



# Non Metallics Inspection

Integrating Non-Destructive Testing  
with Quality-Safety-Service and Cost  
Effectiveness

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# Evisive Scan

- Evisive consists of a transmitter and two receivers in the same unit (transducer). The transmitter emits a single coherent frequency of microwave energy between 5 and 50 GHz.
- The energy is reflected and transmitted at every interface between materials with differing dielectric constants.
- The outgoing signal is mixed with the incoming reflections, and the resulting interference pattern is measured at discrete points, providing an image





# Field Scanning



- The Evisive scanning can be provided using:
- automated and manual pipe scanning
  - manual hand scanning for complex geometries, spot checks or large objects (i.e. tanks)
  - Laboratory scanning, including very complex geometries

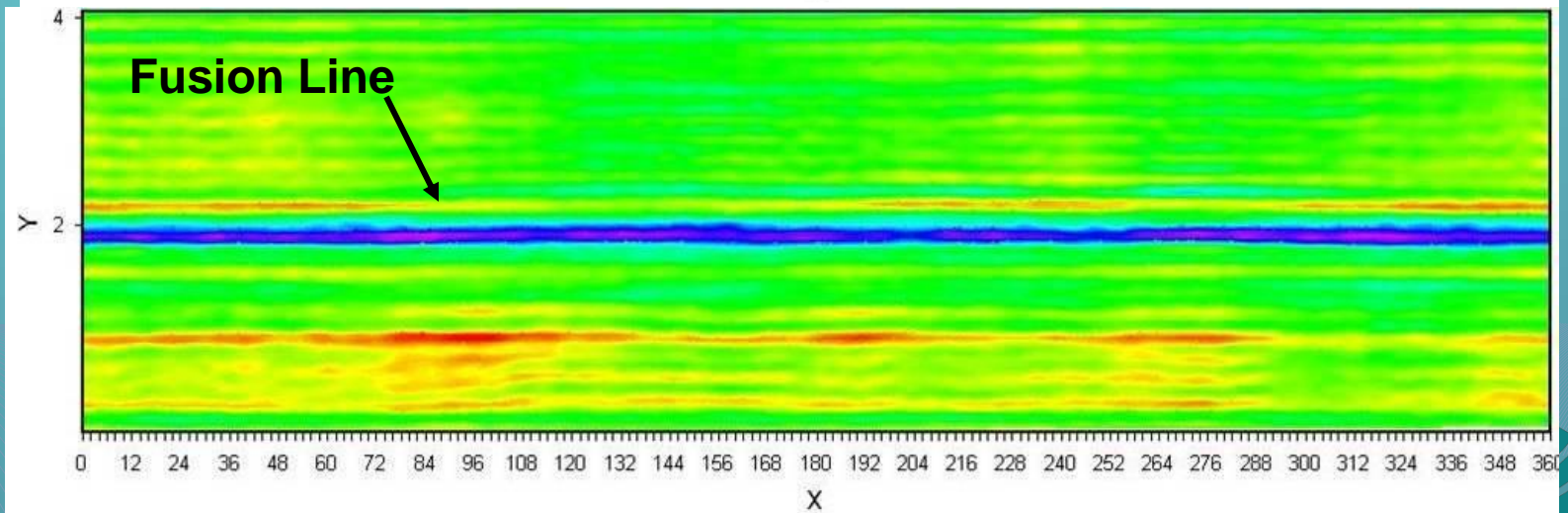
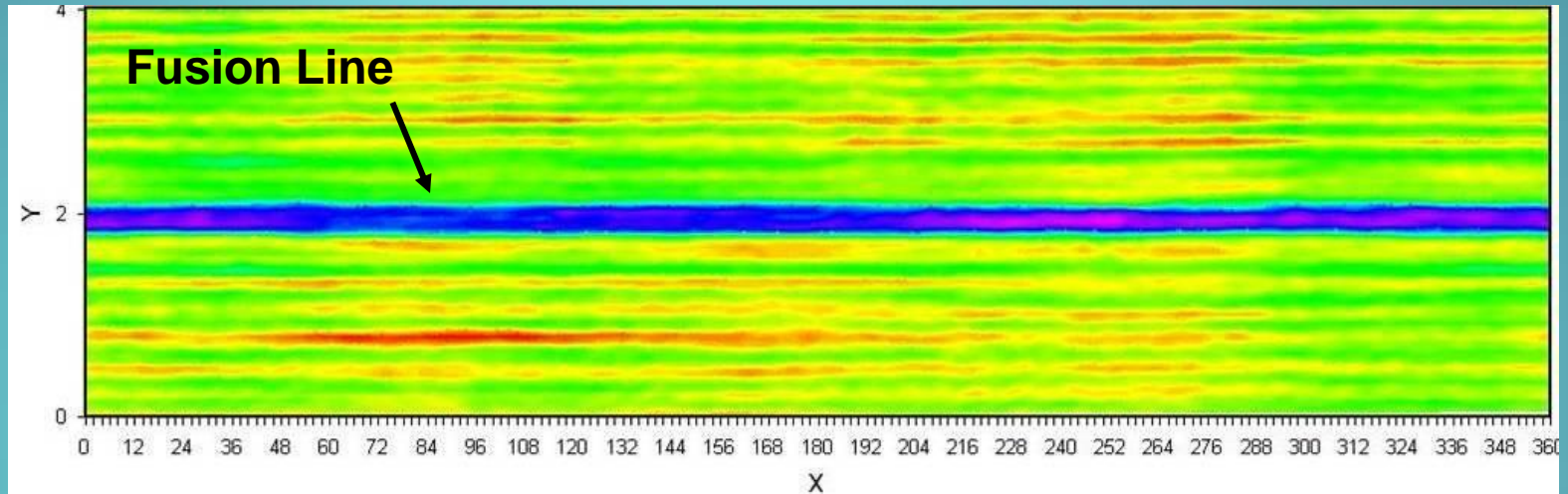


