Docket No. SA-534
Exhibit No. 8-A

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C.

In-Line Inspection Tool Capabilities
Presentation by Geoff Foreman
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(9 Pages)

ILI Tool Capabilities

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NTSB pipeline hearing
March 3rd 2011
Washington DC

ILI is a process - not just about technology

Prove the pipeline is piggable

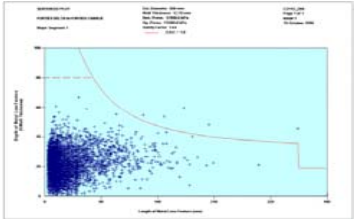
Pipeline Expertise

ILI Tool Run

Applied Physics

Analyze the data & produce the inspection report

Analysis Algorithms



Integrity assessment and plan responses

Engineering Expertise

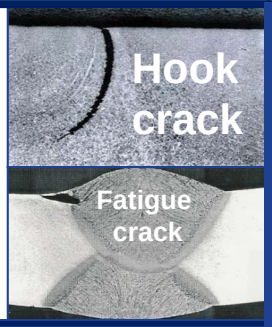
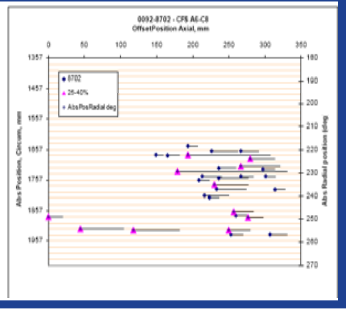
Carry out Mitigation Action

Carry out repairs)

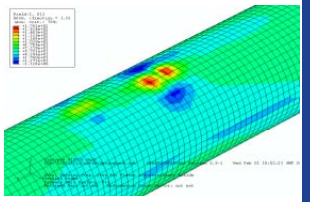
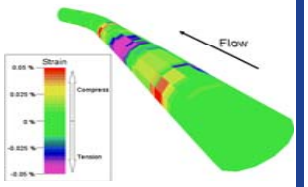
Carry out Report Validation (Confirm defect size)

NDE Expertise

Crack Inspection capabilities

Mission	Min detection	Enabling Technologies
Identify and size significant cracks 	• liquids 0.040in deep and 1” long (USCD) • In Gas 0.080in deep and 2in long (Emat) • 25% wt deep and 2” long (TFI)	Transverse field MFL (TFI Gas & Liquids) 
Accurately locate and predict failure potential 	• +/- 3ft 3ins to weld • +/- 8in along the pipe • Use length and depth to prioritize	Ultrasonic crack detection (USCD Liquids only) 
Predict failure potential from adjacent cracks 	• Extensive SCC crack fields populated with both critical and subcritical cracks	Phased Arrays crack detection (USDuo liquids only)  Emat Ultrasonic crack detection (Ematscan Gas & liquids) 

Corrosion and other inspection capabilities

Mission	Minimum detection	Enabling Technologies
General Corrosion  **Local Pitting** 	• 0.2in diameter • 5% wt for general corrosion • 10% wt for local pitting corrosion	 Ultrasonic Wall Measurement (USWM liquids only)  Corrosion + geometry combo (MFL Gas & Liquids)
Mechanical Damage 	• 0.1 inch in depth • Dents & with metal loss signal in MFL combo	 Transverse field MFL (TFI Gas & liquids)
Map centerlines Detect wrinkles 	•Positioning of Centerline - GPS • +/- 5ft • Bending Strain (pipe specific).	 Geometry and Mapping (Caliper Geo gas & liquids)

Minimum defect sizes and tolerances

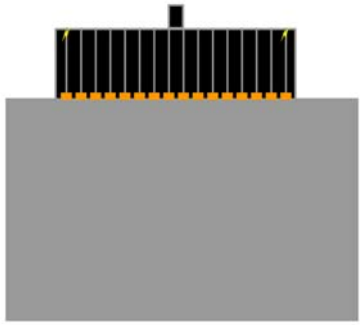
Typical Metal Loss (Corrosion) ILI tool specification								
Inspection Specifications	Axial Magnetic (Gas or Liquids)		Axial Magnetic (SHR) (Gas or Liquids)		Transverse Field Magnetic (TFI) (Gas or Liquids)		Wall Measurement Ultrasonic (USWM) (liquids only)	
	Pitting Corrosion	General Corrosion	Pitting Corrosion	General Corrosion	Pitting Corrosion	General Corrosion	Pitting Corrosion	General Corrosion
Min Detectable depth	10% wt	8% wt	8% wt	5% wt	40% wt	20% wt	0.040 inch	
Depth sizing tolerances	+/- 10% wt @ 80%		+/- 10% wt @ 90%		+/-15% wt @ 80%		+/-0.0197 in	+/- 0.04 in
Min detectable dia.	0.276 in		0.197 in		0.197 inch		0.393 in	
Probabilty Of Detection	90%		90%		90%		90%	
Probabilty Of Identification	80%		90%		80%		90%	

