

New Approach for Rapid and Accurate Corrosion Inspection on Pipe Elbows

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Overview

- ▶ Inspection challenge
- ▶ New inspection solution
- ▶ User cases
- ▶ Benefits of new solution

Inspection Challenge

- ▶ Corrosion inspection of small diameter elbows is challenging because of **important surface shape changes** between intrados and extrados
- ▶ **Multiple pipe diameters** need to be covered, preferably with the same probe configuration
- ▶ Combine high **detection probability** and **100% coverage**
- ▶ Fully automated scanners may be too laborious to deploy in the field
- ▶ Solutions with « water column » probes may require too much water for some environments

New Inspection Solution

Replace traditional « grid type » examinations by encoded manual scanning sequences, to generate high-resolution C-Scan images, using :

- ▶ **ElbowFlex** Scanner
- ▶ Flexible high-resolution phased array UT probe
- ▶ **TOPAZ** family of portable phased array units
- ▶ On-board **UV Touch** software, for efficient setup, data recording, data analysis and reporting

ElbowFlex Scanner – Key Features

- ▶ Inspection of carbon steel pipes and elbows
- ▶ 4 magnetic wheels
- ▶ Carries flexible phased array UT probe, fixed to Aqualink wedge
- ▶ Single button to manage data acquisition : start / pause / next index line / reset
- ▶ Additional button for couplant pump control



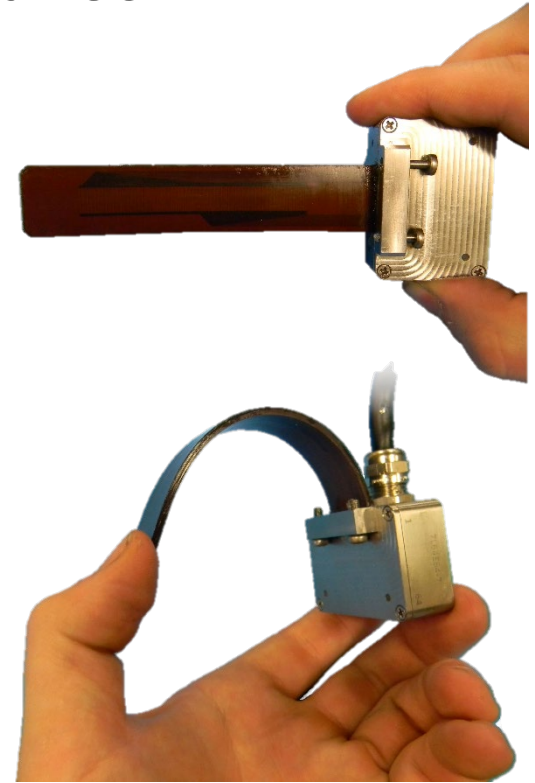
ElbowFlex Scanner – Key Features

- ▶ Adjustable angle of magnetic wheels, adapts to surfaces from 4'' NPS to flat
- ▶ Scanner works on elbow extrados, intrados and cheeks
- ▶ Lightweight, 0.6 kg (1.3 lbs)



Flexible PA UT Probe – Key Features

- ▶ Flexible 1D-linear array probe, 7 MHz, 64 elements, pitch = 1 mm
- ▶ Available with both ZPAC or IPEX connector
- ▶ Aqualink™ wedge, only a thin film of water or water-based gel for adequate coupling
- ▶ Operates in pulse-echo mode, UT performance comparable to solid PA UT probes on rexolite wedges
- ▶ Covers up to 50 mm circumference with a single scan line



Couplant Pump – Optional

- ▶ Compact peristaltic pump unit
- ▶ Controlled by ElbowFlex button (or from pump)
- ▶ Pelican casing
- ▶ Battery operated, > 20 h continuous operation
- ▶ Handles water-based gel as well as water only
- ▶ Strongly reduces amount of couplant spilled



UV Touch software on **TOPAZ** units, for efficient setup, recording & analysis :

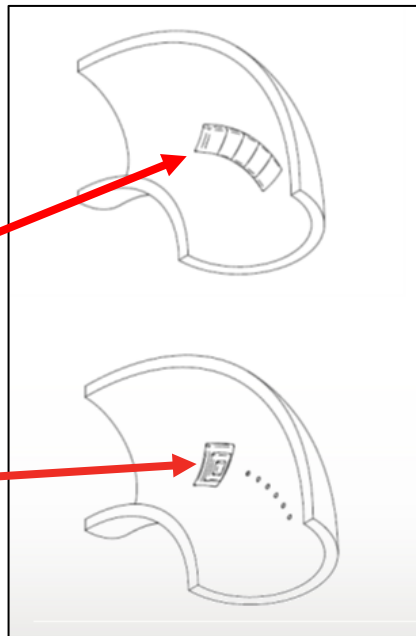
- ▶ Integrated control of scanning sequence with dedicated button on scanner allows for inspection by a single operator
- ▶ On-board corrosion data analysis tools
- ▶ **Export C-Scan Data** tool (*.txt file), allows for transferring inspection data to proprietary customer software or Excel

