

A Comprehensive Update in the Evaluation of Pipeline Weld Defects

PRCI Perspective

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ECA of Girth Welds

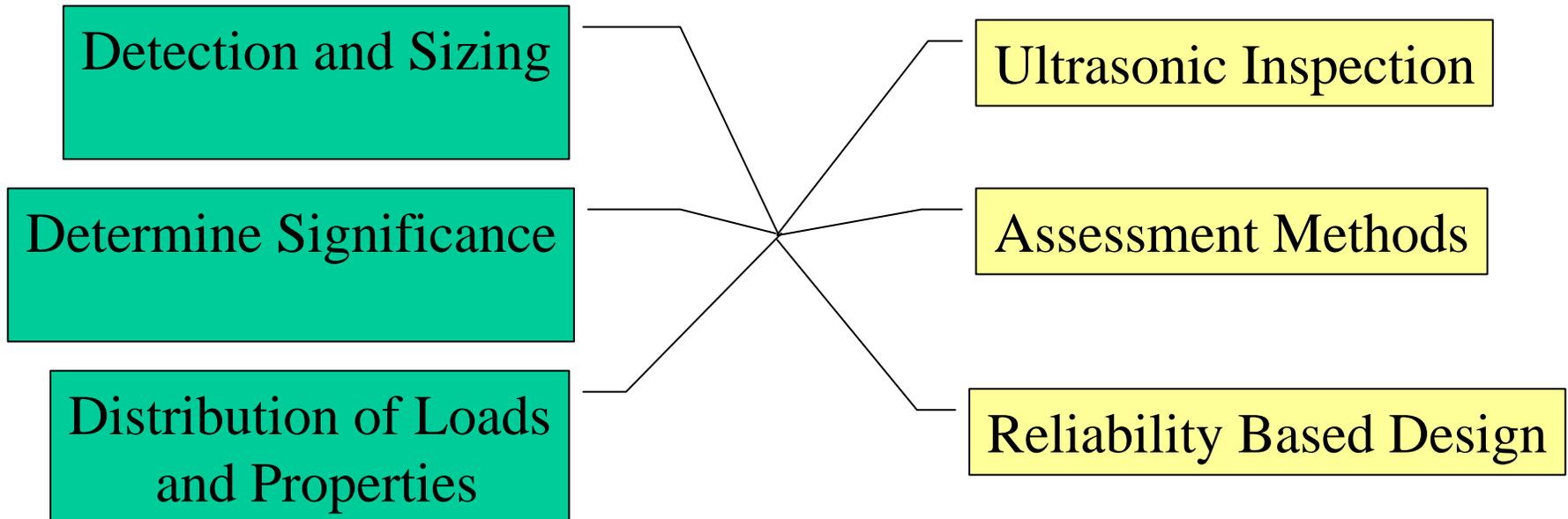
- Acceptance criteria for girth weld flaws base on fracture mechanics principles
- Allows more efficient pipeline construction while maintaining adequate safety
- Permitted by various standards
- Some standards have fallen behind existing proven technology

ECA Standards Require:

- Fracture assessment
- Plastic collapse assessment
- Flaw interaction rules
- Toughness testing requirements
- Rules for application
 - stress analysis
 - essential variables
 - etc.

PRCI

- Developing ECA methods since 1970's
- Continuous refinement and improvement
- Tools for easy use



PRCI - Detect and Size Girth Weld Flaws

- Discrimination & Sizing Automated Ultrasonic in Automated Welds (Advantica)
- Validation of Current Approaches for Girth Weld defect Sizing Accuracy (EWI)
- Inspection of Welds in Thin Wall Pipe Using Mechanized Ultrasonic Inspection (EWI)
- Further Investigation of AUT Defect Detection and Sizing [DOT cost match] (Advantica)
- Compensation for Temperature and Wall Thickness Changes using Phased Array Transducers (RD Tech)