# Non-Destructive Examination Technologies for the Inspection of Butt Fusion Welded High Density Polyethylene Joints

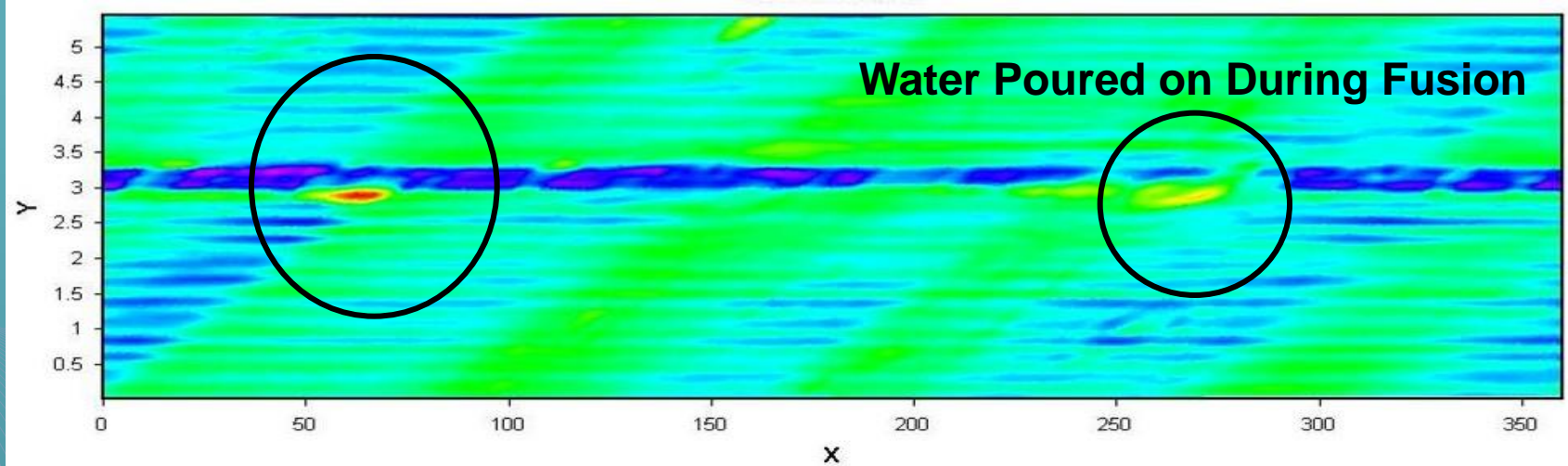
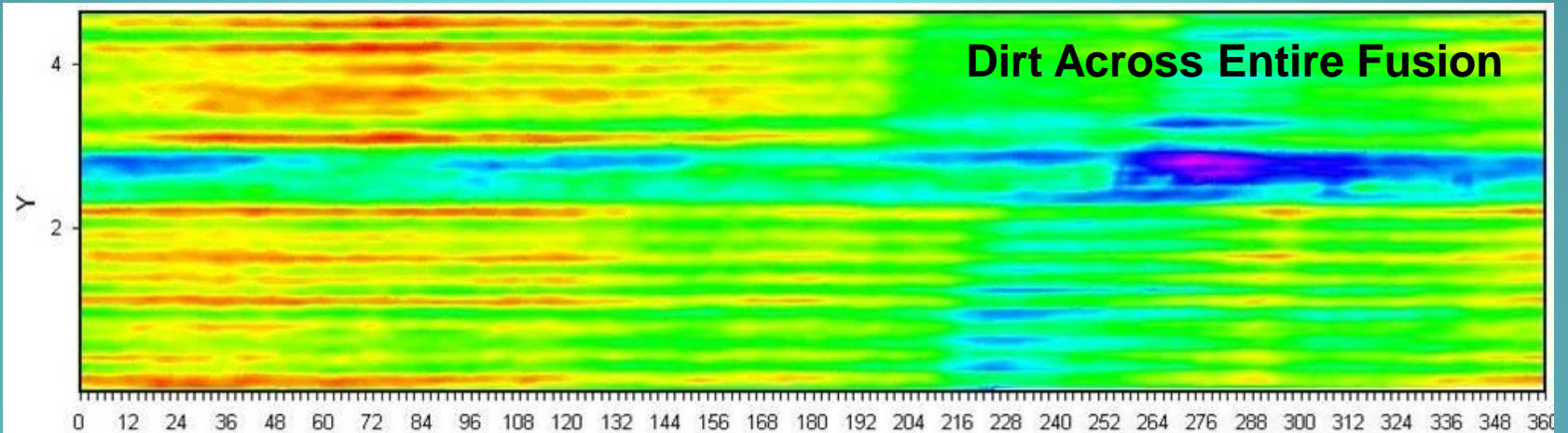