UV Analysis software, for advanced analysis and data management :

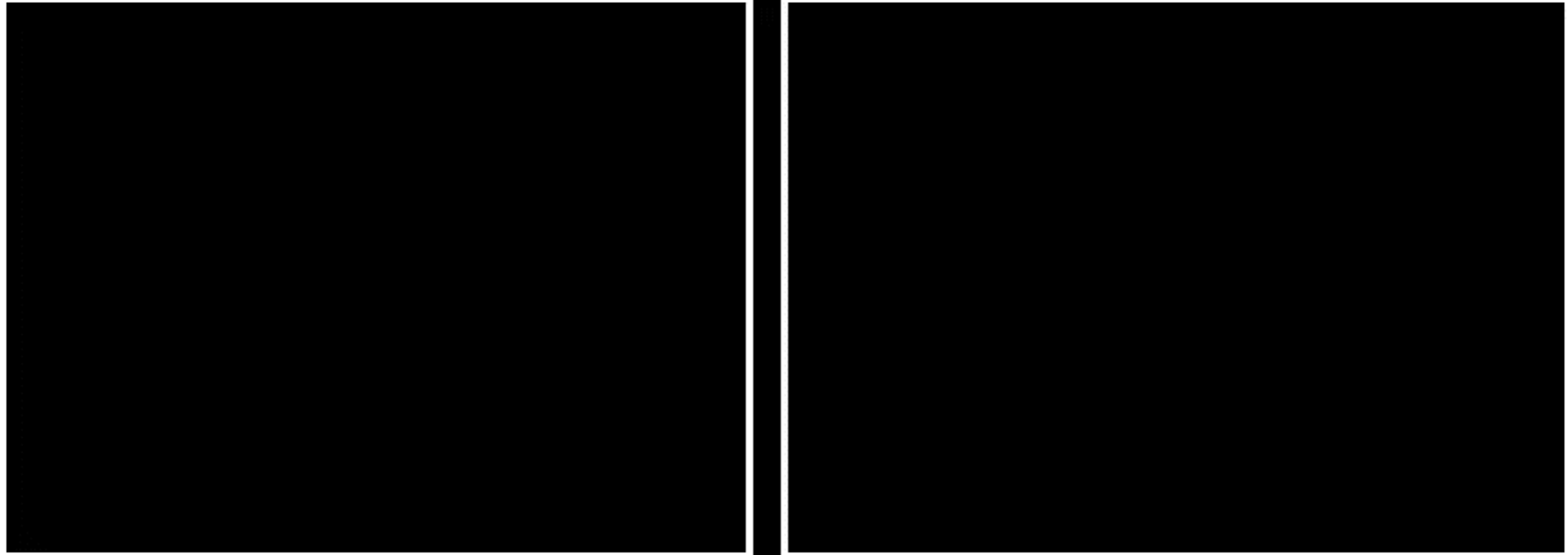
- ▶ **Software Synchro** tool, allows to compensate for thickness variations of Aqualink wedge, and OD surface geometry variations.

User Case 1 – Inspection Configuration

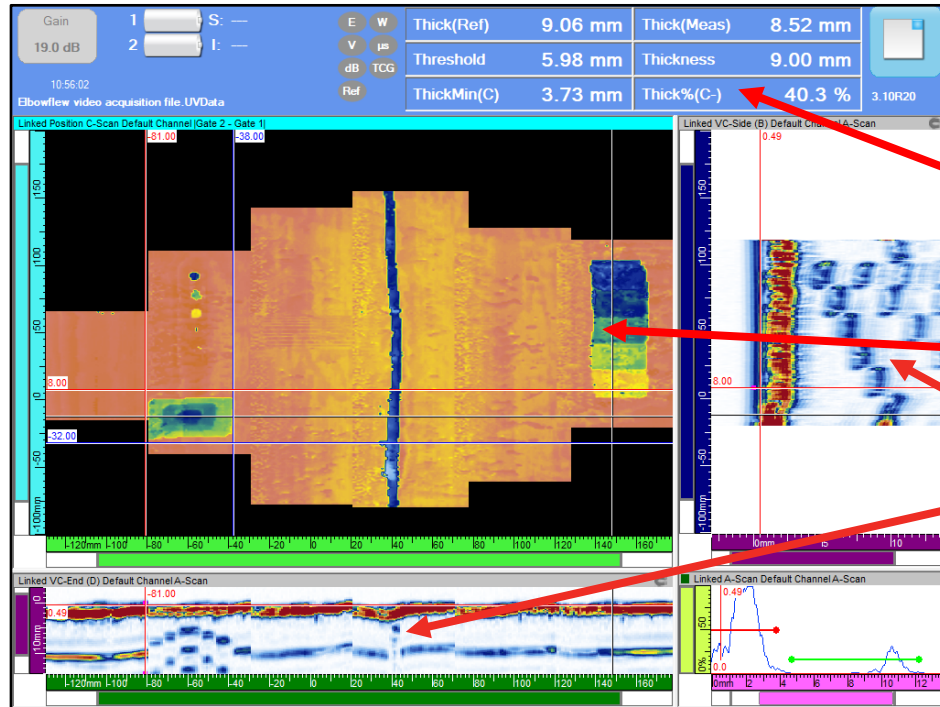
- ▶ Elbow in 4'' NPS pipe
- ▶ Wall thickness = 8.6 mm
- ▶ Machined « step »
- ▶ Simulated ID corrosion and pitting (FBH, SBH)



