Inspection for Corrosion Under Pipe Supports (CUPS)
Pipe Supports

- No direct access, perpendicular UT not applicable
- Medium and/or long range NDT techniques required to provide assurance
  - LRUT (GW)
  - SH-EMAT
  - CHIME
  - Multiskip
Long Range Guided Wave

- Low frequency Ultrasound (20-100kHz)
- Diameters 1.5" to 48" (up to 78")
- 100% Coverage
- Test Range - Typical ±30m
  - Depends on pipework geometry

Longitudinal

Torsional

Flexural
Example of LRUT Pipe Support Results

-14dB
Pipe Support – Priority Follow Up

-20dB
Pipe Support – Acceptable

-26dB

-32dB

Bend Weld

Pipe Support – Acceptable

Weld

Distance from Datum (Metres)
-12.92
-12
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2

Clockwise

Back

Forward

0
120
240
360

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Long Range Guided Wave

- Amplitude response based on cross-sectional area of defect
- Prioritisation depends on amplitude and circumferential extent
- Screening technique – requires secondary NDT technique to quantify
- Prioritises pipe supports for follow-up actions
Medium Range Techniques

- Sonomatic have developed three techniques for the detection of degradation under pipe supports:
  - Shear horizontal electromagnetic acoustic transducers (SH-EMAT)
  - Creeping head wave inspection method (CHIME)
  - Multiskip
EMAT - Introduction

- EMATs are non-contact ultrasonic probes.
- The probe consists of a magnet and an electric coil.
- Suitable for samples with a thickness less than or equal to 15 mm.
EMAT - Probe setup

- Typically, probes are separated circumferentially and scanned axially over the pipe support.
  - Can also be used axially along pipe
- The signals produced cover the full circumference of the pipe
- Any degradation is indicated by a change in the signals.
EMAT – Example Results

Axial position (mm)
0 50 100 150 200 250 300 350 400

Time (microseconds)
0 50 100 150 200 250 300 350 400

- Repeat signals
- Internal 20 mm diameter 1.9 mm deep
- Internal 20 mm diameter 3.8 mm deep
- External 20 mm diameter 1.9 mm deep
- External 20 mm diameter 3.8 mm deep
- External 30 mm diameter 3.8 mm deep
- External 30 mm diameter 1.9 mm deep
- Internal 30 mm diameter 3.8 mm deep
- Internal 30 mm diameter 1.9 mm deep

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Innovative inspection technologies
CHIME - Introduction

• Transmitter fires pulse at critical angle – sets up regenerating creeping waves and head waves.

• A-scan at receiver shows a characteristic pattern that is a function of material thickness and profile between the probes.

• Suitable for samples with a thickness between 5 mm and 80 mm.
CHIME - Classification

- Type A – up to 10% of wall loss.
- Type B – between 10% and 40% of wall loss.
- Type C – greater than 40% of wall loss.
CHIME - Setups
Multiskip - Introduction

- Probes separation up to 2 m, NWT >10 mm, internal and external defects
- Different skip signals due to beam spread.
- Depth, location and extent of defects have different effect on arrival times of different skip signals
Multiskip - Inspection Capability

- Very accurate sizing of average thickness when there is no degradation (sizing typically better than 1 mm).
- Very accurate depth sizing of localised degradation (for example, sizing of a single pit typically to within 1 mm).
Inspection Capability

Multiskip Sizing – current status

• Reasonable capability when degradation is very general, i.e. small variation in thickness across the support. An average thickness is obtained.