# Evisive Scan Images: Control Welds

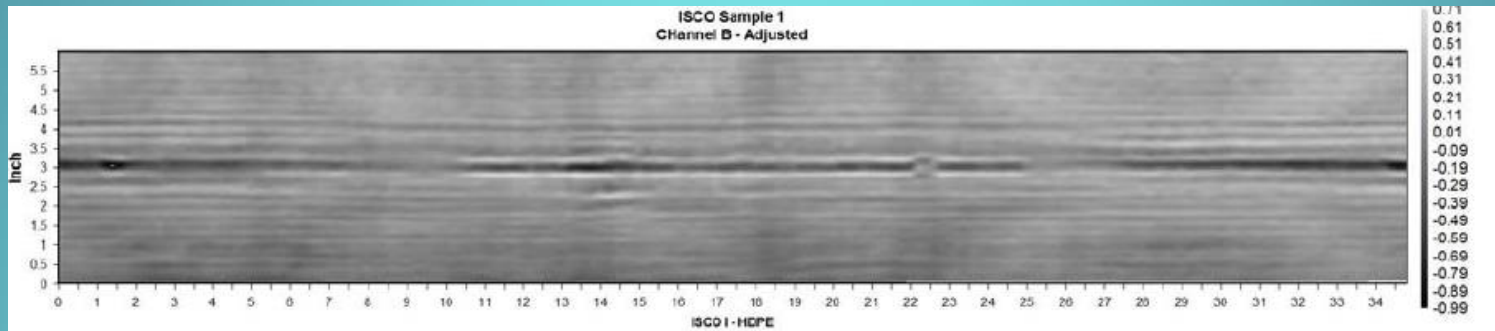


# Evisive Scan Images: Imbedded Defects





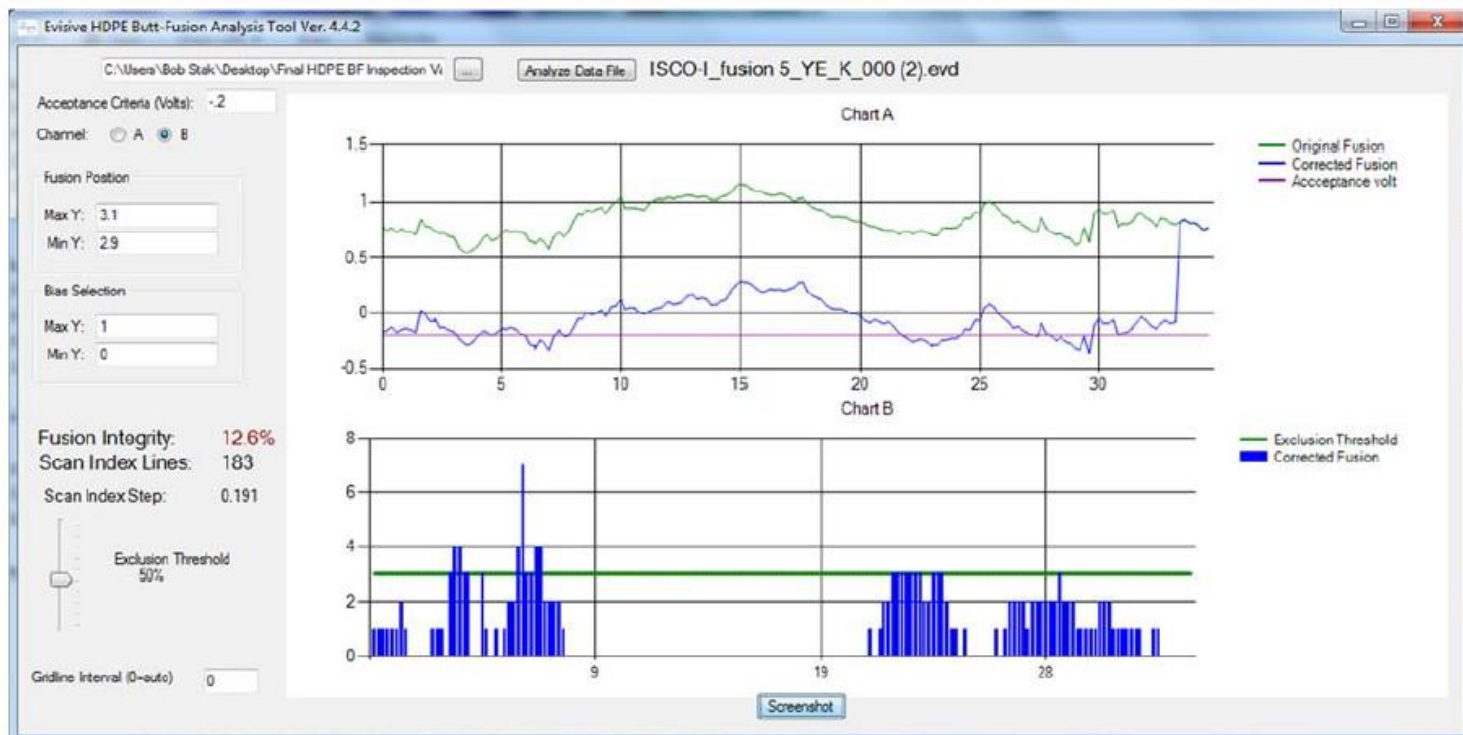
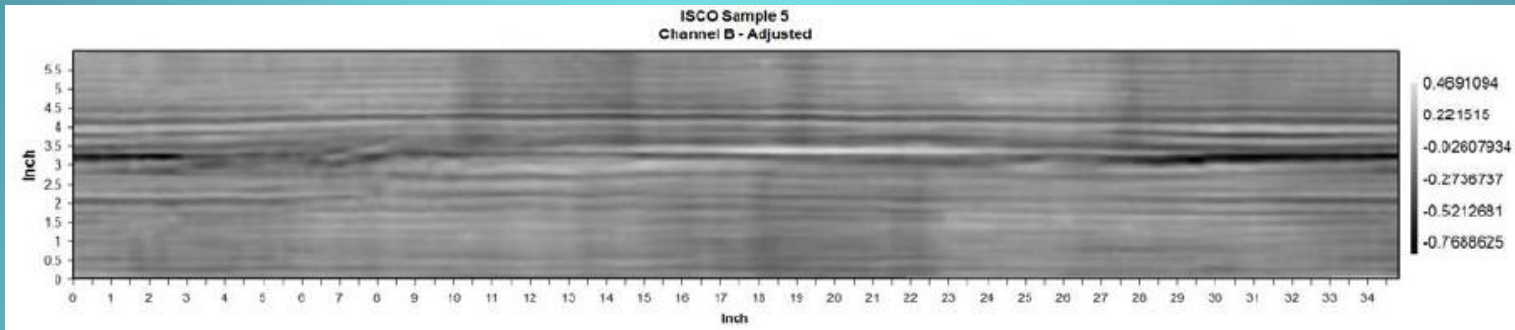
# Evisive Scan: Pass/Fail Software



"A" Channel Analysis Results showing the selection of ductile threshold of 76.5%



# Evisive Scan: Pass/Fail Software



"B" Channel Analysis Results showing a determination of 12.6% ductile for Fusion 5





