

PREPARED FOR

AUCSC

# COMMON PIPELINE ANOMALIES

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Better Cleaning, Better ILI Data



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## Better ILI Data

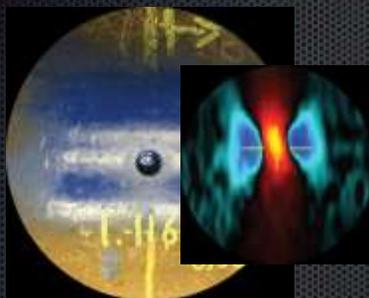


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## ILI PERFORMANCE

Methodologies

Calibrate and verify our sizing models



Real Corrosion  
Machining  
ECM Defects



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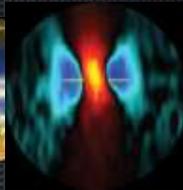
# ILI PERFORMANCE

Methodologies

Process requires quality source data



Machined defects



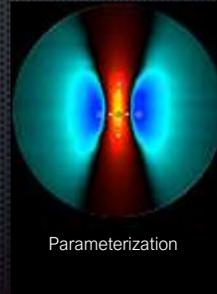
Signal capture



ECM defects



Pull testing



Parameterization

# We are Pipeline Integrity

ILI Solutions-Based Innovation

Caliper Deformation Technology



MfL Multi-Tech Tool

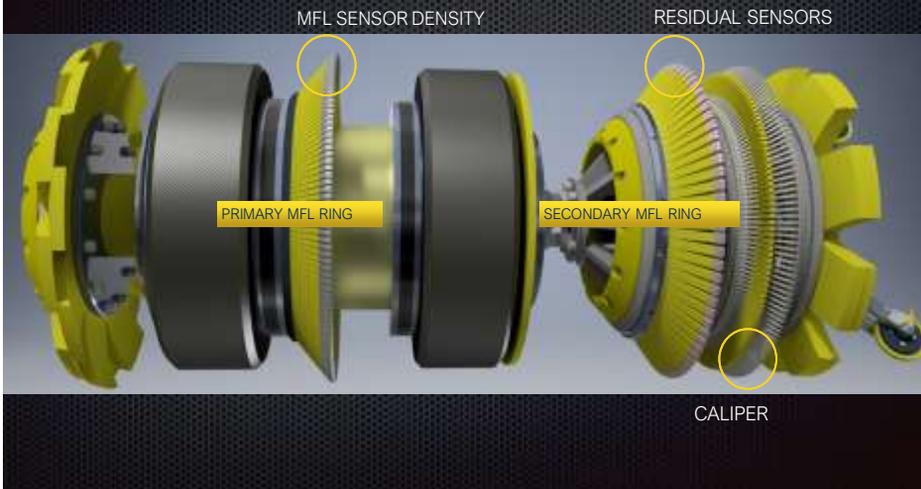


## MfL Combo Tool



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## MfL MULTI-TECH ILI TOOL MfL Combo Tool



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# MfL SENSORS

- General Corrosion
- Pinhole Metal Loss
- External Metal Loss
- Internal Metal Loss
- Laminations

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# MfL SENSORS

## Anomaly Classification Chart

Defect Width

Defect Length

|                          |                          |                   |
|--------------------------|--------------------------|-------------------|
| CIRCUMFERENTIAL SLOTTING | CIRCUMFERENTIAL GROOVING | GENERAL CORROSION |
|                          | PITTING                  | AXIAL GROOVING    |
| PIN HOLE                 | AXIAL SLOTTING           |                   |

- General Corrosion
- Internal/External Defects
- Anomaly sizing required
- Variables:
  - Defect Interactions
  - Wall Thickness

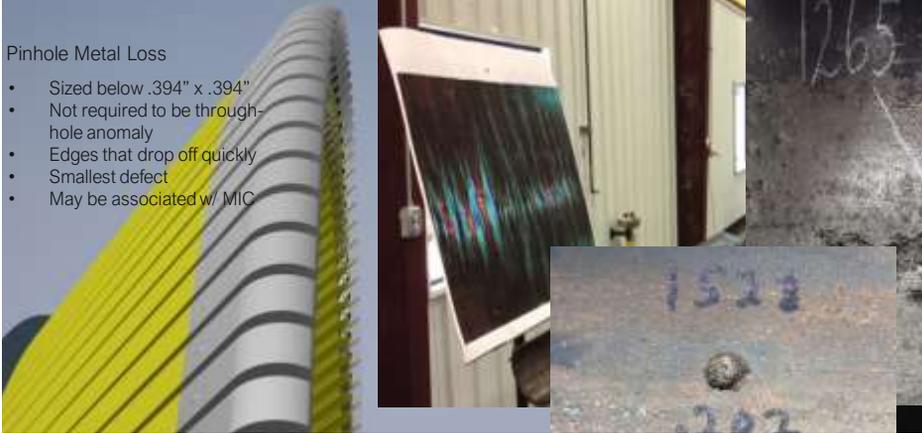
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# MfL SENSORS