User Case 1 – Data Recording



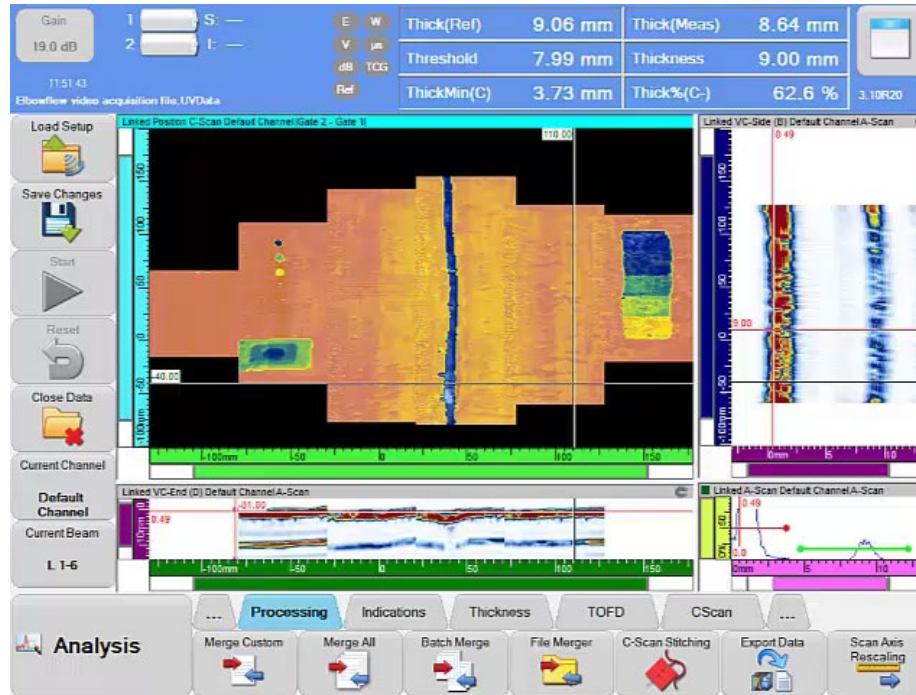
User Case 1 – Data Analysis



High-resolution corrosion mapping :

- ▶ Quantitative info
- ▶ Position C-Scan
- ▶ Thickness profile linked to data cursor

