AUTOMATED MICROWAVE INSPECTION OF NON-METALLIC MATERIALS

Oceaneering Asset Integrity offers an innovative approach to the requirement to reliably inspect a range of non-metallic materials.

Recent developments in technology have resulted in a reliable non-destructive testing technique for the inspection of non-metallic materials which are becoming more widely used to replace traditional steel components. Microwave technology can provide assurance on the integrity of many materials like polyethylene piping and fibreglass. Previous inspection of these materials was limited to the detection of foreign objects or separated areas of delamination. Microwave technology is the only technology, which can detect incipient failure such as a poor adhesive bond, or a “cold” thermal weld, which can cause component failure over time.

The Technology

The advancement of microwave inspection produces the capability to inspect components previous inspection techniques could not. The inspection system consists of a laptop computer, a small instrument box, umbilical cable, scanning device, and the microwave transducer. The scans are performed from one side of the component being tested, much like conventional ultrasonic testing. The transducer produces the microwaves and projects them past sensors, which record baseline voltage strength. The microwaves then penetrate the test piece, and at an area where discontinuities are present, the energy creates reflected responses. These signals are measured in volts by the probe. The data is then processed and digital images are produced. This provides baseline data, which can be repeated as part of an ongoing maintenance program. Many non-metalic components have been successfully inspected including wood, ceramics, composite aircraft parts, polyurea coatings, spay-on foam insulation, and rubber piping expansion joints. The system can detect abnormalities such as delaminations, disbonds, foreign material inclusion, voids, changes in thickness, moisture and other liquid contamination, mechanical damage, and physical changes due to chemical attack.

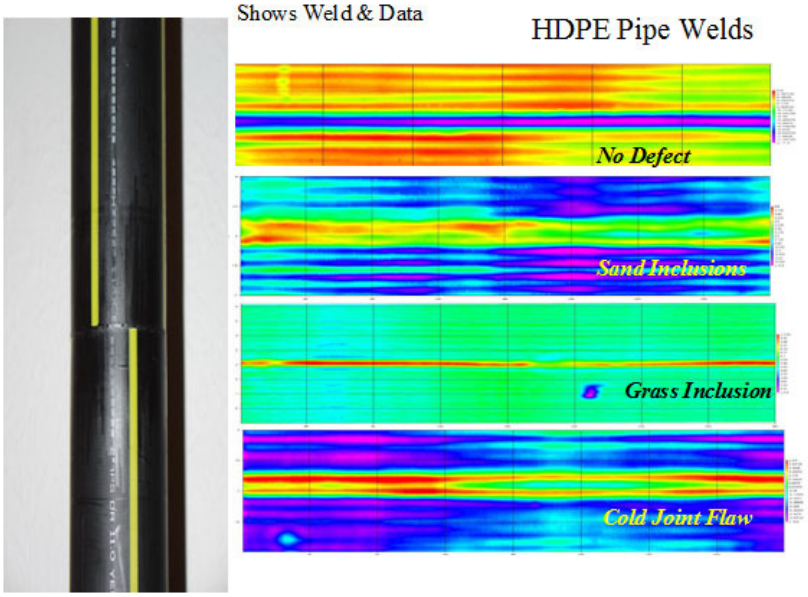
OCEANEERING®

Oceaneering International, Inc. | Asset Integrity | 11911 FM 529 | Houston, TX 77041
email: Inspection@oceaneering.com | www.oceaneering.com

AUTOMATED MICROWAVE INSPECTION OF NON-METALLIC MATERIALS

Polyethylene Piping

Polyethylene piping is becoming more prevalent in the refining and petrochemical industry due to its ability to withstand highly corrosive environments and its low cost compared to steel. Many types of polyethylene are used such as high-density polyethylene (HDPE) for fire water service, and low-density polyethylene (LDPE) for gas transfer service. Joints in the piping systems are typically made by thermal welding, mechanical coupling and glue bonded couplings. Microwave technology can detect a range of defects.

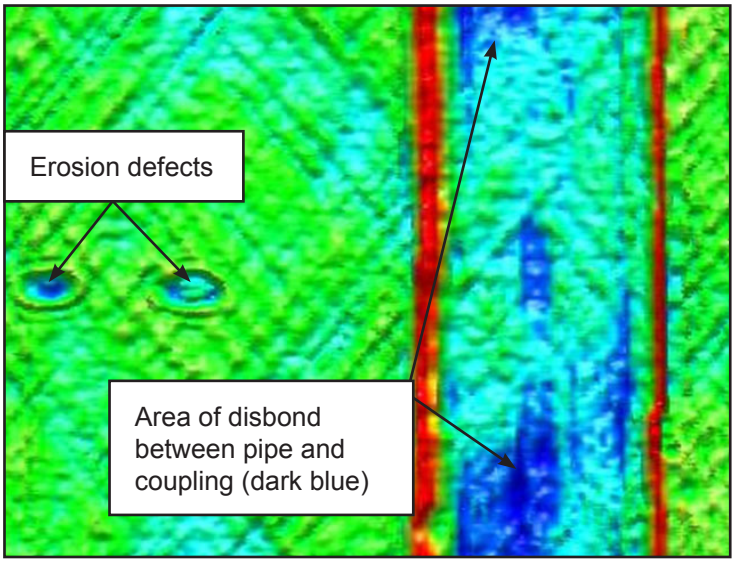


Fiberglass

Fiberglass patches and piping are used where highly corrosive fluids are found. Since fiberglass joints are typically glued together a common defect is an inadequate glue layer, with resulting poor adhesion. This leads to joint failure due to thermal cycling or mechanical loading. Microwave inspections provides a reliable inspection method to ensure the integrity of the joints

Fiberglass Pipe Coupon

Two four inch pieces of FRP pipe connected via glued coupling.



Scan Results (Shown rolled out into flat plane for ease of viewing.)

The recent advances in microwave inspection technology allow inspections of components where conventional inspection techniques provide poor or inadequate data. Scanning of these components ensures the integrity of the specimen can be maintained. Continuing improvements in motorized scanning systems will decrease inspection times and therefore cost.

OCEANEERING®