## PRIMARY MfL RING

### Pinhole Metal Loss

- Sized below .394" x .394"
- Not required to be through-hole anomaly
- Edges that drop off quickly
- Smallest defect
- May be associated w/ MIC



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# MfL SENSORS

## PRIMARY MfL RING

### External Metal Loss

- Metal Loss signature (peak) on MFL data set
- No internal surface change measured



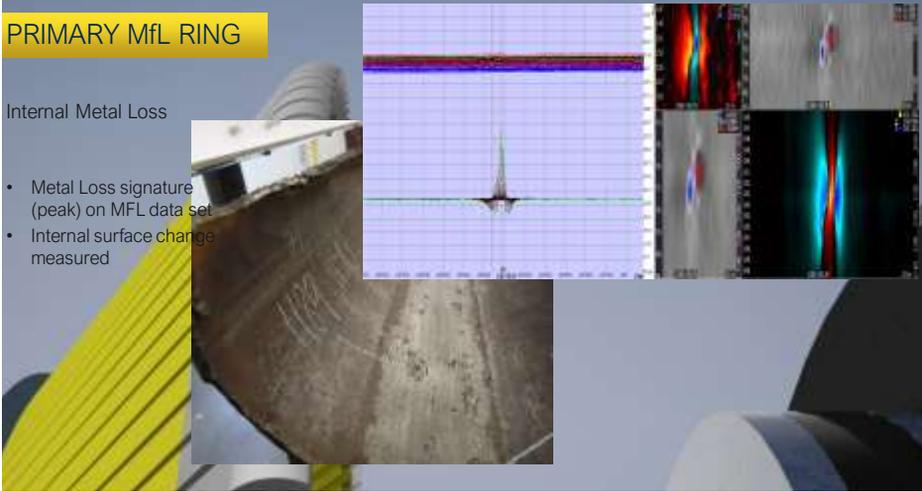
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# MfL SENSORS

## PRIMARY MfL RING

Internal Metal Loss

- Metal Loss signature (peak) on MfL data set
- Internal surface change measured



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# MfL SENSORS

## SUPPLEMENTARY DATA

## PRIMARY MfL RING

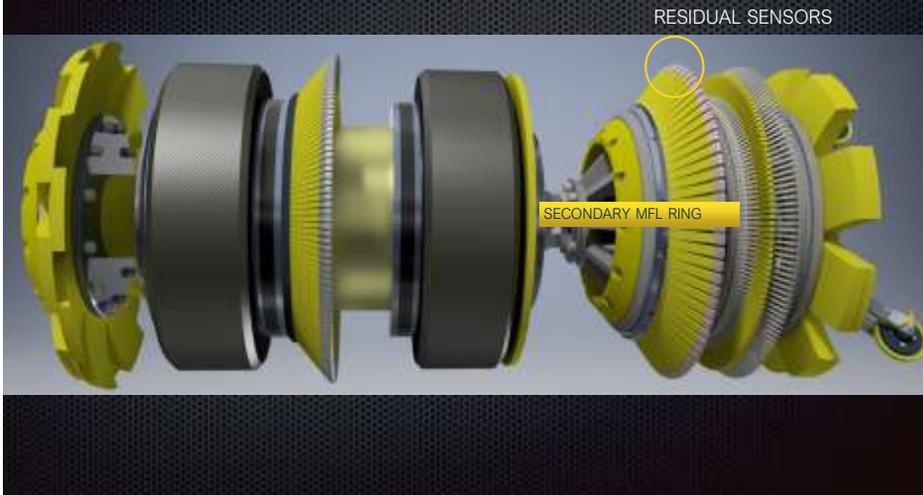
Lamination



- Mid-wall originated anomaly
- Requires internal surface break for classification (MfL technologies)