User Case 1 – Data Analysis & Reporting

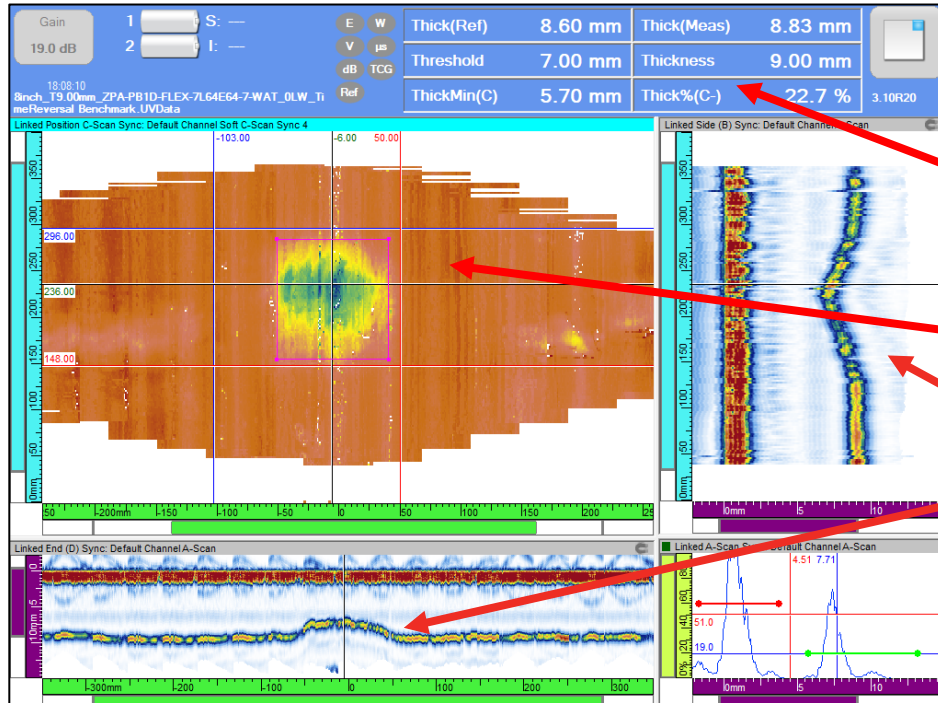


User Case 2 – Inspection Configuration

- ▶ Elbow in 8" NPS pipe
- ▶ Wall thickness = 9.0 mm
- ▶ Simulated large surface ID corrosion



User Case 2 – Data Analysis

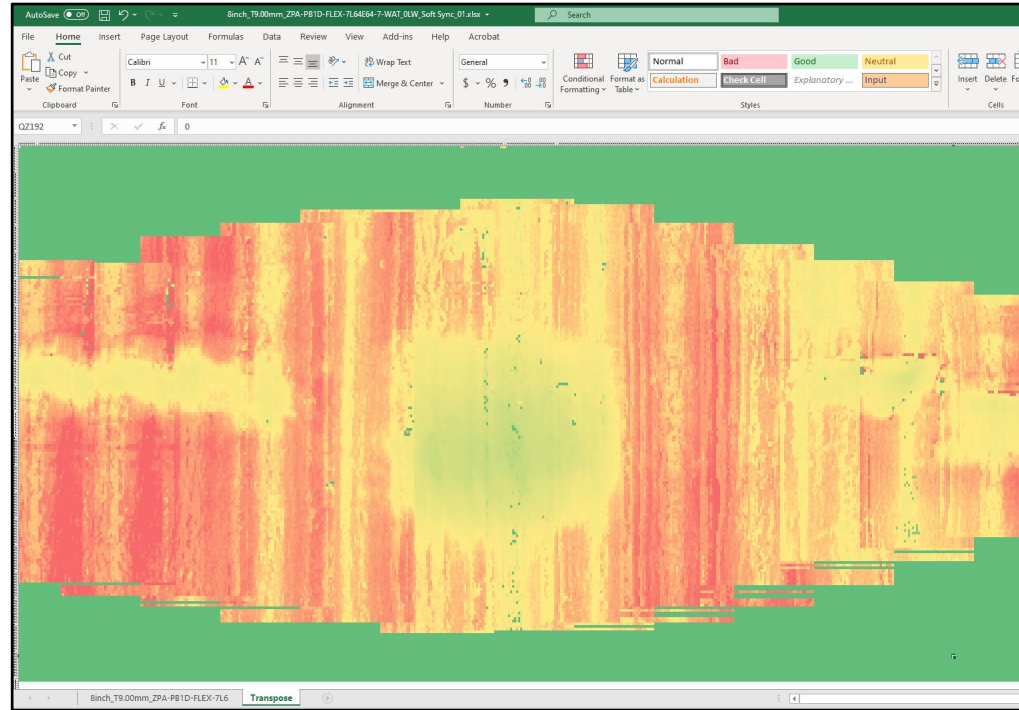


High-resolution corrosion mapping :

- ▶ Quantitative info
- ▶ Position C-Scan
- ▶ Thickness profile linked to data cursor

User Case 2 – Data Export

- ▶ Export Data (as *.txt file)
- ▶ Importation and visualization in Excel



Conclusions – Benefits of New Solution

- ▶ **ElbowFlex solution** can provide high detection probability and complete coverage for corrosion inspection on CS pipes and elbows
- ▶ Magnetic wheels help the operator keep the scanner in place while following the scan lines for complete coverage
- ▶ A **single flexible PA UT probe** adapts to the surface changes for a wide range of elbow diameters, and for wall thickness up to 20 mm
- ▶ Aqualink wedge allows for adequate coupling, while **drastically reducing the amount of couplant** (compared to systems with water chamber)

Conclusions – Benefits of New Solution

- ▶ One button control for scanning sequence : start/pause & indexing
- ▶ On-board UV Touch software generates high-resolution corrosion mapping
- ▶ Analysis, processing, reporting and exportation of corrosion data

Any Questions ???