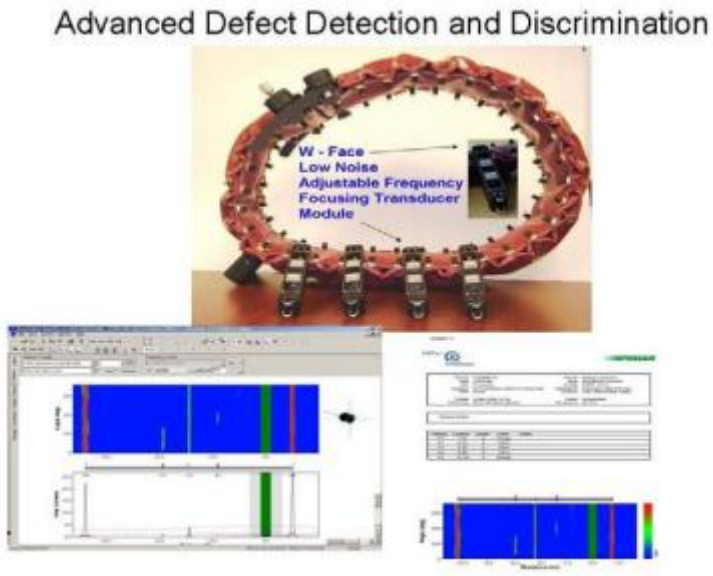
GUIDED WAVE ULTRASONIC MULTIPLE SCANNING

Guided wave ultrasonics are utilized for the rapid scanning of large volume of piping systems. Guided wave utilizes a ring of transducers that is place around the pipe and emits sound waves that are sent along the pipe in both directions from the ring. Many feet of pipe may be inspected at one time, depending on a variety of factors including surface condition, the presence of pipe wrap systems and mechanical features such as elbows etc... Guided waves are best used as a screening tool as part of a more comprehensive strategy that pinpoints where more extensive volumetric examinations should be performed.

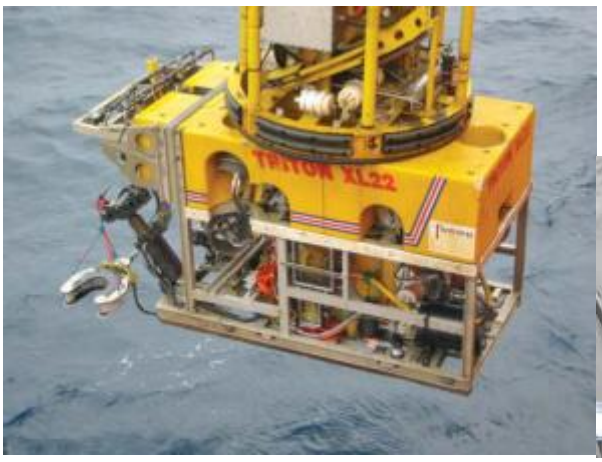
While traditional inspection methods provide value to plant operators, many have begun condition based inspection programs aimed at bolstering their mechanical integrity and preventive maintenance programs. With this in mind, many plants have chosen to inspect their piping systems using Guided Wave UT MULTIPLE SCANNING. The benefits of this inspection include: Large sections of piping can be inspected rapidly and safely often with no scaffolding Minimal insulation removal for Corrosion Under Insulation (CUI) inspections Localized damage can be pinpointed and characterized as to length and depth MULTIPLE SCANNING is an excellent tool for cased crossings and unpiggable pipe Point of contact corrosion can be found without lifting the pipe thus avoiding potential leaks and protecting the environment.

In the hands of an experienced technician, MULTIPLE SCANNING can locate and characterize defects internally and externally and will pick up cracking in many cases. The benefits of this program include increased efficiency of a plant's inspection budget and minimizing maintenance upsets due to piping system failures. The latest generation MULTIPLE SCANNING equipment, the G-5, provides adjustable transducers capable of running multiple frequencies and wave forms characterizing defects more accurately than ever before. The equipment can be used in many applications such as CUI, point of contact, road crossings, air to soil transitions and for offshore above the surface and subsea by diver or ROV deployment.

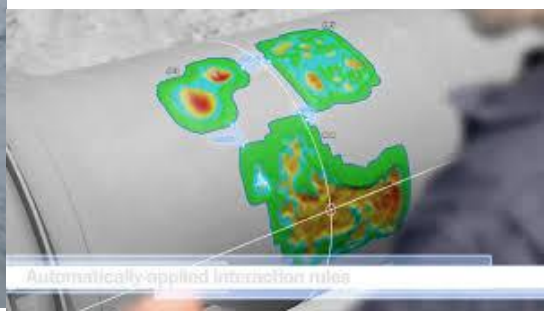


Case Study: Refinery Piping Inspection was contracted by a major domestic refinery to perform MULTIPLE SCANNING Inspections on a variety of piping systems including elevated, buried, insulated and piping resting on supports. These systems were chosen in order to determine the viability of using long range guided waves as a screening tool to identify specific damage mechanisms such as soil-to-air interface, corrosion under insulation and touch point corrosion. One of the refinery's prime reasons for contracting HYDROSEAL was the ability to provide highly qualified ultrasonic inspectors with experience in performing MULTIPLE SCANNING Inspections.