# Electro-Fusion Coupling



4" Electrofusion Coupling and Piping

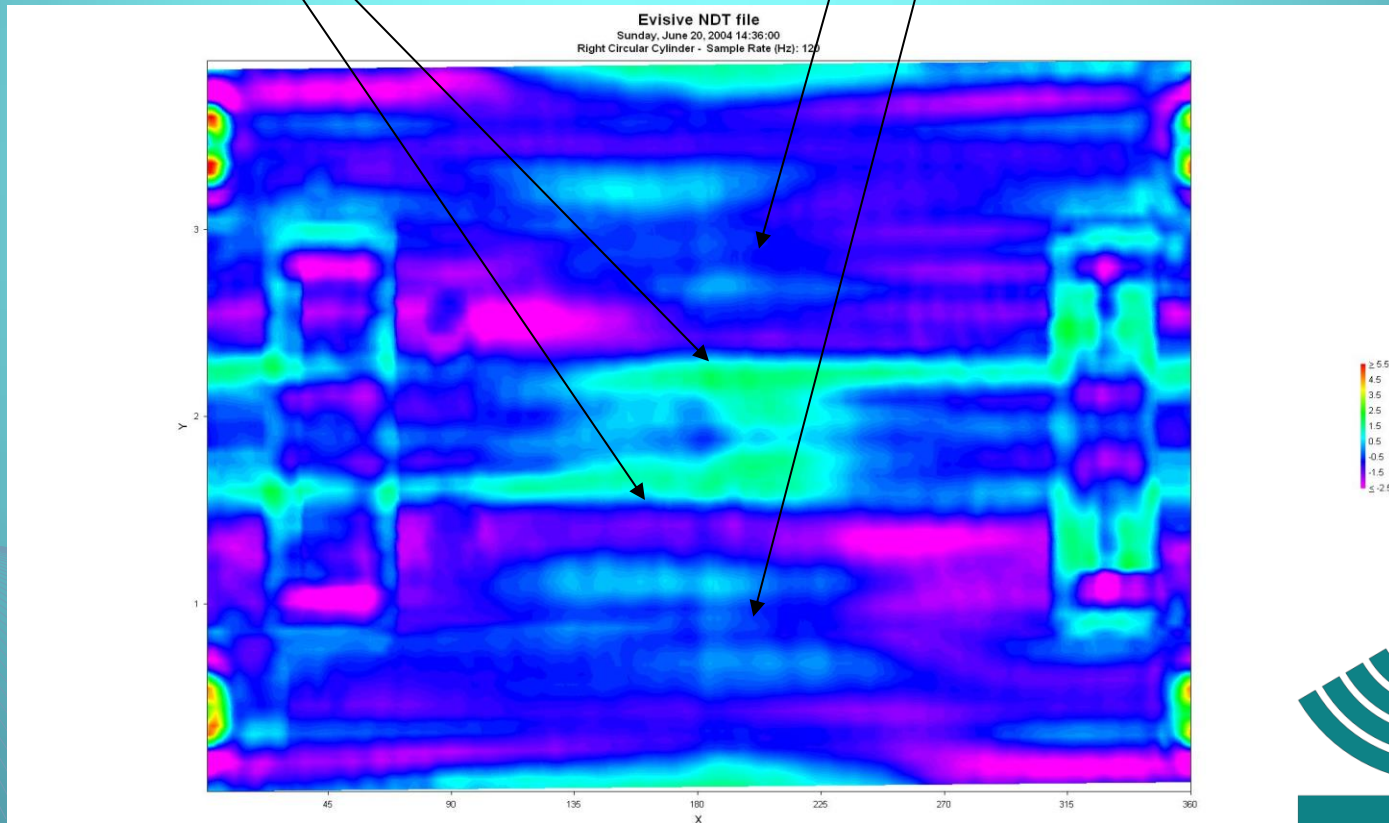


# 4 Inch Electro-Fusion Coupling

## Good Fusion

Edges of pipe shown at proper location

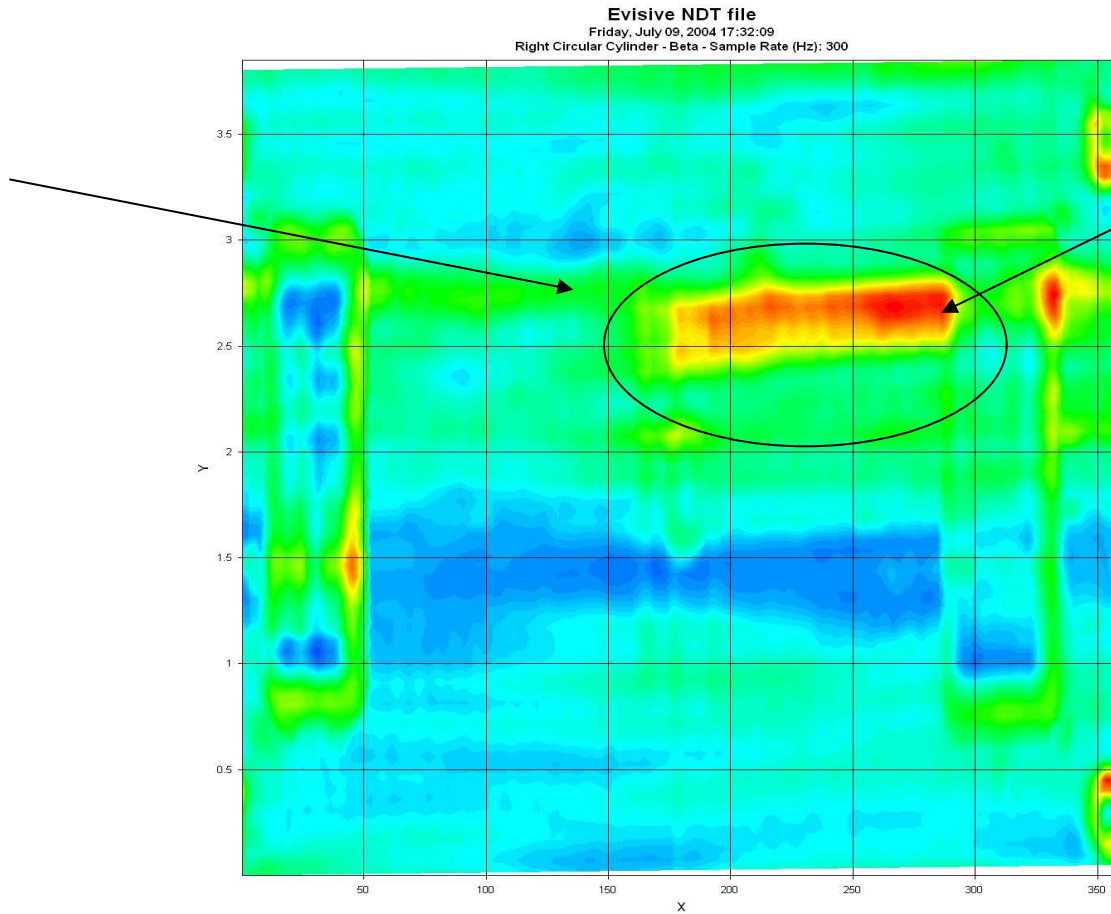
Lack of interest in fusion area-appropriate fusion



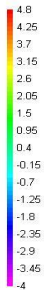


# 4 Inch Electro-Fusion Coupling Poor Insertion w/Melting

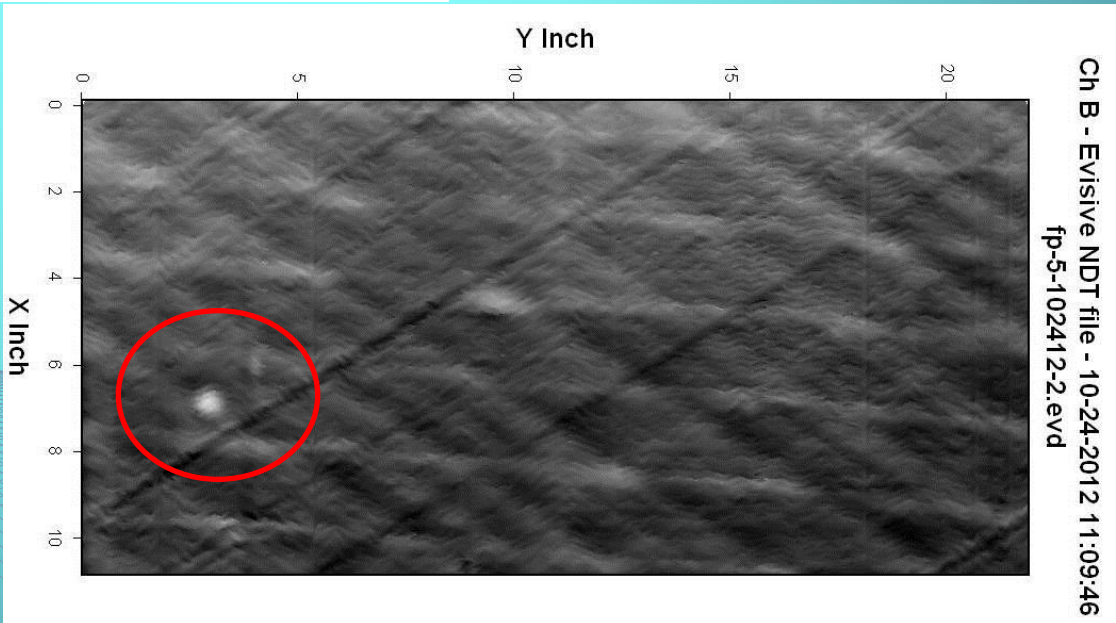
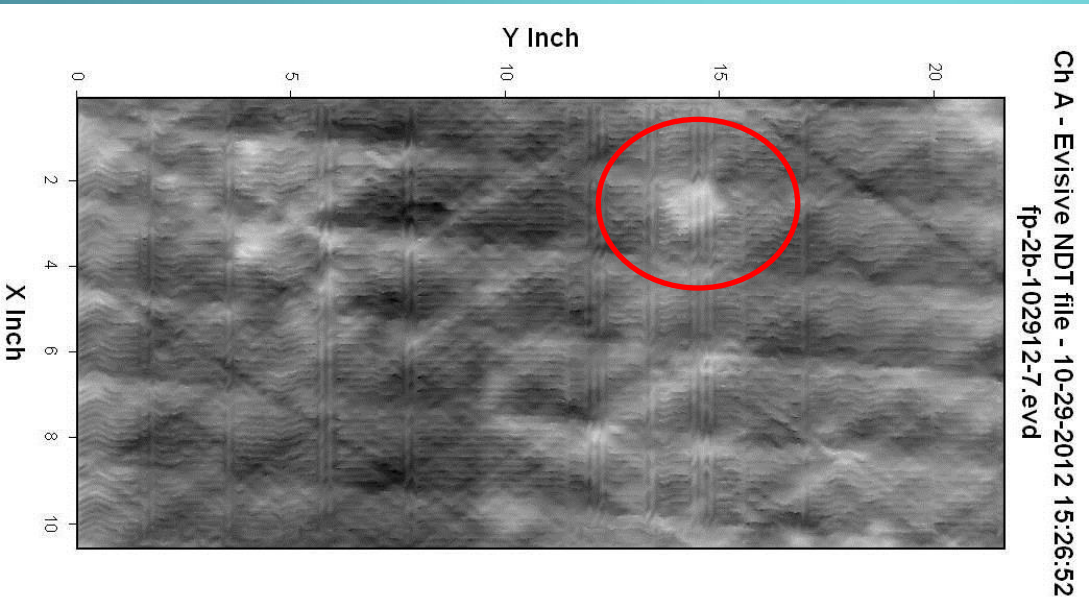
Edge of pipe at  
wrong  
location