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# MfL MULTI-TECH ILI TOOL RESIDUAL



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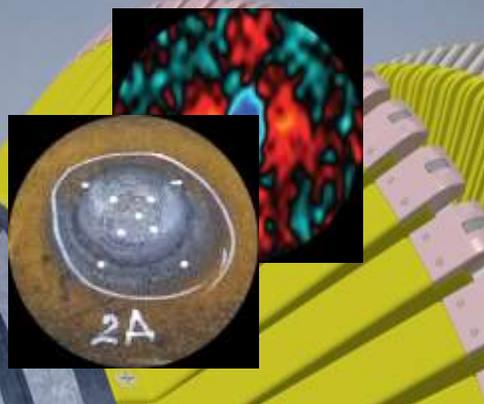
## MfL RESIDUAL SENSORS SUPPLEMENTARY DATA

SECONDARY MfL RING

ENHANCES ANALYSIS

Mill Defects

Heat Affected Zones (HAZ)



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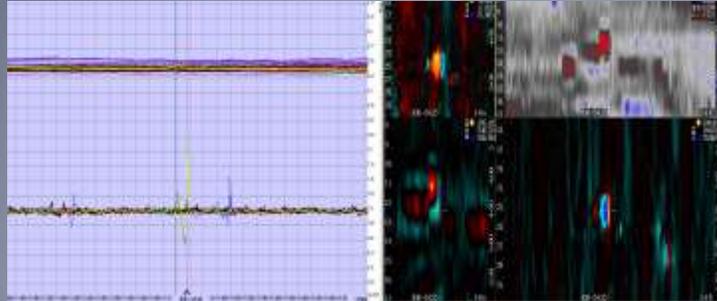
# MfL RESIDUAL SENSORS

## SUPPLEMENTARY DATA

### SECONDARY MfL RING

ENHANCES ANALYSIS

Mill Defects



- Sharp bipolar signal on the MfL and Residual data sets
- Internal surface change measured
- Non-typical Dent or Metal Loss signature

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# MfL RESIDUAL SENSORS

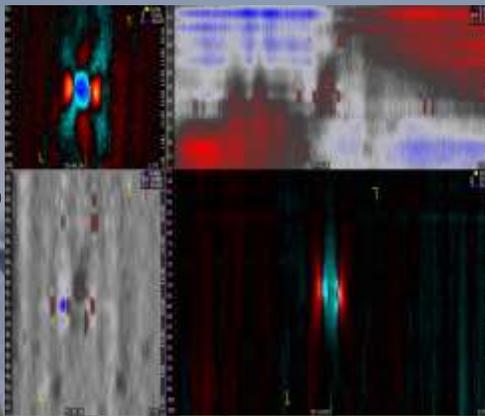
## SUPPLEMENTARY DATA

### SECONDARY MfL RING

ENHANCES ANALYSIS

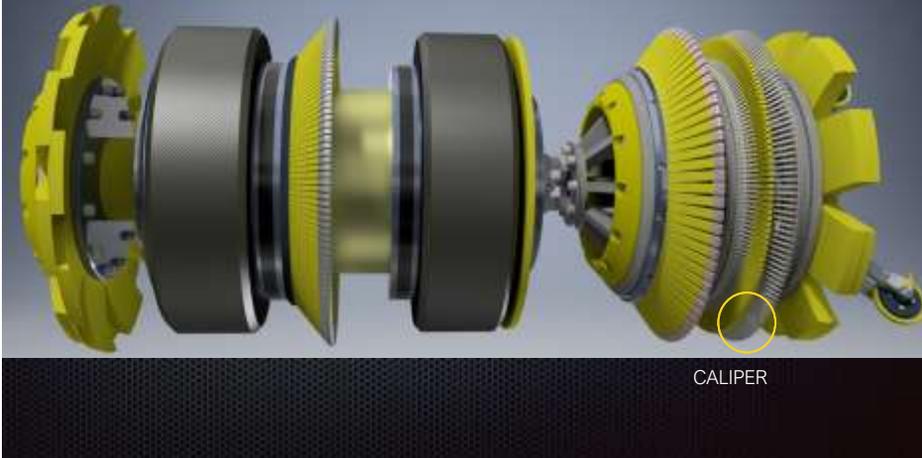
Heat Affected Zones (HAZ)

