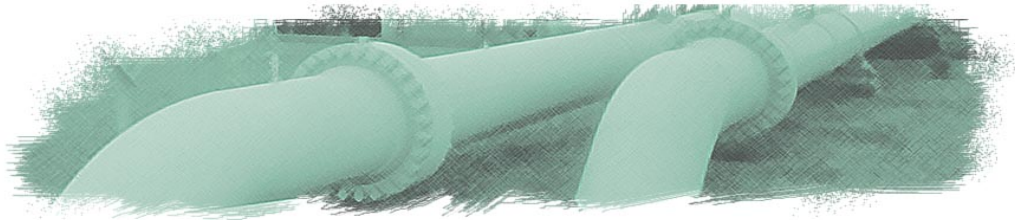
ENRON

TransGas

ارامكو السعودية
Saudi Aramco

Gaz de France

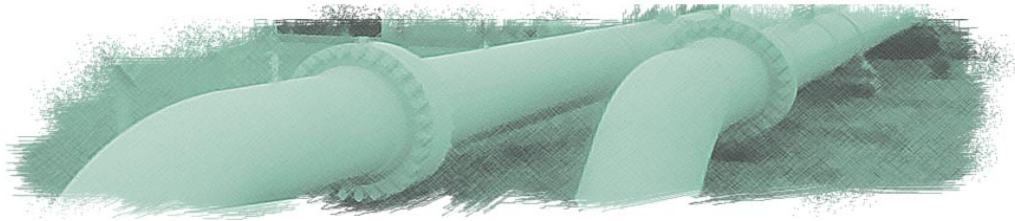
PRCI
Technology for Energy Pipelines



How Does it Work?

- Pipeline member technical experts plan & manage the technical agenda
- One Member/One-Vote on the Board & Technical Committees
- Members Have Free Access to All PRCI Technology
- More Than $185MM Contributed Since 1952

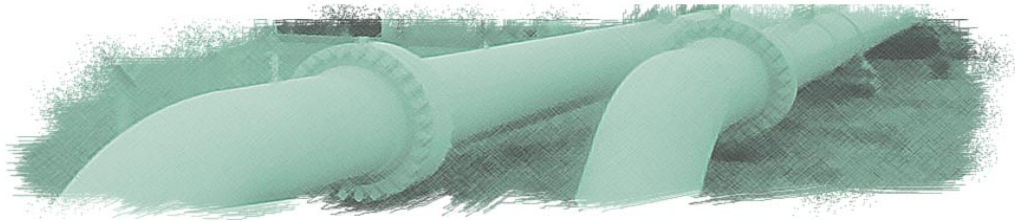
PRCI
Technology for Energy Pipelines



PRCI Technical Committees

- Corrosion and Inspection
- Design, Construction, and Operations
- Materials
- Measurement
- Underground Storage
- Compressor and Pump Station

PRCI
Technology for Energy Pipelines

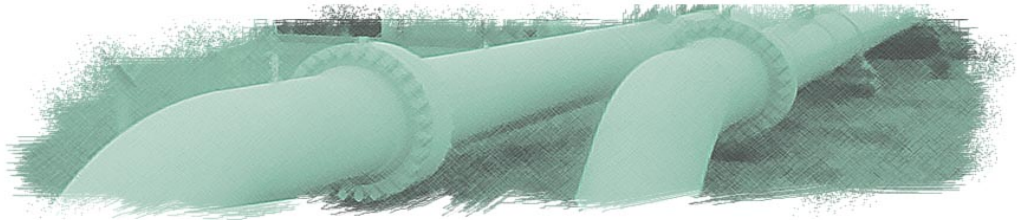


R&D Budgets

Program ($MM)	2003	Co-fund	2004	Co-funds
Design, Const. & Ops.	$1.6MM	$1.0MM	$2.0MM	$1.5MM
Materials	3.0	0.6	3.0	1.8
Corrosion & Inspect	3.8	0.5	3.7	3.1
Compressor & Pump	1.4	1.9	1.3	0.9
Underground Storage	0.6	0.7	1.0	1.5
Measurement	0.7	0.3	1.0	0.4
Total	$11.1MM	$5.0MM	$12MM	$9.2MM