Poor  
Fusion  
zone



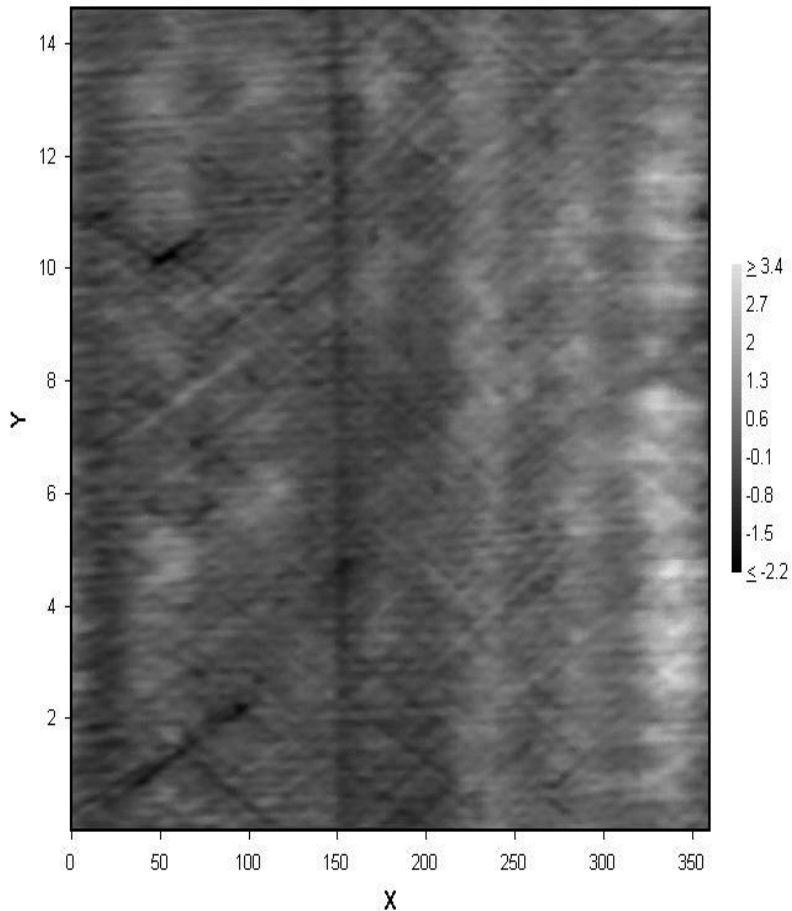
# FRP Defect Samples



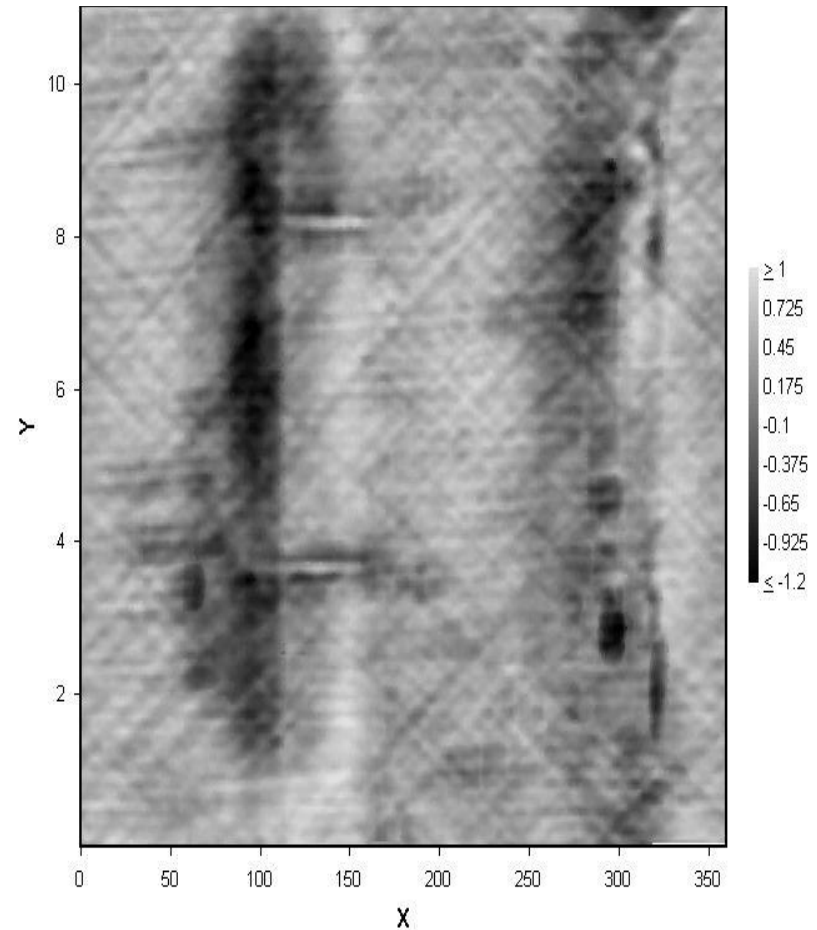


# Fiberspar Pipe

## Normal pipe section

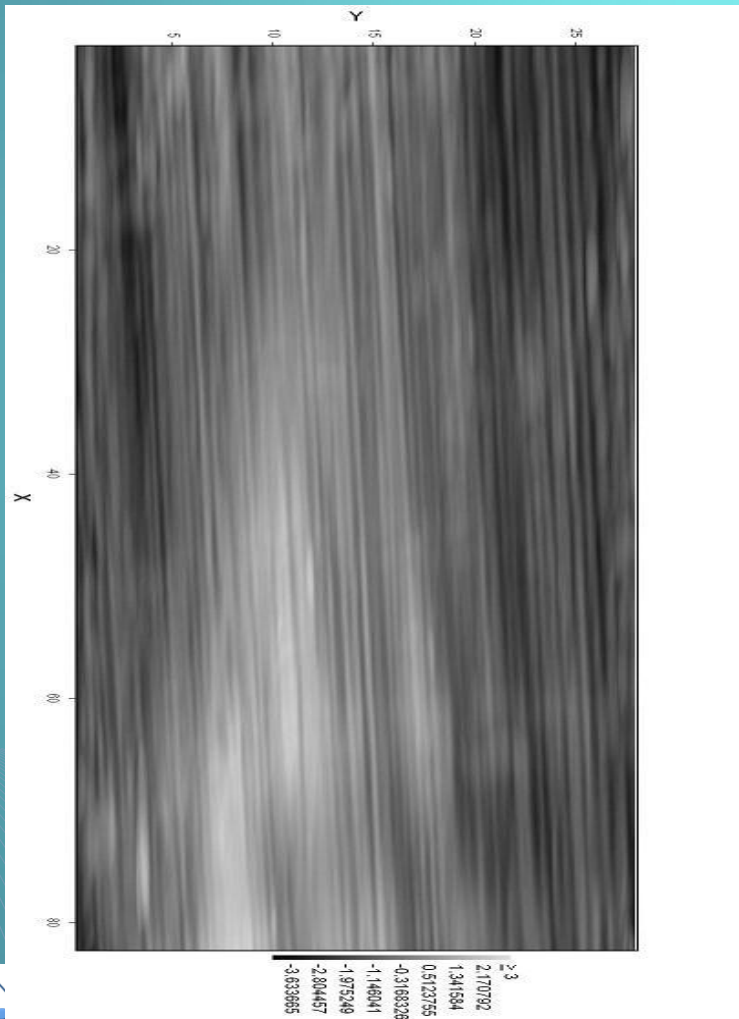


