ULTRASCAN - Application Note

Subject Identifying holes in welded seams on metal tanks

Note Ref. **AN312.01**

Seal Integrity of metal fabrications

A common problem in the manufacturing of containers is a reliable method of checking the integrity of any welded seams. Traditional methods using compressed air and soapy water have several disadvantages:

i) Compressed air costs money to generate and maintain.

ii) Soap is a consumable cost.

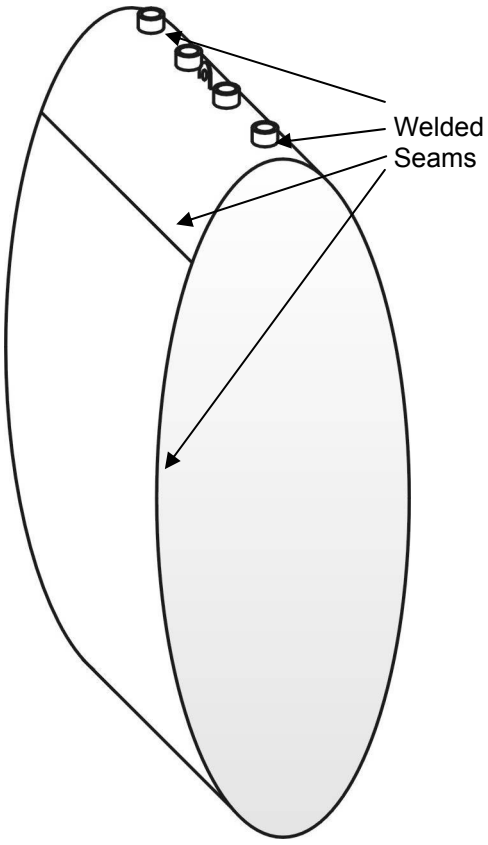
iii) If the hole is too large the soap can't produce a bubble.

iv) Application of the soap to the welded seams requires accuracy.

v) Soap is a contaminant which needs removal before painting or re-welding.

Practical example

A manufacturer of small volume petrol storage tanks fabricates them out of steel sheet with welded joints. The process is automated using robot welding stations and then the sealing quality is checked with compressed air and soap. An alternative checking process is sought due to the reasons cited above.



For safety reasons the tank is subject to a maximum pressure of 0.2bar.

Normally the solution to identifying a compressed air leak is to listen to the ultrasonic emissions caused by the escaping gas. However, at such a low pressure, and with such small holes this method is impractical. Additionally the leakage from the temporary seals used during the test create high levels of ultrasonic noise and mask any real leak.

Alternative methods such as helium or water loading have the same, if not worse, cost and operational penalties as the compressed air technique.

Proposed solution

A proposed solution is to provide a system which replaces the use of compressed air completely, by using ultrasound as the test medium.

This provides significant advantages because it:

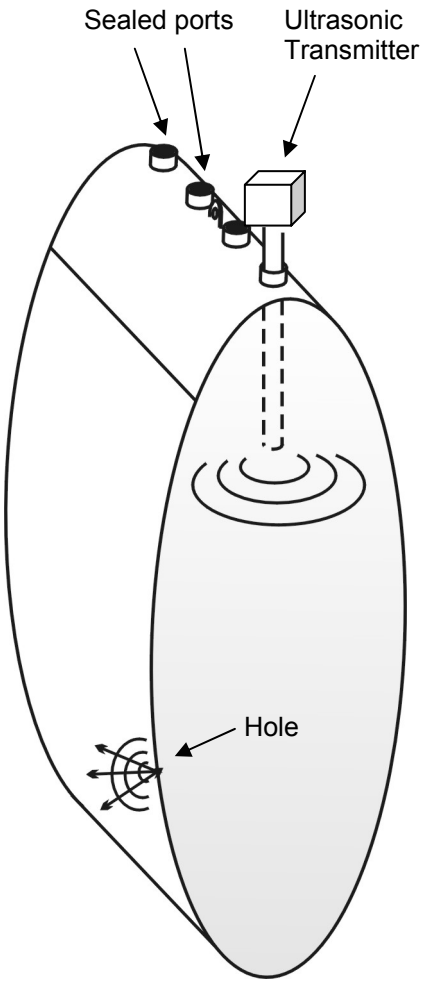
i) Incurs little consumable cost.

ii) Safer than compressed air.

iii) Independent of hole size

iv) No cleaning required after test

v) Simple to use

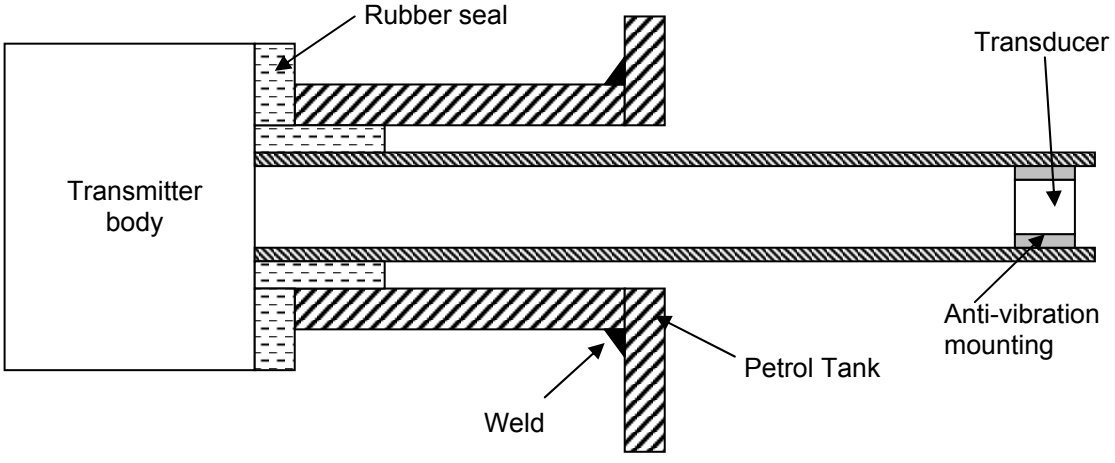


The system consists of an ultrasonic transmitter for generating the ultrasound, and a pass/fail receiver for indicating the presence of leakage.

The method proposed is to block all the inlets except one with a soft end cap. This could be a rubber bung, or a plastic screw cap with a silicon rubber. There is no need to make this seal particularly airtight.

The remaining inlet pipe is used to inject ultrasound into the tank. The principle is that ultrasound will bounce all around the container and 'leak' through any air gaps, including any weld imperfections. These leaks can be detected by a hand held receiver which is moved along the welded seams.

A special packaging of the ultrasonic transmitter would ensure that the source of ultrasound was from inside the tank, and that an acoustic path would not be created through the transmitter body, thus giving false results.



The test process is to firstly close the inlet/outlet pipes and fit the ultrasound transmitter.

The transmitter should be turned on to maximum and the casing checked for direct ultrasound radiation using the hand-held receiver. (i.e. if the signal is too strong it will pass through the steel and radiate).

If ultrasound is detected directly through the metal, turn the transmitter power down until no signal is detected on the receiver.

Now follow each weld with the hand-held receiver and the presence of any holes will be detected by the ‘detect’ light.