2003 total $16.1MM 2004 total $21.2MM

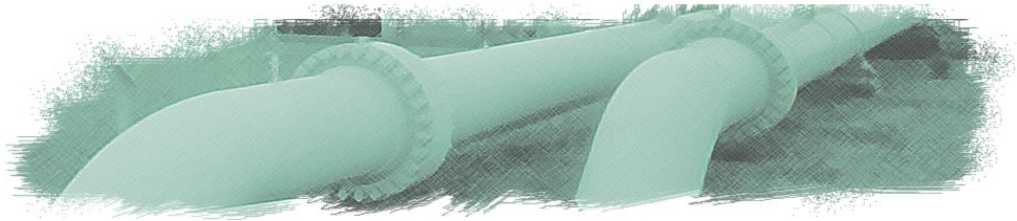
Technology for Energy Pipelines



PRCI Committees

- **Corrosion and Inspection**
  - ILI for mechanical damage, cracks, & geometry, direct assessment, coatings & inspection tools, SCC, MIC
- **Design Construction and Operations**
  - Implementing new integrity standards, reliability based design, preventing 3rd party damage, human factors, abnormal external loads, wrinkles/wripples
- **Materials**
  - Stronger steels, (X100 and beyond), repair & assessment tools, new welding and inspection processes, processes to lower construction costs

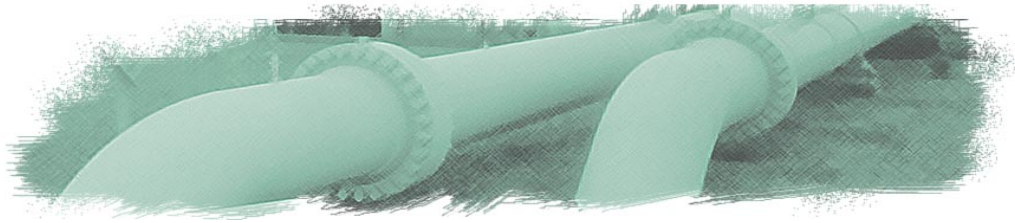
Technology for Energy Pipelines



PRCI Committees

- **Compressor and Pump Stations**
  - Flexibility, Life Extension & Reliability, Engine Efficiency and Environmental Compliance
- **Measurement and Metering**
  - Reliability and Accuracy, Wet Gas Solutions, Product/Pipe Compatibility and Integrity
- **Underground Storage**
  - Cavern Safety, Productivity, & Deliverability
  - Cavern Expansion

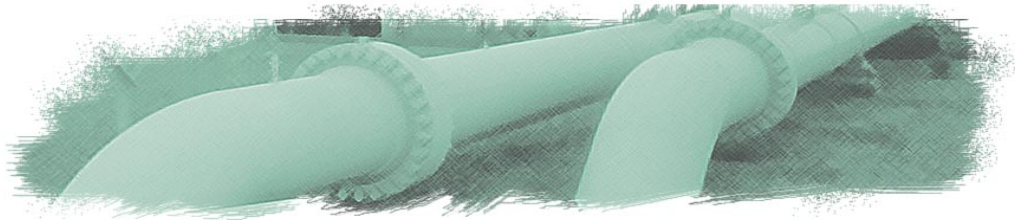
PRCI
Technology for Energy Pipelines



Corrosion and Inspection Programs

- **7 Programs, ~ $11MM in 2003/04**
  - Locate Mechanical Damage
  - Enhance Integrity of Non-piggable Pipelines
  - Protect Shielded Pipe and Enhance Environmental Corrosivity Models
  - Identify and Prioritize Locations for Internal Corrosion Inspection, Monitoring, and Mitigation
  - Optimize Integrity Assessment Intervals
  - Improve SCC detection, assessment and management
  - Improve CP System Effectiveness

PRCI
Technology for Energy Pipelines



Corrosion and Inspection Projects

➡ Locate Mechanical Damage

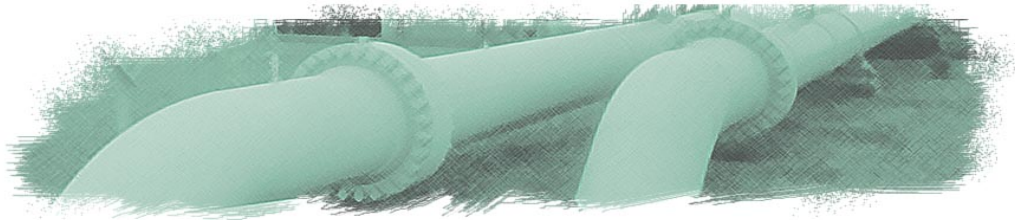
– Details of Defect Induces in MFL Signals

Total funding: $2.2M

Model MFL signal responses to determine stress fields and detect mechanical damage