## Fibreglass Disbonded from HDPE

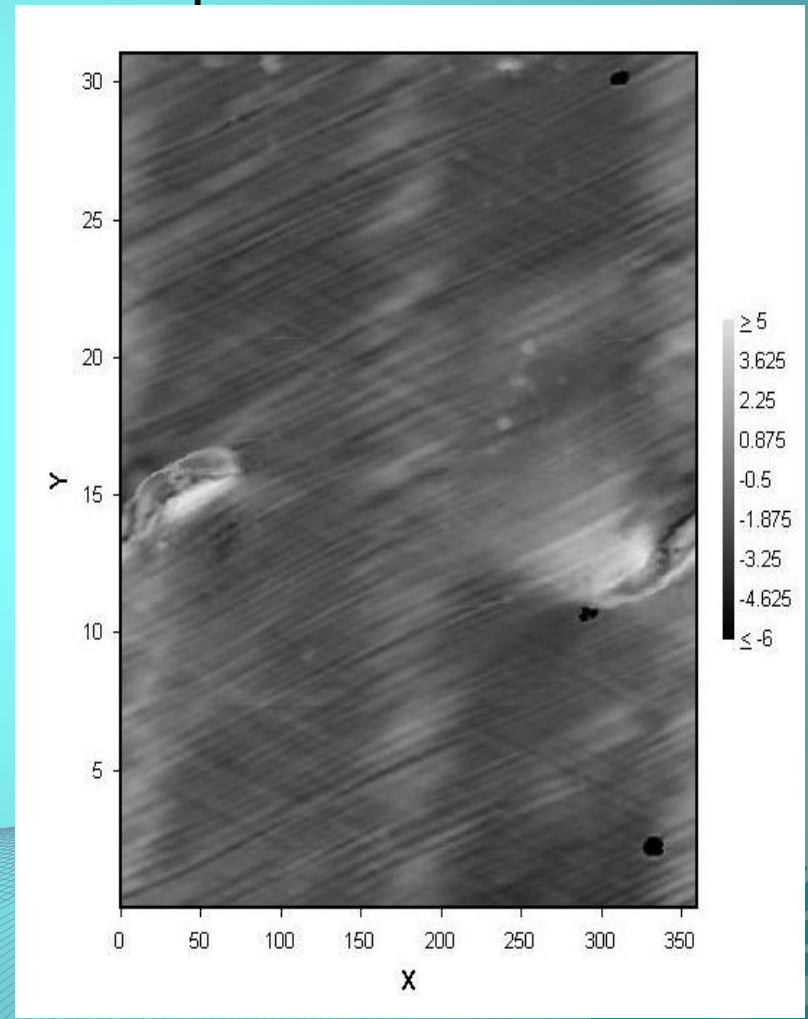


# Flexpipe

## Normal pipe section

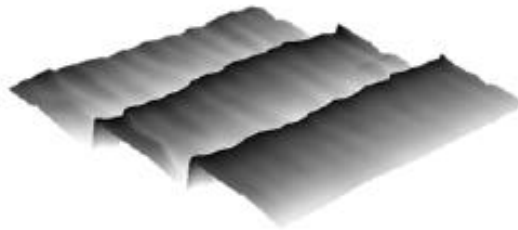
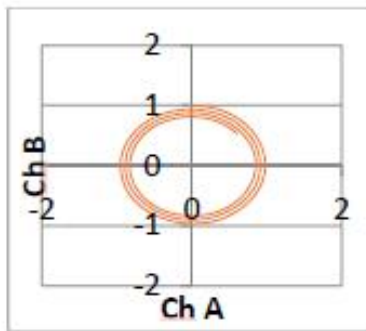
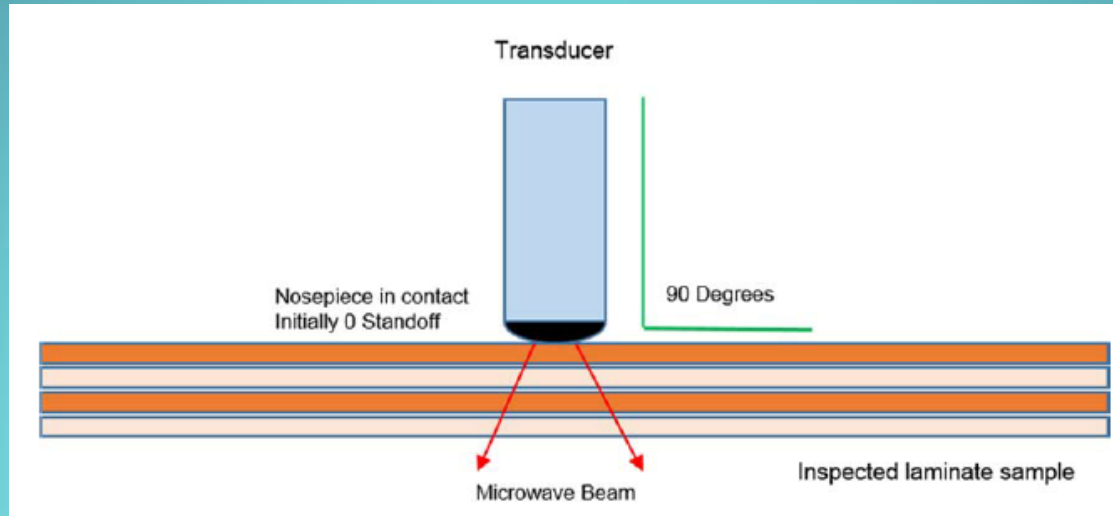