- Internal surface change measured
- Metals in close proximity (MfL)
- Can make determination between:
  - Type A Sleeves (Reinforcing)
  - Type B Sleeves (Pressure Containing)



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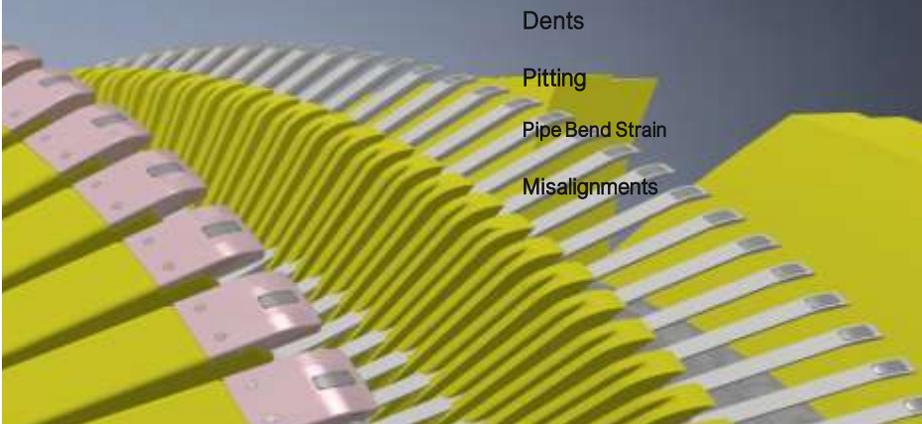
# MFL MULTI-TECH ILI TOOL CALIPER



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# MFL CALIPER SENSORS

CALIPER RING



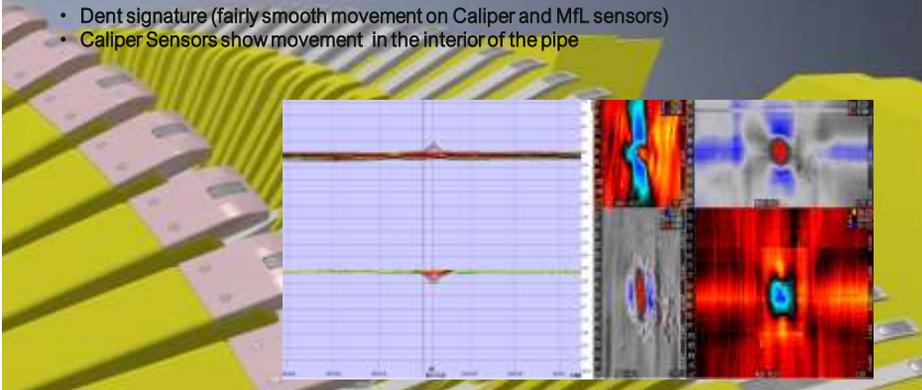
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# MFL CALIPER SENSORS

## CALIPER RING

### Dents

- Dent signature (fairly smooth movement on Caliper and MFL sensors)
- Caliper Sensors show movement in the interior of the pipe



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# MFL CALIPER SENSORS

## CALIPER RING

### Gouges

- Pipeline metal has been upset
- Identification of third party damage



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# Caliper

## GEOMETRIC DETECTION

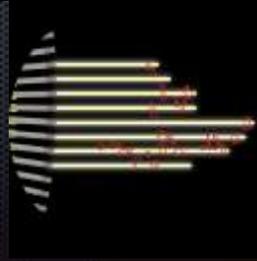
Dents



Dent Strain  
Pipe Bend Strain



ID/OD & Pitting



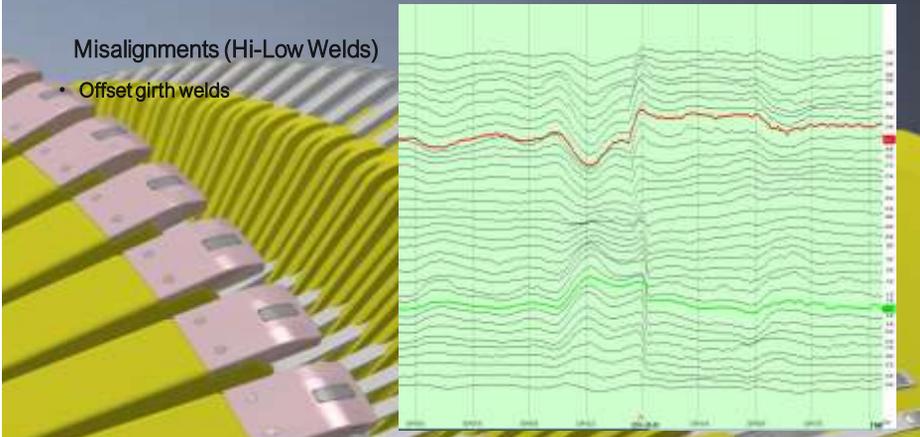
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# MFL CALIPER SENSORS