Completion: 2005

PRCI
Technology for Energy Pipelines



Corrosion and Inspection Projects

➡ Improve CP System Effectiveness

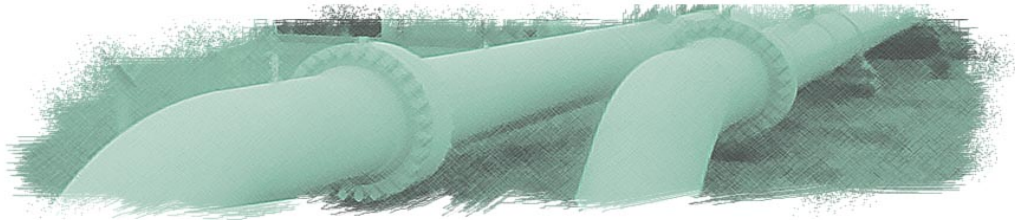
– Develop Quantitative Relationships Required to Define Mitigation Levels Necessary to Prevent Corrosion

Total funding: $500K

Model distribution paths of AC in confined corridors and suggest mitigation strategies

Completion: 2005

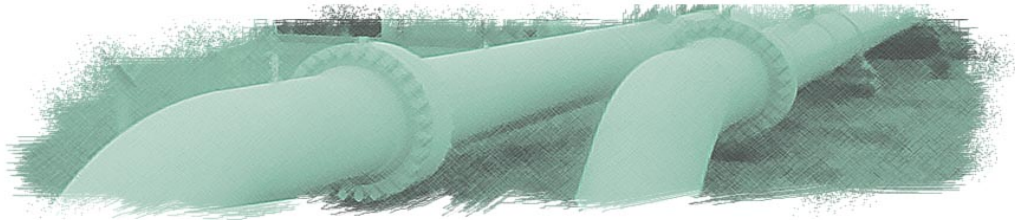
PRCI
Technology for Energy Pipelines



Design, Construction, and Operation Programs

- **7 programs and ~ $6MM in 2003/2004**
  - Prevention of 3rd party damage
  - Implementing integrity standards
  - Reliability-based design alternatives
  - Determination of maximum safe surface loads
  - Leak detection and notification
  - Prevention of critical pipeline strains
  - Solutions for adverse crossings

PRCI
Technology for Energy Pipelines



Design, Construction, and Operation Programs

➡ Prevention of 3rd party damage

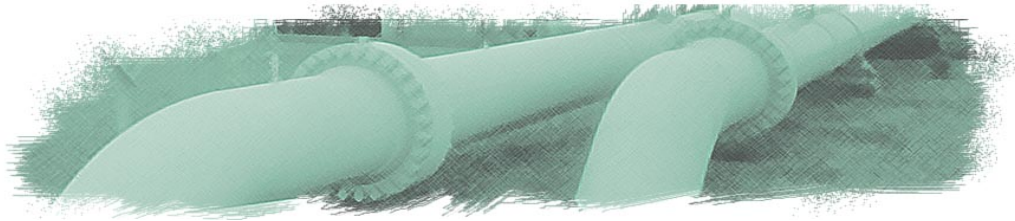
– Detection & Monitoring:

Develop acoustic monitoring for mechanical damage, satellite imagery for unauthorized encroachment and ground movement, and software to detect changes in radar images

Total funding: $1.7M

Completion: 2004

PRCI
Technology for Energy Pipelines



Design, Construction, and Operation Programs

➡ Leak Detection and Notification

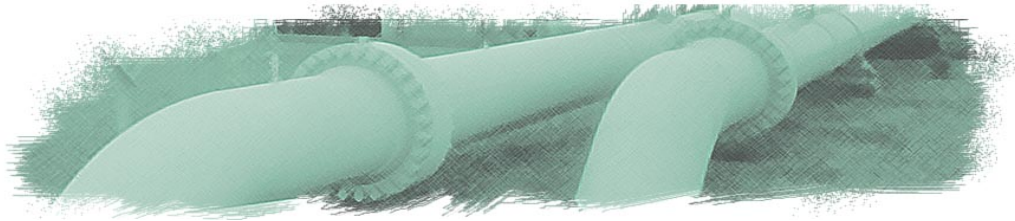
– Liquid Release Detection:

Parametric based model to lower the leak detection threshold for liquid pipelines

Total funding: $400K

Completion 2005

PRCI
Technology for Energy Pipelines



Design, Construction, and Operation Programs

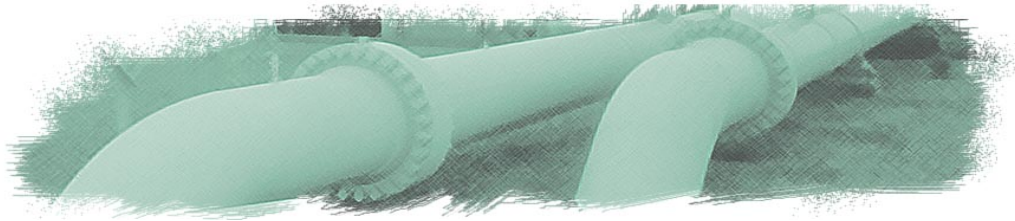
➡Prevention of Critical Pipeline Strains

