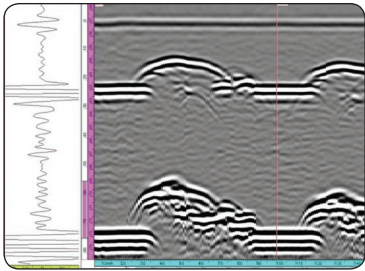




# TIME OF FLIGHT DIFFRACTION (TOFD)



**Time of Flight Diffraction or TOFD**, is one of the most promising ultrasonic techniques for the examination of welds on pressure vessels in lieu of radiography; for pipe weld quality or crack detection and also weld root erosion. TOFD is a computerized ultrasonic system able to scan, store, and evaluate indications in terms of height (through wall thickness), length and position, with a degree of accuracy and speed never achieved with other ultrasonic techniques.



## Theory

TOFD consists of a separate ultrasonic transmitter & receiver. The probes are aimed at the same point in the weld volume. The entire weld is then flooded with ultrasound allowing inspection of the weld. After emission of a compressional wave from the transmitter, the first signal to arrive at the receiver is the lateral wave or OD wave which represents the outer surface or OD. In the absence of defects, the second signal to arrive at the receiver is the L-wave backwall echo which represents the inner surface or ID. When a flaw is present, a diffracted signal is generated at the upper tip of a defect and will arrive before the signal generated at the lower tip of a defect. With a time of flight of each flight path, ultrasonic velocity and the spatial relationship of the two probes, the location and height of the defects can be accurately calculated. Gray scale imaging techniques are applied to the RF (AC) signal phase and enables weld integrity to be observed in real time.



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