

Development and Validation of an Automated Ultrasonic System for the Non-Destructive Evaluation of Welded Joints in Thermoplastic Storage Tanks

Thermoplastic tanks are an attractive alternative to metal tanks for the containment of many products, including hazardous chemicals. Such tanks are normally designed for a finite life, usually between 15 and 25 years. However, due to economic pressure, many of these tanks are still in operation beyond their design life, often with little or no engineering justification. It is also not uncommon for plastics tanks to be used for storing chemicals that they were not designed to contain. For these reasons it is very important that operators of plastics tanks and vessels inspect them throughout their life. An issue at hand is that there are currently no standards for the in-service inspection of plastics tanks. There is also very limited expertise available on the visual examination of plastics tanks and virtually no use of non-destructive examination (NDE).

The 2-year PolyTank project, launched in the frame of European Seventh Framework Programme, in November 2012 will determine the potential failure mechanisms in plastics tanks and storage vessels and develop ultrasonic NDE procedures, techniques and systems to be able to identify these. An important aim of the project will be to develop an inspection system that is site-rugged and simple to operate.

Existing NDE Methods and Limitations

The majority of visual inspections are external and can therefore only identify cracks that break the outside surface of the tank. Since many of the cracks initiate from the inside of the tank there is already a leak path through the tank wall if and when the crack is detected. Internal inspections are carried out less frequently, if at all, because they are expensive, potentially dangerous to the inspector, and result in a shut-down because the tank has to be emptied. Until now, full volumetric examination of tank welds has not been possible.



Technical Project Objectives

- To develop a new approach for testing welded joints in thermoplastic storage tanks and storage vessels using automated non-destructive evaluation
- To create a database of critical defect sizes and contamination levels that cause a reduction in the long-term integrity of each type of welded joint
- To develop acceptance criteria for different types of flaws in welded joints based on both short-term and long-term testing
- To design and develop of NDE system for the reliable volumetric examination of plastics tanks and storage vessels

Potential Benefits of PolyTank Technology

- A new technology based on ultrasonic examination of the full weld volume, from the outside surfaces of the tank
- Not necessary to open up a tank to prepare the inside for examination
- Replace unreliable periodic visual inspection
- Reduce the risk of catastrophic failures

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