



## Guided Wave Ultrasonic Technology

### *GUL Overview*

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 (GUL) Inspection. 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
- GUL 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

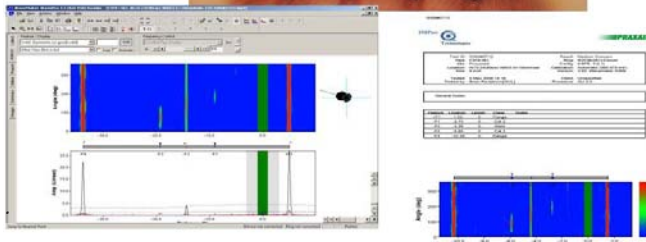
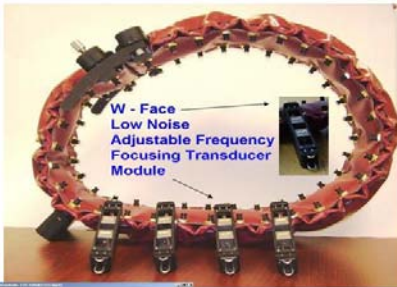


*Complete inspection of 112' up-stream and 97' down stream in refinery excavation*

In the hands of an experienced technician, GUL 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 GUL equipment, the G-3, provides adjustable transducers capable of running multiple frequencies and wave forms characterizing defects more accurately than ever before.

The GUL 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.

### Advanced Defect Detection and Discrimination

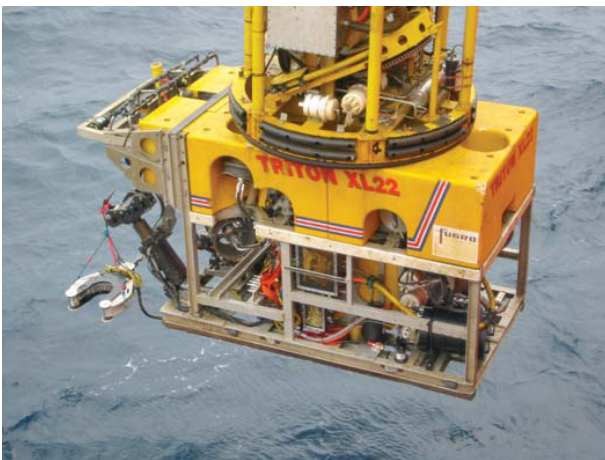


### Case Study: Refinery Piping Inspection

MISTRAS was contracted by a major domestic refinery to perform GUL 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 MISTRAS was the ability to provide highly qualified ultrasonic inspectors with experience in performing GUL Inspections.



*Permanently installed GUL monitor eliminates future digs and provides accurate information regarding Asset Integrity.*



*ROV deployed GUL*



*Difficult pipe inspection of pipe through concrete in the pump station*

A GUL 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 MISTRAS performed over 2000 shots looking for various damage mechanisms.

### Results: 99% Correlation

After performing the GUL 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 GUL inspection performed by MISTRAS' 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.

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