

Vision Assisted Assembly System

Requirement Nuclear fuel rods are assembled by welding end plugs onto the fuel tube. Automatic welding equipment performs the welding. Because of the sensitive nature of the product, extensive testing and verification of materials is required during and after assembly.

The most recent version of this welder included a laser welder instead of the traditional TIG welder to attach the end plug to the fuel rod.

Laser welders create a much smaller hot area, about 1/10th the size of a TIG electrode. The small size of the weld area required that the laser weld beam be positioned more accurately and precisely than when welding with a TIG electrode.

Solution

Working together, AEC and the customer specified a frame grabber and motion platform to permit 3-axis positioning of the weld head over the seam to be welded. Using a PC computer, the frame grabber, and the 3-axis positioning table, a custom application was developed to acquire laser beam position, calculate the position error of the laser head, then position the laser beam to the calculated position. This measurement and positioning is repeated until the laser beam is centered over the target. Z-axis positioning is done using a lookup value to maintain constant distance over the laser target for fuel rods of different diameter.

Synchronization with the PLC controller is implemented using discrete inputs and outputs.

A high speed data acquisition system was specified and installed in the same computer to permit acquisition and later analysis of weld parameters such as gas flow, current, and volts during the weld process. This system permits high speed (10,000 samples per second) data sampling and acquisition during welding.

Technologies Scorpion Frame grabber
Compumotor 6400 Indexer
Parker 3 axis linear actuator
Data Translation Analog to Digital converter

