



EWI[®]

We Manufacture Innovation

Automatic Welding for Pipeline Repair

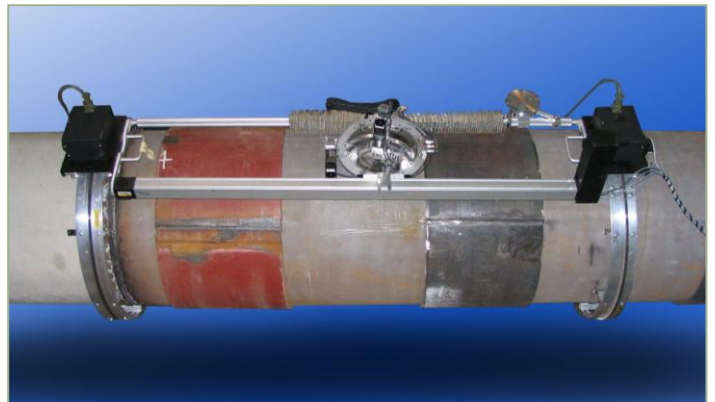
EWI TECHNICAL BRIEF

EWI has extensive experience in the development of automatic welding systems for pipeline repair and laser-based inspection systems. Several systems for inspecting surface defects on pipelines and defects on welds have been developed in the past decade. This technology uses commonly available laser sensors to make measurements of the surface profile of objects such as welds and pipeline surfaces. These profile images are compiled from three-dimensional surface topography data that can be analyzed by software programs, enabling precise measurement of surface defects.

Automated Corrosion Repair

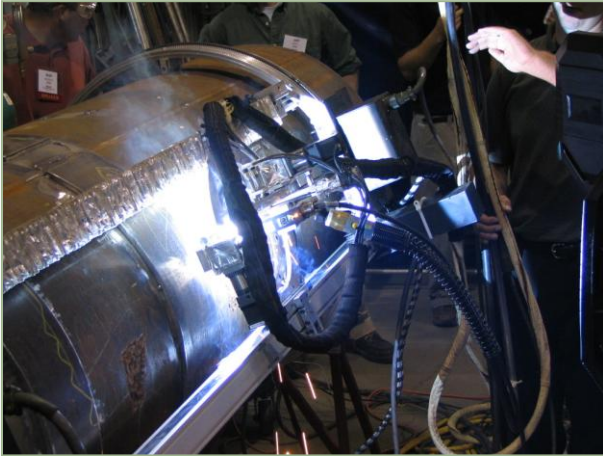
The repair and remediation of in-service pipelines is a safety critical process that is closely controlled, but at the same time it must be performed with cost-effective techniques. For repair of large-diameter pipelines, the current practice of using of manual welding is time-consuming and the risk of operator error is great due to the long welding times required. Similarly, higher strength pipelines require precise weld bead placement to ensure proper tempering of previous weld layers and the electrodes conventionally used will not provide adequate weld metal properties on pipe grades above X80.

EWI developed a portable, automated welding system to map corroded areas on an in-service pipeline and automatically repair the susceptible areas. The prototype system to the left is the first of its kind to automate this normally manual SMAW process. The system uses EWI's laser-based algorithms for corrosion inspection



and implements these algorithms into an automated FCAW welding system.

First, the area is mapped with the laser and corrosion depth and area is determined. Next, either a repair sleeve or a fill patch is automatically welded over the corroded area as shown to the right. During welding, the laser sensor tracks the welding joint or tracks the fill height and position to ensure reliable welding conditions. The system was successfully demonstrated at a Pipeline Repair Workshop after field trials in April 2007.

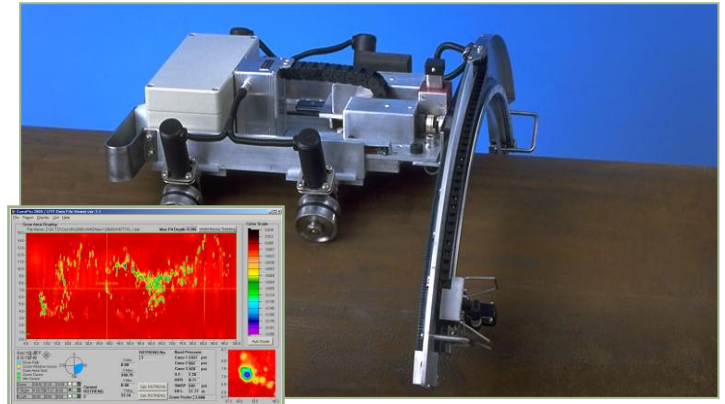


Pipeline Corrosion

To determine fitness for service, pipelines are inspected and the severity of corrosion is detected and sized both internally and externally. Automated ultrasonic inspection “pigs” travel through pipelines to locate corrosion damage sites. In the case of external corrosion, the areas of suspected corrosion are then excavated to allow access and to conduct a detailed inspection of the pipe surface. The accuracy of this inspection is the key to calculating the remaining strength of the pipeline and the make an informed decision regarding the required course of action. In the past, the tools to measure the extent of corrosion have been limited and there was a need for systems, which can provide an accurate contour map of the external corrosion of the pipe.

EWI has been active in developing the mapping techniques incorporating visual methods and a magnetically attachable crawler. A laser-based automated corrosion inspection system, as shown to the left, was developed by EWI, which uses low-cost laser sensors to scan over a circumferential segment of the pipe.

An algorithm was developed that analyzes the surface features, and can distinguish between normal pipe surface features, such as seam and girth welds, and determines the depth and severity of the corrosion. The result is a corrosion map, indicating areas requiring repair.



The laser-based mapping system was licensed by a member company and several additional systems have been developed for service.

If you have questions or would like to learn more about automatic inspection of welds, contact:

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