## CALIPER RING

Misalignments (Hi-Low Welds)

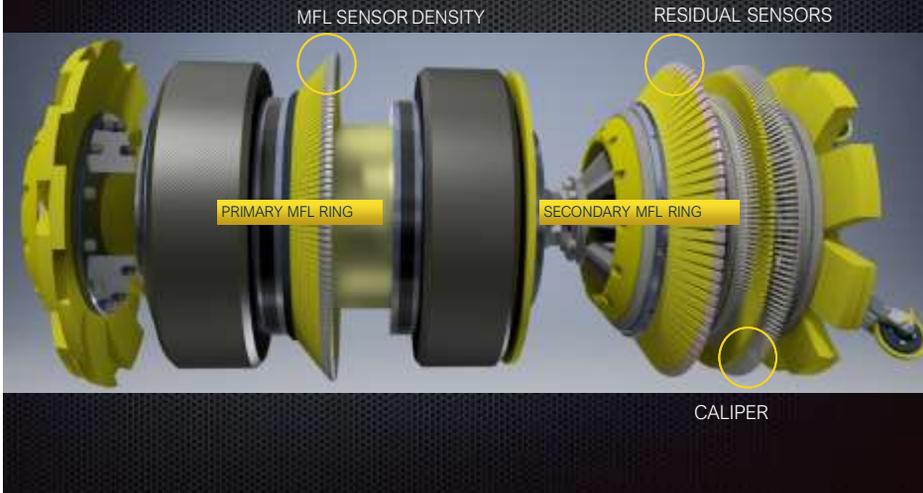
- Offset girth welds



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# MfL MULTI-TECH ILI TOOL

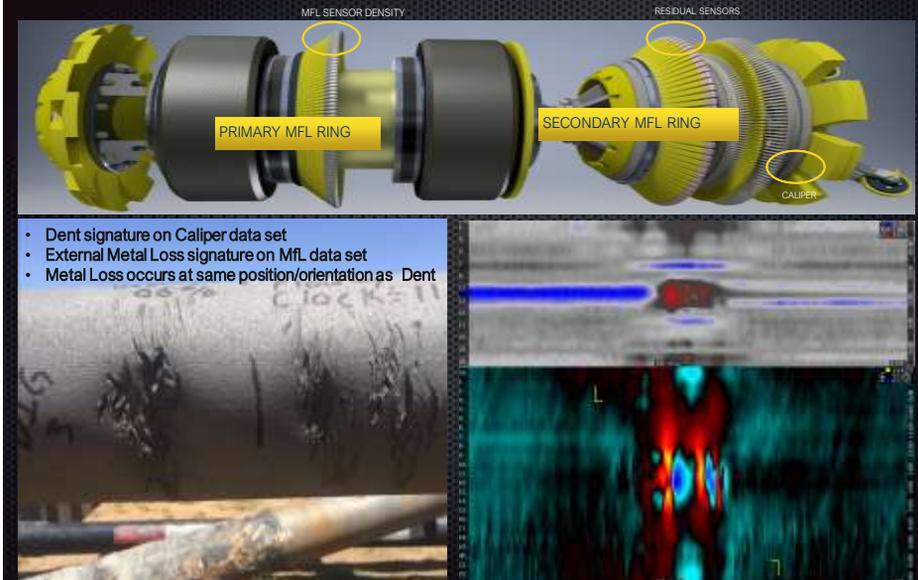
## MfL – Multi Data Sets



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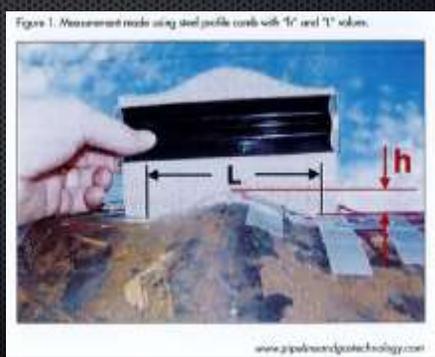
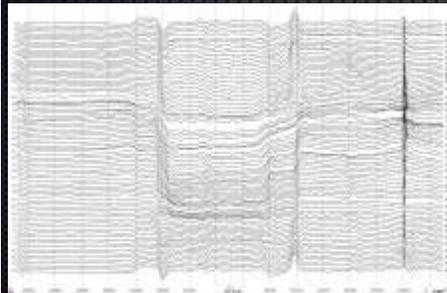
# MfL MULTI-TECH ILI TOOL

## Dent with Metal Loss



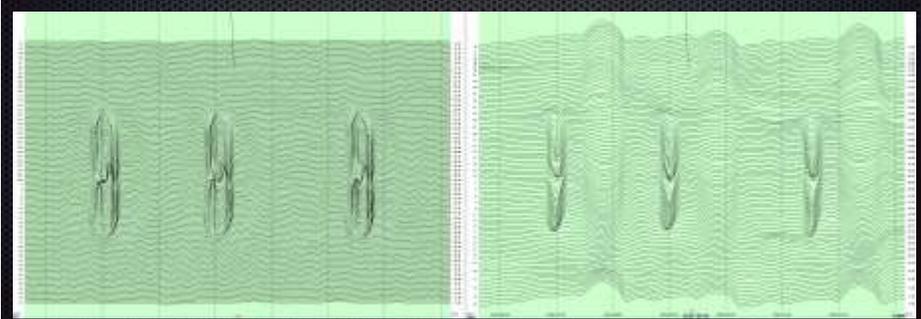
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# MfL MULTI-TECH ILI TOOL Expansions