- Pipe – Soil Interaction: $700K in 2003/2004

  Models and methods for addressing pipe-soil interaction effects in design and mitigation (including frozen soils)

  Completion: 2004

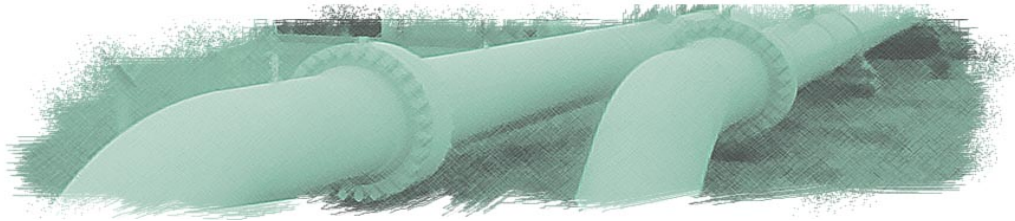
PRCI
Technology for Energy Pipelines



Materials Programs

- **4 Programs, ~ $9MM in 2003/04**
  - Integrity Assessment and Management of in-service damage
  - New Materials and Welding Processes to Lower the Cost of New Pipeline Construction
  - Maintenance Welding Techniques
  - Advanced Material Design, Safety, and Integrity

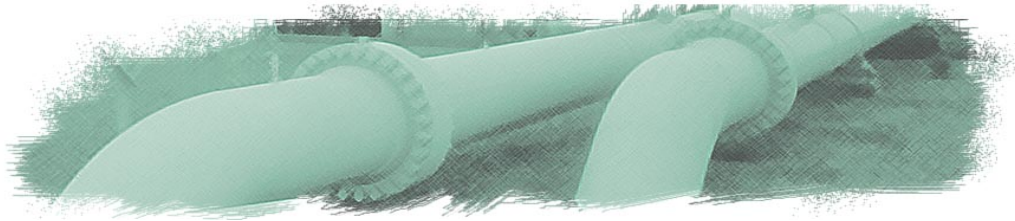
PRCI
Technology for Energy Pipelines



Materials Projects

- **Integrity Assessment and Management for In-Service Damage**
  - SCC Crack Extension and Coalescence Modeling: Extend the SCC crack growth model to project SCC behavior over time under generalized loading conditions
  - SCC Avoidance in Ethanol Pipelines: Identify the primary factors and range of service conditions likely to cause SCC in ethanol pipelines

PRCI
Technology for Energy Pipelines



Materials Projects

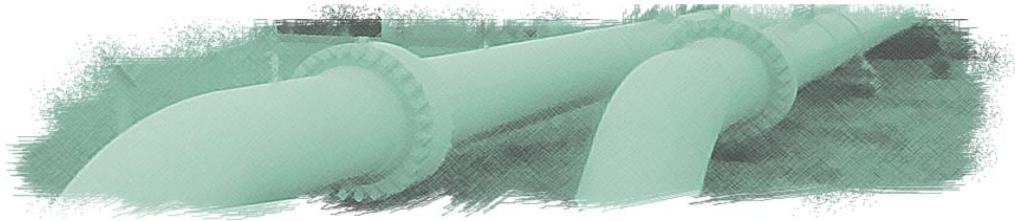
- **Integrity Assessment and Management for In-Service Damage**
  - Assessment of Remaining Strength of Corroded Pipe

    Guidance to assess remaining strength of corroded pipe subject to biaxial & cyclic loading, of corroded higher strength pipe (x80/100), & failure pressure of corrosion defects in low toughness pipe

    Total funding $400K

    Completion 2005

PRCI
Technology for Energy Pipelines



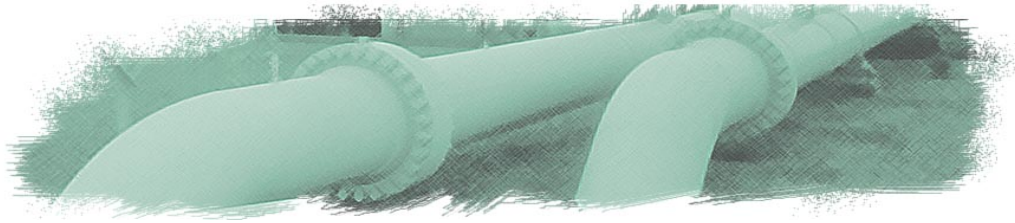
Materials Projects

- **New Materials and Welding Processes**
  - Improved Welding Methods for Pipelines

    Multi-wire GMAW procedures for high speed, high deposition fill pass welding

    Total funding $500K

    Completion 2005



Contact Details

Christina Sames

703/387-0190 X105

csames@PRCI.org

Pipeline Research Council International Inc.

www.prci.org