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Reality Check – Ultrasonic Testing

Ultrasonic testing is a useful tool in the medical profession but cannot be considered relevant as a predictor of leakage in a residential fuel oil tank. Proponents of this test for this purpose relate a presumed steel thickness measurement to ***premature failure***. Such a relationship does not exist. Hundreds or even thousands of measurements may be necessary to determine the true condition of a twelve square inch area of tank. This is considerably more invasive and time consuming than simply testing the tank bottom at large spatial intervals, which is what is currently done. At any rate, premature tank failure does not occur as a result of the gradual uniform thinning of the tank. This, in fact, can be reliably approximated by simply knowing the age range of the tank (5-10yrs, 10-15yrs, etc). Therefore, it is important for all risk managers to realize that this method is not applicable to risk minimization when dealing with residential oil tanks.

The problem involves an inherent limitation in the focusing range or sensitivity of the equipment. The current system allows the thickness of the tank wall to be measured with enough accuracy so that general areas of pitting can be identified. However, because of its travel through the tank wall, the ultrasound wave has a focusing width of approximately 1/16th of an inch. Consequently, tank flaws of a lesser dimension are virtually undetectable. Manufacturing inclusions and defects, weld and seam cracks, micro fine splits and pinholes cannot be reliably located using this instrumentation due to the perpendicular orientation of the defect to the direction of the ultrasonic sound wave. ***Of course, these are the causes of premature failure.*** .

Another limitation exists in the inability to clearly distinguish between materials of a different acoustic density. This might be present in sections of a tank having a buildup of rust, iron oxide, biological material or other debris normally present on the interior wall. Ultrasound waves will travel within one material of a specific density until they reach a boundary layer having a different acoustical characteristic (i.e. water, gas, air, rust, dirt, or biological material). Ultrasound waves are then reflected back from the boundary layer along the same basic path to provide a round trip time interval upon which actual wall thickness is determined. There are also a number of degradation factors that may contribute to future leaks or failures that are not within the scope of an ultrasonic evaluation. Included in this category are inferior welds, stresses, and material defects, among others. This lack of distinction could cause inaccurate thickness measurements and may result in corrosion remaining unidentified.

It is important to note that operator error plays a role as well. Since it may be inconvenient for some technicians to observe the instrument readings while climbing into and out of the test position to correctly record the data, some tank test technicians "memorize" ten or 20 readings and then record them via recollection of the "ballpark" figures. This, of course, introduces error and risks the integrity of the tank test data.

Ultimately, the reliability of this or any ultrasonic evaluation is based upon numbers - many numbers, and the ability to “see” the actual cause of premature failure. However, due to limitations of equipment (it doesn’t see the actual cause), data collection (it is impossible to take enough readings) and operator error, this process must be rejected as a predictor of premature failure.

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