- May occur in complete pipe joint or the middle of a pipe section

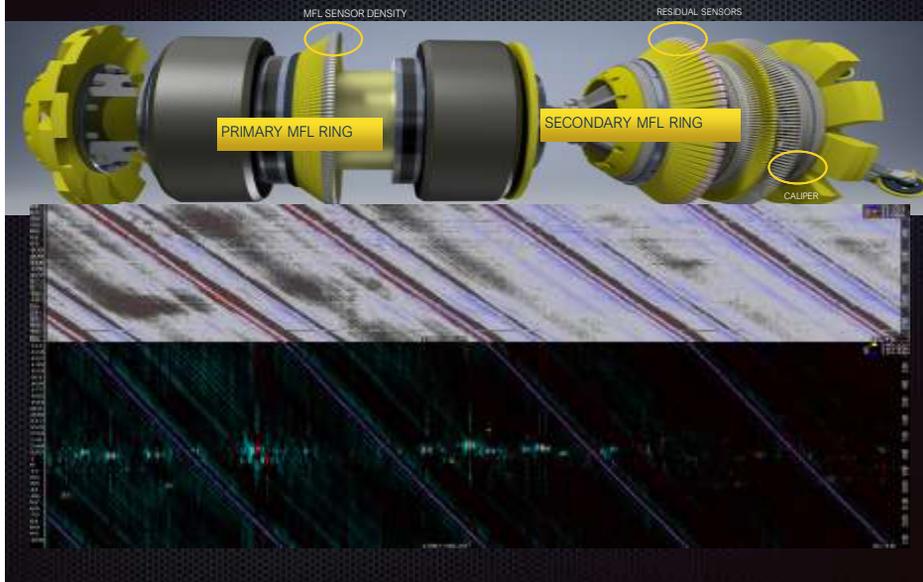
# MfL MULTI-TECH ILI TOOL Wrinkles



- All Caliper Sensors move from baseline

## MfL MULTI-TECH ILI TOOL

External Metal Loss in Spiral Seam Pipe



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## MfL MULTI-TECH ILI TOOL

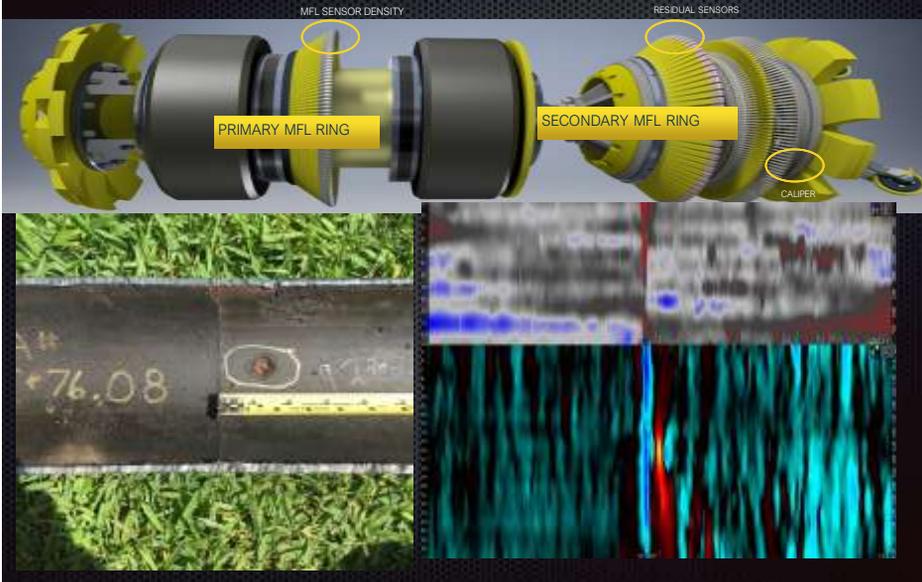
Dent in Spiral Seam Pipe



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# MfL MULTI-TECH ILI TOOL

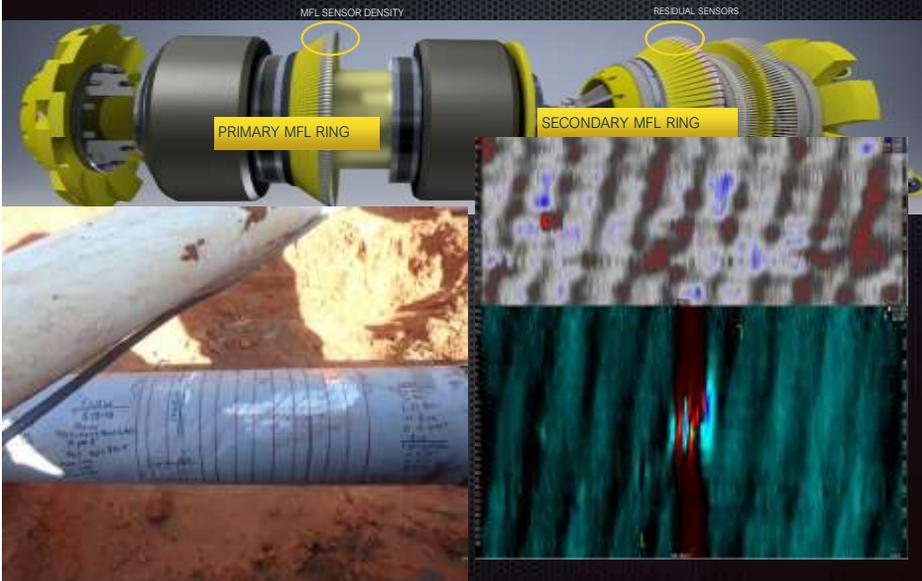
## Internal Metal Loss near Weld



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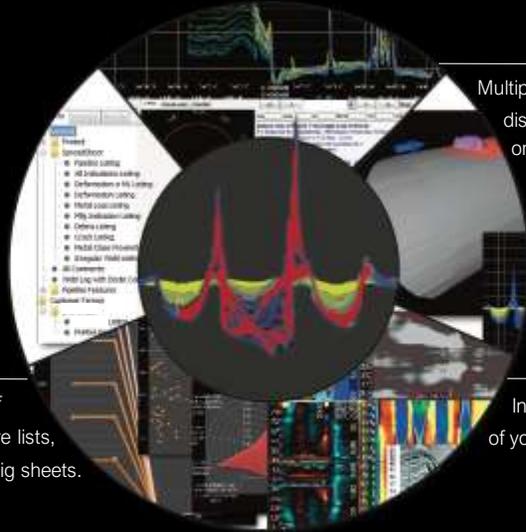
# MfL MULTI-TECH ILI TOOL

## Gouges



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# Data Analysis



Visualize

Multiple sensor displays for each on-board technology.

Report

Easy export of priority feature lists, plots and dig sheets.

Explore

Intuitive navigation of your ILI data.

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THANK YOU

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