Permanently installed MULTIPLE SCANNING monitor eliminates future digs and provides accurate information regarding Asset Integrity. A inspection is performed by placing a collar around the pipe section, including stripping an area approximately 24" wide if the system is insulated, and then performing the test. Each of these individual scans is termed a "shot". During this project HYDROSEAL CONSULTANCY performed over 2000 shots looking for various damage mechanisms. Results: 99% Correlation After performing the MULTIPLE SCANNING inspection, a variety of follow-up techniques were used to "prove up" the results, including manual ultrasonics, semi automated ultrasonics and material sectioning of suspect areas. Refinery management concluded that the MULTIPLE SCANNING performed by HYDROSEAL CONSULTANCY experienced technicians, yielded a reliability correlation factor of 99%. The 1% inaccuracy occurred in areas that were conservatively identified as a potential discontinuity and after further evaluation were considered acceptable.



ROV deployed multiple scanning



Unique 3D report of multiple scan result.

Handheld multiple scanning

Standard Inclusions

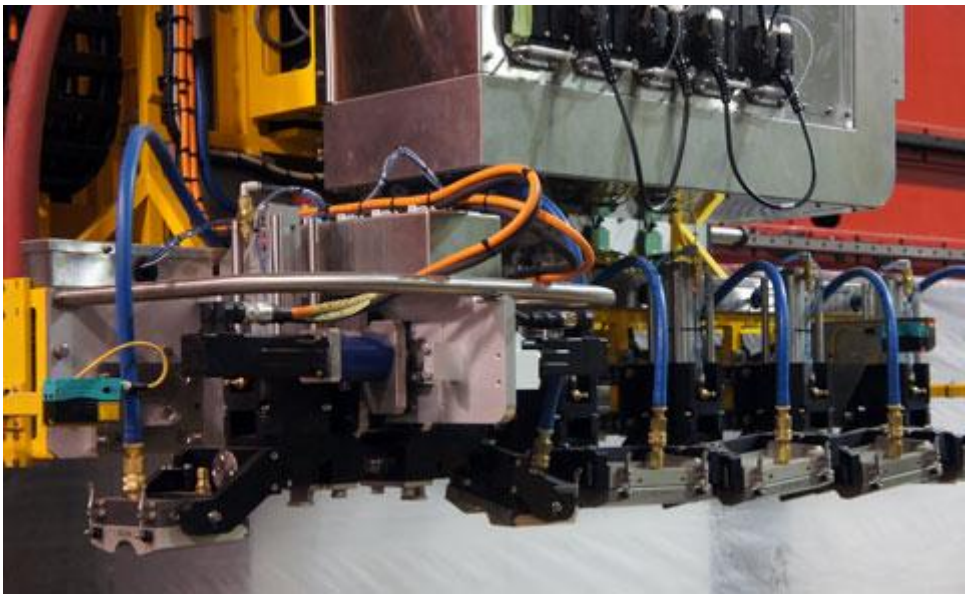
- Scanner frame with handles, and:
- Two 340 mm (13.5 in.) frame bars
- Two 500 mm (20 in.) frame bars
- OmniScan-compatible waterproof spring-loaded wheel encoder with 5 m cable
- Four 90º probe holder brackets
- 4 spring-loaded arms (SLA)
- 4 TOFD-P/E 31.75 mm yokes
- 2 PA 40 mm × 55 mm yokes
- Irrigation tubing and accessories

Note: Umbilical cable, probes, and wedges are not included with the scanner.

Options

- Umbilical
- Remote Pulser/Preamplifier
- Couplant-Feed Units
- Laser Guide Kit
  Battery-operated laser-guiding device for easier weld tracking.
- Yokes
- TomoScan FOCUS LT Encoder Cable Adaptor
- Replacement encoder
- Probe holder Kits
  Set of two spring-loaded arms (SLA) mounted on 90º brackets, to allow more than four probes.
    - Standard-For pipes larger than 12 in. OD.
    - Pivoting-For pipes smaller than 12 in. OD.

Automatic Multiple scanning



Designed for:

- Seamless, welded, and upset pipes
- Carbon, Stainless, and 13% Chrome pipes
- OD range: 60.3mm (2 3/8") to 508mm (20")
- WT range: 3mm (1/8") to 51mm (2")
- References:
    - Longitudinal (L), transverse (T), oblique 11°/22°/45°/68°(O),
    - Lamination (LAM) and wall thickness (WT) measurement

System Key Features

The main characteristics of the MULTIPLE rotating pipe inspection system are:

High Productivity

- Large mechanical scan overlap covering up to 120 mm/r.
- Versatile system quickly reconfigurable to different inspection configurations:
    - Fast mechanical changeover time.
    - Quick access to predefined inspection setups.
    - Software wizard tool to create new inspection setup.
- Multiple parallel firing to simultaneously inspect at different positions on pipe:
    - Up to 4 apertures per phased array probe.

Quality

- Multiple defect types inspection capability (L, T, O, and LAM) and wall thickness (WT) measurements.
- Unique cluster/water wedge (WW) concept allowing:
    - Many degrees of freedom (DOF) in order to follow pipe movement.
    - Perfect coupling, even with important straightness variations.
- Mechanical and acoustic design leaving only small untested tube ends.
- Automatic calibration per channel providing the highest documented repeatability in the industry with detailed data reporting.
- High sensitivity on small reference defects with an SNR greater than 12 dB.
- Fulfills testing regulations such as API-5CT and API-5L.
- Qualified by the most important oil companies in the world (Exxon-Mobil, Shell, BP, and Chevron).

User Friendly

- Easy interpretation of the inspection results using real-time strip-chart displays.
- Easy and fast mechanical reconfiguration between two pipe sizes.
- Detailed alarms and data reporting.
- Supervisor software that:
    - Merges and archives inspection data in one common database.
    - Centralizes inspection results and real-time displays on a single work station.
- DCOM exchange protocol for easy interface with customer level 2 production-line systems.