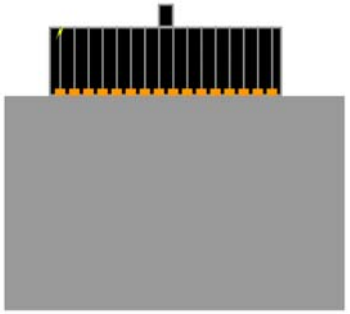
Typical Crack Inspection Tool specifications					
Inspection Specificartions	Piezoelectric Ultrasonic (USCD) (for liquid pipelines)	Phased Arrays Ultrasonic (for liquid pipelines)	EMAT Ultrasonic for Gas (or Liquids)	Transverse Field Magnetic (for Gas or Liquids)	
				short	long
Min Detectable Crack Length	1 in	1 in	2 in	1 - 2 in	> 2 in
Min Detectable Crack Depth	0.04 in	0.04 in	0.08 in	50% wt	25% wt
Min Detectable Crack width	0.0 in	0.0 in	0.0 in	0.004 in	
Crack depth sizing tolerances	12.5% - 25% wt 25% - 40% wt > 40% wt	+/-0.04 in	12.5% - 25% wt 25% - 40% wt > 40%wt	+/- 25% wt	
Probabilty Of Detection	90%	90%	90%	80%	80%
Probabilty Of Identification	90%	90%	90%	30%	70%

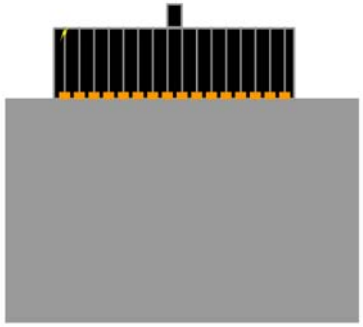
Tools have different specifications

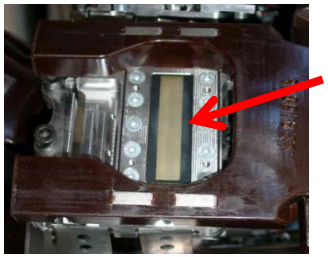
Emerging technologies – Phased Arrays & Emat

