Conventional UT vs. Phased Array UT

What You Need to Know About Ultrasonic Testing

Ultrasonic testing (UT) is a non-destructive testing (NDT) method used on Oil Country Tubular Goods (OCTG). Both conventional and phased array inspections provide near full-length coverage of tubular goods in accordance with American Petroleum Institute (API) specifications.

The biggest difference between conventional UT and phased array UT is the transducer. Conventional UT's use single-element transducers or paired element transducers, one for transmitting and one for receiving, to generate and receive ultrasonic sound waves. Phased array UT transducers have 16 to 256 individual elements, a substantial increase. With computer-controlled firing of element groups, focal depth, incidence angle, and the very physics of the inspection process can differ between these two NDT techniques.

Phased array UT transducers have 16 to 256 elements

Conventional UT has mechanically fixed inspection parameters, each inspection configuration has a fixed focal point and fixed incidence angle. The focal point in the test material is the depth the inspection is performed, and is determined by the acoustic lens physically on the probe. The incidence angle is the angle the ultrasonic signal is emitted into the test material, and is mechanically determined by a wedge used to create the angle. Because both the focal point and incidence angle are fixed parameters, determined by physical components, it can be difficult to optimize conventional UT's to detect expected flaws.

Conventional UT has mechanically fixed inspection parameters

Phased array UT's solution to the difficulties inherent with conventional ultrasonic testing is to utilize multiple elements on a single transducer. This provides the inspection system flexibility to electronically control parameters such as focal point, beam size, and incidence angle by pulsing elements in groups to create the desired beam shape (liner, focused, or sectorial). When groups of phased array elements are pulsed, the ultrasonic sound waves combine constructively and destructively to form software configurable wave fronts that can be optimized for expected flaws.

Software configurable wave fronts provide versatility for phased array UT inspections

Improved flaw detection and flaw visualization

The ability for phased array UTs to digitally control numerous ultrasonic elements simultaneously has greatly improved flaw detection and flaw visualization over conventional UT methods. All traditional and proven means of ultrasonic defect sizing remain viable with phased array UT (i.e. amplitude comparison, dB drop, time of flight diffraction, and zone discrimination methods).

Industry leading repeatability of ±2 dB

Since the commissioning of the industry's first automated phased array UT at PTS Channelview in 2006, the NDT method has proven to be reliable and accurate with documented industry leading repeatability (accuracy) of ±2 dB. In addition to the inspection services provided by a conventional UT, Patterson's phased array UT units can measure the outer diameter (OD) and ovality of tubular products.

In general, PTS's phased array UT units are compatible with tubulars of the below characteristics. Please contact us regarding tubular goods outside this range.

Compatible Material	Seamless and Electric Resistant Welding (ERW) OCTG and Line Pipe
Composition	Carbon Steel, Chrome, and Exotic Alloys
Outside Diameter Range	2.375 in to 24 in (60.325 mm to 609.6 mm)
Wall Thickness Range	0.190 in to 2 in (4.826 mm to 50.8 mm)
Length Range	20 ft. to 48 ft. (6.1 m to 13.7 m)

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