PRCI - Assessment Methods for Girth Weld Flaws

- Assessment Procedures & Software for Girth Welded Pipes and Welded Sleeve Assemblies (EWI)
- Interaction of Flaws Under Plastic Collapse Conditions (three phases) (U Gent)
- Compendium of Updated Pipeline Girth Weld ECA Methodologies to Support Revisions to Existing Code Practices (EMC2)
- Strain Criteria for Assessment of Defects/Plastic Collapse Behavior (EMC2)
- Extension of Strain Design Criteria to Buried HAZ Defects (EMC2)
- Guidelines on Tensile Strain Limits (EMC2)
- The Effects of Constraint on Fracture and Plastic Collapse (EMC2)
- Input to code revision for interaction of girth weld defects under plastic collapse conditions (U Gent)
- The Effect of Weld Metal Yield Strength Mismatch & Yield-to-Tensile Ratio on the Structural Integrity of Girth Welds in API 5L X 80 Pipe (U Gent)

PRCI - Material Properties Affecting Girth Weld Integrity

- Database of Mechanical and Toughness Properties of Pipe (Battelle)
- Application of Master Curve Approach to Critical Assessment of Pipeline Girth (EWI)
- Web Database: Pipeline & Weld Properties (Tech. Toolboxes / Eiber)
- In-Situ Pipeline Mechanical Property Characterization (CC Tech)
- In-Situ Pipeline Mechanical Property Characterization (Fleet)
- Factors Affecting the Strength and Toughness of Weld Metal in 5LX80 Pipe (U Gent)
- Effects of Welding on HAZ Softening of X 70 / X 80 TMCP Linepipe Steels (U Gent)

PRCI - Reliability Based Design

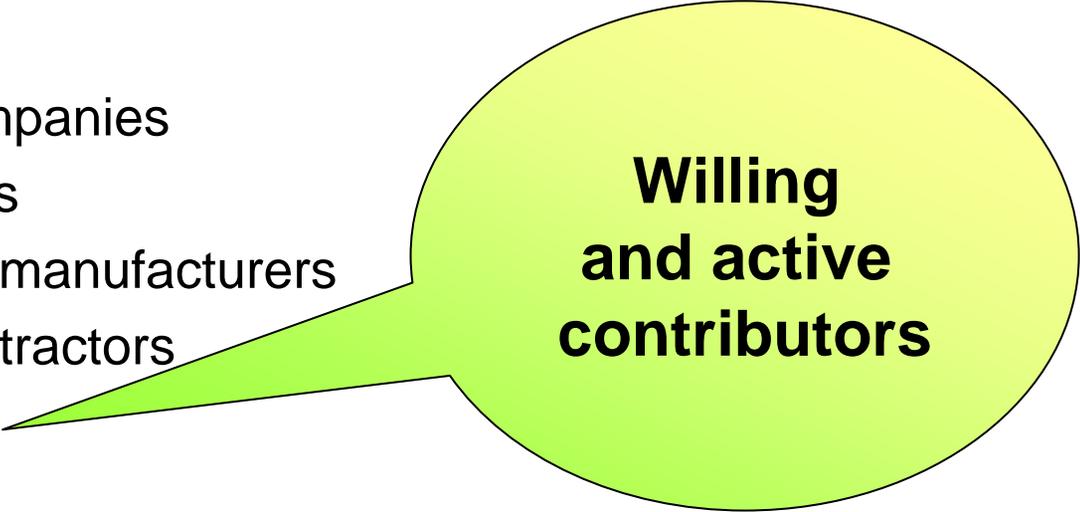
- A Limit States & Reliability Based Girth Weld Assessment Framework for Long Segments (EWI)
- Reliability Assessment Using the Improved ECA Procedure (EMC2)
- Girth Weld Reliability of Older Pipelines (EWI)
- Reliability of Girth Welds in Early Generation Pipelines - Joint Design & Flaw Combinations (EWI)
- Optimized Sampling Frequencies for Weld Reliability Assessments of Long Pipeline Segments (Southwest Research)

Implementation of Technology

- Tools Developed
- Industry Approval
- Standards Development
- Regulatory Acceptance
- Widespread Use

Canadian Approach to Standards Development

- Participants
 - Pipeline companies
 - Steel makers
 - Component manufacturers
 - Pipeline contractors
 - Regulators



**Willing
and active
contributors**

Regulatory Acceptance virtually guaranteed

PRCI Goals

- Research factors affecting girth weld integrity
- Develop useful tools for industry
- This project:

Provide information to allow development of practical standards:

- Safe
- Easy to implement
- Cost effective