



## Automated Ultrasonics for Refrigerated Liquefied Natural Gas Tanks under API 620

### *Introduction*

MISTRAS Group's Service Division offers a complete range of inspection, training and QA/QC services. We integrate innovative, new technologies with conventional testing methods to assure the integrity of industrial materials and components as cost effectively as possible.

Liquefied Natural Gas (LNG) for tanks is one of the many industries that uses our nondestructive testing techniques to detect, locate and assess structural problems.

### *Current Condition*

Large refrigerated (-267° F) LNG storage tanks built under API 620 require 100% NDE inspection of the welds. These tanks are normally 260 feet in diameter and 110 feet height for a 160,000 M3 capacity. The construction can be double wall or concrete lined. The estimated weld length is 20,000 linear feet, just for the shell and the internal tank, holding the liquid gas is normally constructed of 9% Ni Steel and welded with Inconel based materials.

Radiography is the primary method of inspection, but Automated Ultrasonics (AUT) is allowed if the rules under API 620 Appendix U are followed.

### *Application Solutions*

Using Automated Ultrasonics (AUT) provides a dramatic reduction to the construction time by eliminating "X-ray



windows" and allowing the welders and other construction personnel to stay in the tank while the inspection is in progress. AUT also allows for permanent digitally recorded information that is easily reviewed and audited by Level III inspectors. The data is collected at an inspection speed of about 200 feet of weld per crew per shift. The information is then analyzed and the areas for repair are marked on the tank and included in the weld inspection report.

Specific Test Procedures and Scan Plans are required to be developed by the API 620 Code. These requirements include writing a specific test procedure that includes the ability to record data in an automated fashion, ensure 100% coverage of the weld and weld heat affected zone and prove up the procedure on mock up plates with known manufactured defects welded to the same procedure that is to be used in production. In addition our technicians are required to prove their competency on the test specimens in blind tests in order to satisfy the code requirements.

MISTRAS Services developed a procedure based on combining two advanced ultrasonic technologies: Phased Array (PA) and Time of Flight Diffraction (TOFD).

This procedure and the associated scan plans demonstrated that indications on any position within the weld or the heat affected zone were detected, sized and positioned correctly. The inspection crews were qualified by demonstrating they could repeat the results in blind tests.



## Results

The rejection rates and repairs of welds were high at the beginning of the project, showing the difficulties that welders were having with these sophisticated materials. As the project progressed the rejection rates went back to “normal.” All the flaws called for repair were found every time with consistent accurate position and sizing. Additionally, several radiographics were taken on different welds verifying the AUT results. Production was never slowed down due to inspection and the areas for repair and reports were normally available the morning after the scanning.

## Benefits

Using Automated Ultrasonics during the construction of API 620 Refrigerated Tanks for LNG or other applications proved to be a success and allowed the tank owner to save money and to obtain the highest quality inspection.

Specific benefits include:

- No production delays due to “radiography-windows”
- No radiological risks
- The information is saved in electronic records, usable and auditable for future inspection programs.
- The procedure allows for a fully portable, battery operated system, where portability reduces access times and increases inspection productivity.



MISTRAS Group, Inc. is a team of skilled researchers, engineers, technicians and manufacturing personnel dedicated to the development of practical and cost saving solutions to your challenging inspection needs.

For assistance or additional information, please contact our headquarters at 609-716-4150 or via email at: [sales.systems@mistrasgroup.com](mailto:sales.systems@mistrasgroup.com).



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