## HDPE ruptured under fibre wrap





# FRP Thickness



# FRP Thickness

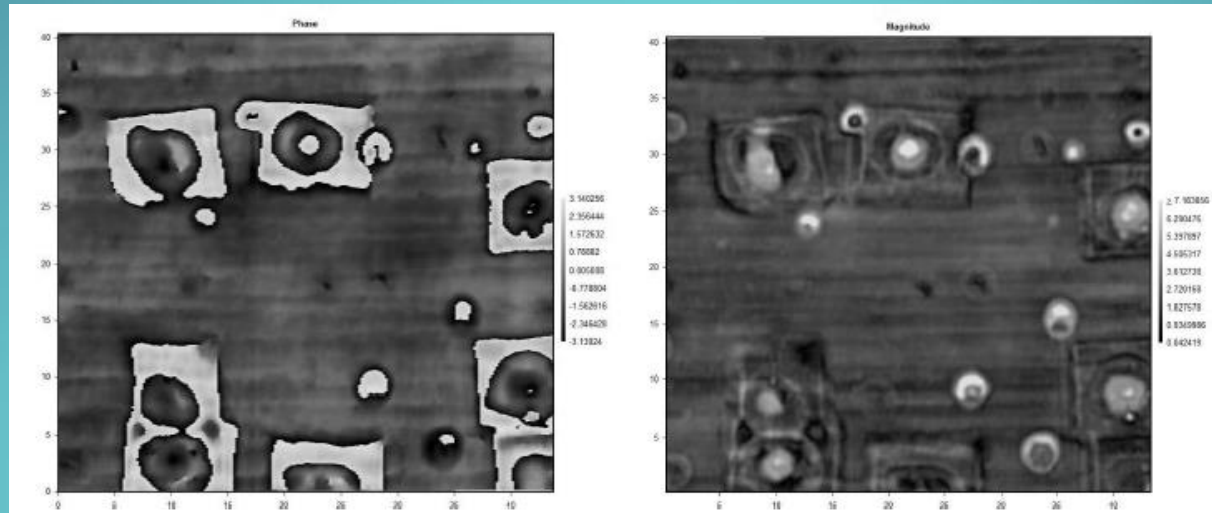


Figure 7.1: - Typical Standing Microwave Scan of customer's FRP tank wall. Left image is "Phase" and Right Image is "Magnitude"



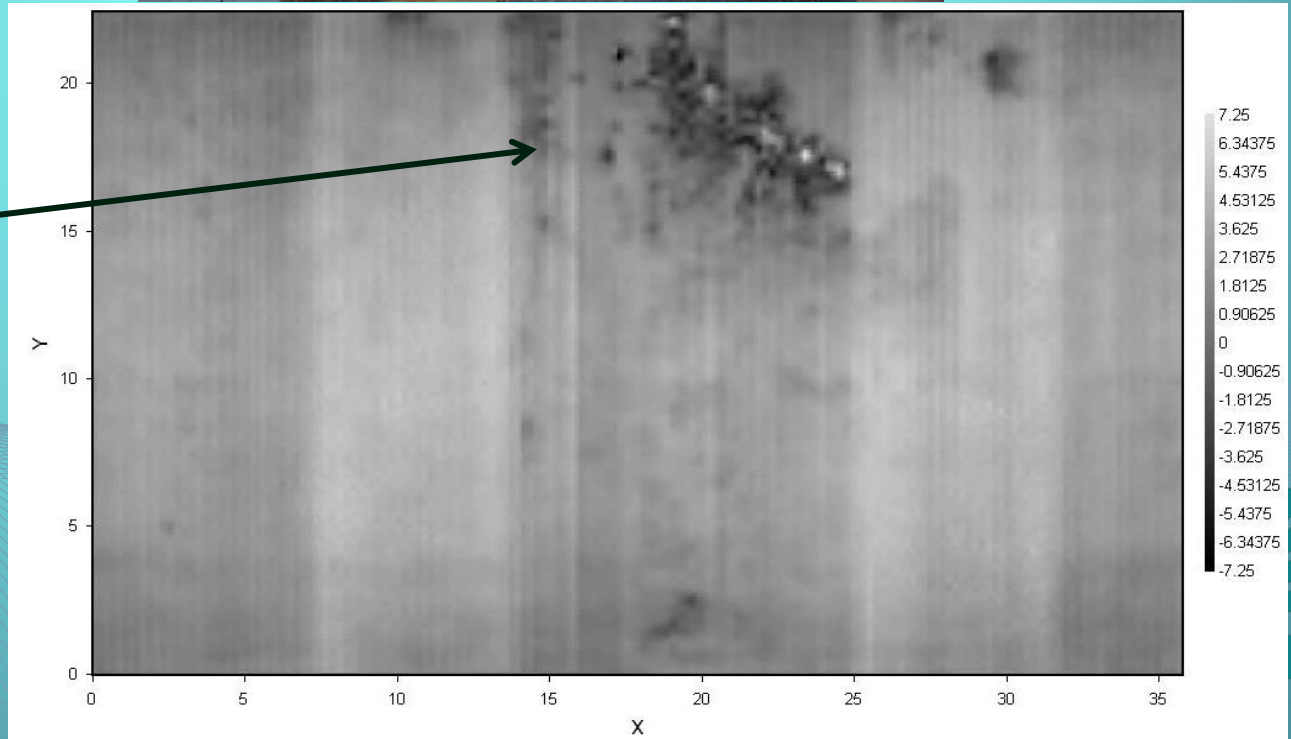
Figure 7.2: - Photograph of the inside surface of the inspected FRP tank showing features detected and characterized by the described standing microwave method



# Pipe Over Wrap with Intentionally Corroded Substrate



The known corrosion on the pipe can clearly be seen in the scan image





# Conclusions

- Evisive microwave imaging has demonstrated an ability to detect cold fusion as well as the other defect modes, and has been verified through mechanical and visual testing
- Evisive Scan has shown a high degree of potential to assist in the development of appropriate criteria to evaluate the quality or integrity of an HDPE fusion joint.
- Evisive has also demonstrated an ability to inspect a wide variety of other non-metallic systems (i.e. Fiberglass, coated steel pipe), as well as viewing corrosion on steel pipe through liners and repairs



# On-site QA / QC Services

- QA Audit of construction company procedures and personnel certifications
- Welding Procedure Qualification at Spectrum
- Development of fusion procedures appropriate to the material and sizes being used
- Deploy Mobile field Laboratory + Field Engineering Team to site to work with Contractor
  - 1. Fusion Bonding Qualification
  - 2. Train / Re-train Bonders if required
  - 3. Optimize process conditions to baseline Procedure Qualification
- Perform production / in-process inspection
- Provide in-process inspection (sampling basis i.e. 100, 30, or 15% as agreed) to meet or exceed desired specifications (i.e. CSAZ662-11)
- The risk of failures after commissioning is mitigated.



