Ultra Sonic Weld Inspection

by
Timothy D. Nolan
Consultant, Measurement & Automation
Data Science Automation, Inc.
USA

Category:
Manufacturing

Products Used:
LabVIEW 8.2.1, VXI 3.5.1, DAQmx 8.7.1

The Challenge:
Develop an interface and control system that would display complex pipe weld inspection data, and allow user communication to a USB VXI chassis and USB DIO module, custom DSP communication and interface with existing control programs. Multiple views were required, including a real-time 2D profile of the unit under test, a strip-chart flaw log tied to the pipe movement rate, and a 1D ultrasonic probe response plot.

The Solution:
The solution used the easy to use LabVIEW display capabilities, along with flexible USB connectivity to perform the rapid DSP communication of very large data sets, as well as the digital communication with the rest of the production line equipment.

Abstract:
A major electronic manufacturer had an existing VXI-based ultrasonic measurement system, but wanted to implement the visual display and communications ability of LabVIEW. DSA was able to use the user friendly device communication of LabVIEW over USB to obtain data and communicate with the other plant devices digitally. The modularity and reusability of LabVIEW enabled a new customizable user interface, superior to the original display capabilities of the control program, while limiting the user interface to a sleek design without excess system-level access. LabVIEW was also able to perform system self-adjustment and customization Operator display, dynamically utilizing all screen space.

Body Text:
Ultrasonic weld inspection is performed on pipes shortly after receiving a longitudinal weld. The pipes are examined in two ways: the Scarf inspection checks for proper removal of the weld bead, where the Flaw inspection checks for weld flaws internal to the pipe. The speed of the pipe, as well as the high data density of the ultrasonic system, led to the data interpretation performed on a proprietary VXI DSP board. A Core LabVIEW program existed to receive data from the USB-VXI system, as well as to update the DSP settings during operation.
The GUI sat on top of this core, and allowed Operator interaction, dynamic sizing and appearance of graphs, as well as saving and restoring DSP settings.

Measurement Theory
The measurement system used a ultrasonic probe to detect flaws and production thickness in pipe.