Phased Array Ultrasonic Inspection









Phased array sensor in liquid pipelines

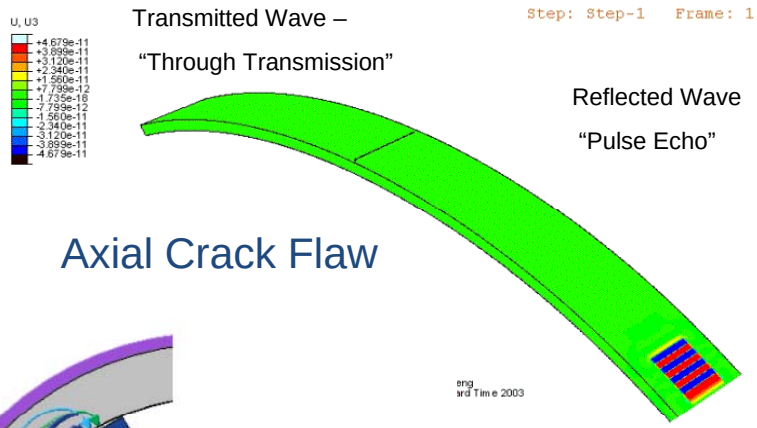
Beam Focusing

Beam Steering

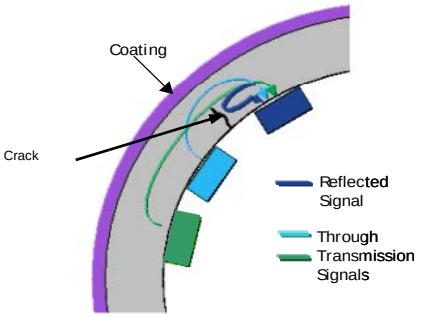
Beam Focusing and Steering

Provides many more sensing options

EMAT Ultrasonic Inspection



Axial Crack Flaw



Electro Magnetic Acoustic Transducer

Generation of ultrasonic waves in the pipe wall by Electromagnetic pulses

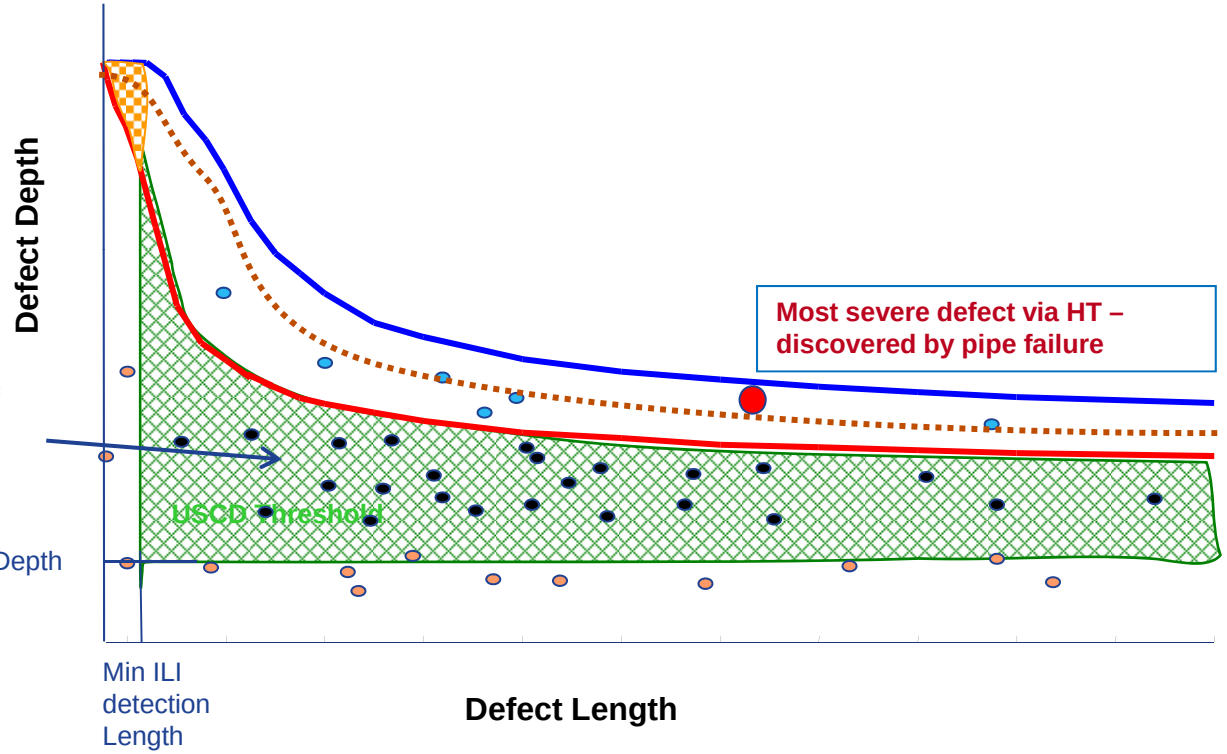
No liquid coupling required – Operates in Gas!

Discrimination of UT Reflector type crucial to characterization (Crack vs. Non-Crack)

Superior crack sizing capability for gas

ILI Capabilities vs. Hydro-test

A typical example of defects that can be monitored in a High Pressure Pipeline, using their length and depth, relative to the proximity of the Hydraulic pressure test failure curve.



Early ILI identification of multiple defects prior to reaching HT test critical size

Min ILI detection Depth

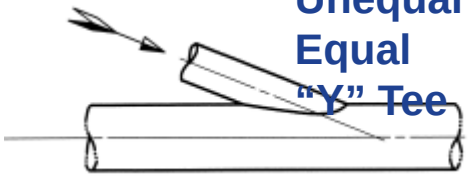
ILI can provide early warnings of growth and increased confidence

NB. Diagram structure taken from IPC 2006 -10434 on Comparison of technologies for SCC threat validation and assessment

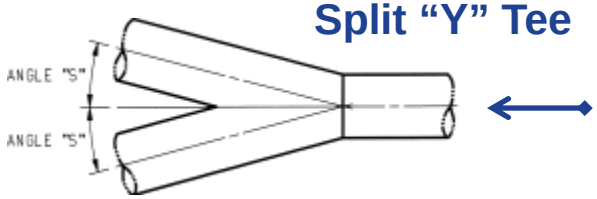
Back up Material

Time or Topic Permitting

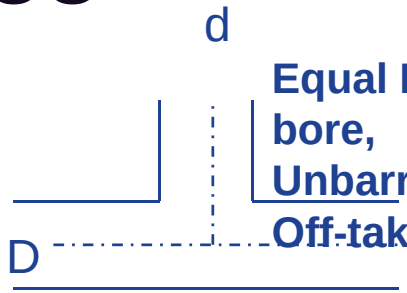
Why are pipelines unpiggable?



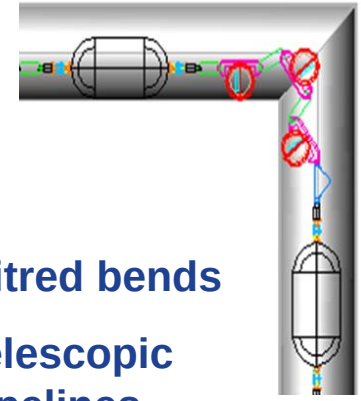
Unequal
Equal
"Y" Tee



Split "Y" Tee



Equal Full bore, Unbarred Off-take



Mitred bends

Telescopic pipelines

24" plug valve in 30" line (60% reduction)

28" gate valve in 36" line (20% reduction)

Manifold type endings

No launch/receive Trap access