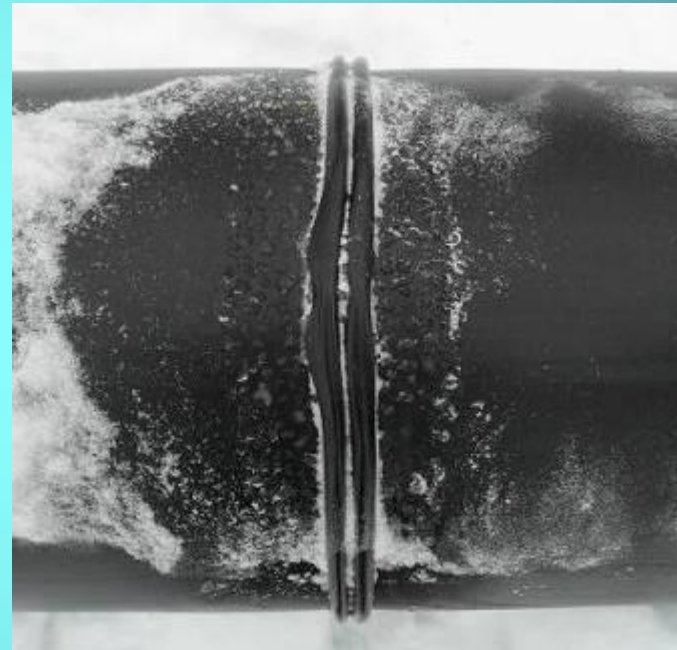
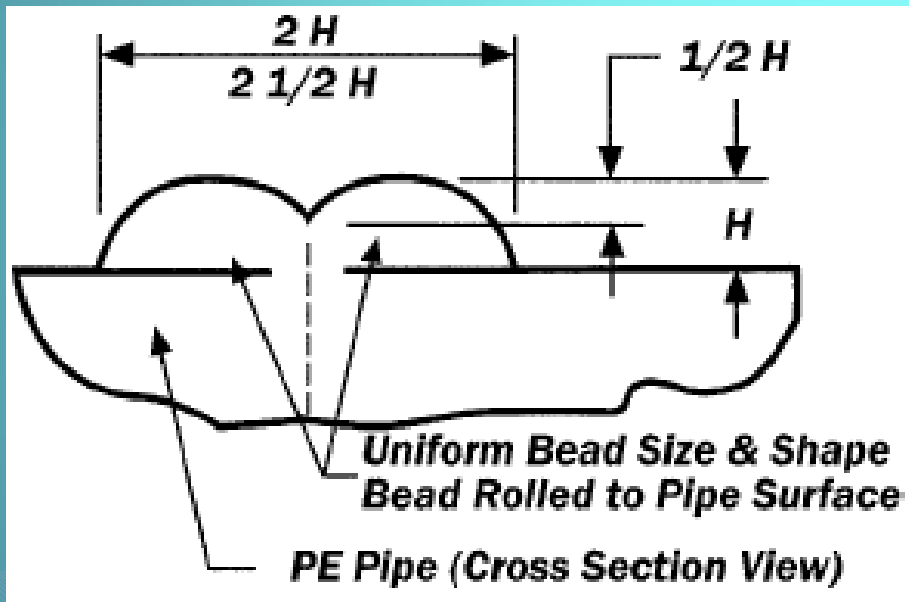






# Visual inspection can also provide information on fusion quality

But is still too subjective



The clients wanted to know...is there a better method than bendbacks to field test the quality of butt fusions?



Pulling a typical pass on the tensile test

McElroy Field Tensile Tester





Additional benefit of FTT is the ability to view the fracture surface.



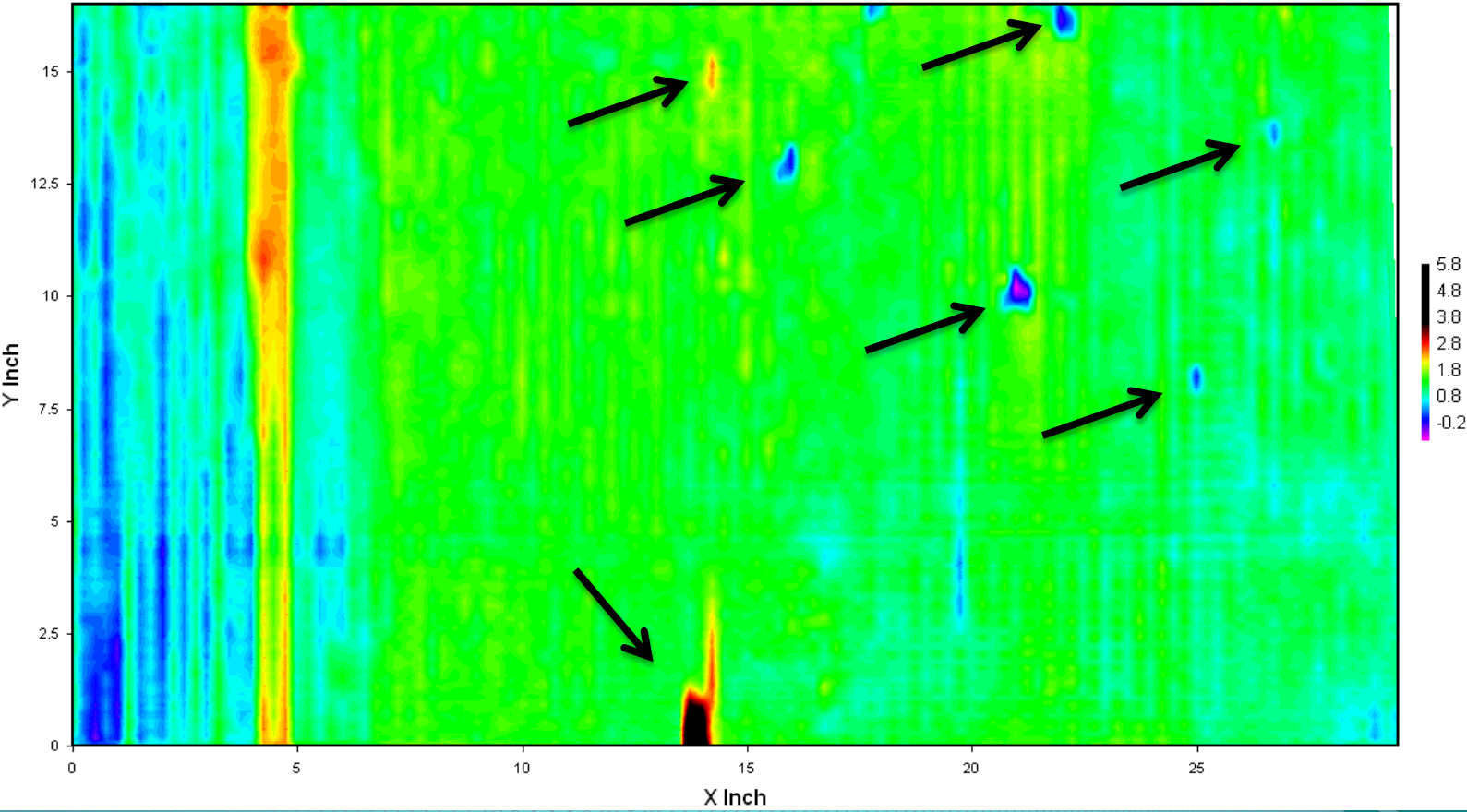


- FTT could detect issues with fusion surface



# Evisive Scan of Suspected Porous Pipe

Ch C - Evisive NDT file - 01-23-2011 17:42:36  
C:\Documents and Settings\Evisive\Desktop\taliman scans\10 test 4 jan 23.evd





- COLLABORATION BETWEEN MANUFACTURERS OF PIPE, FUSION EQUIPMENT, THE INSTALLER, THIRD PARTY QC, AND THE END USER ARE NECESSARY TO MOVE FORWARD INTO THE NEXT PHASE OF HDPE, AND OTHER NON METALLIC PIPE USAGE

