

## Robotics Case Study

# Old Hardware Salvaged Through New Technology

A recent project by Wolf Robotics demonstrates there is a viable option to the high cost of replacing entire robotic welding systems when the mechanical part positioning equipment is still sound and robust.

By Charles E. Boyer, Wolf Robotics

**W**hat do you do when the robots you bought in 1980 have become obsolete and the manufacturer is no longer in business but some of the system components are still operational and capable of handling today's requirements? Add to that the tendency of corporate America to solve problems by sending the process and related jobs overseas because it would be less expensive than investing in all new technology.

That's exactly what a large off-road equipment corporation was faced with recently, but they took a different approach at solving the problem and discovered there are alternatives if you just look long and hard at the problem.

### The Crisis –

The problem was what to do with multiple welding cells that have functioned acceptably over the years but the robots are old, the original manufacturer no longer supports their products, and replacement parts are getting more difficult to obtain. In addition, new technology now exists to improve the process but the robots are not sophisticated enough to handle the new features. However, the positioners used to manipulate the weldments are still functional and capable of supporting and handling the weight and movement of the welded parts. They were physically built in their day to handle heavy-duty parts and are still in great operational condition. It doesn't make sense to replace the entire system at today's cost if there's anyway to make the old and new work together.

### The Alternatives –

There were basically three alternatives:

The first and most expensive option was to replace the entire systems with the latest state-

of-the-art equipment and scrap out the entire older cell components.

The second option was to modify the existing systems with new controllers linked to the old robots and positioners. This would be more viable if the robot manufacturer was still in business and replacement parts were still readily available.

The third option was to reconfigure the systems by replacing the robot, robot traveling tower carrier, controller and motor/gearbox and to integrate them with the existing positioners.

This is where the engineers at Wolf Robotics stepped in and discovered that the physical design and structure of the existing positioners was more than adequate if they could just replace some motors and/or gearboxes that were more compatible with the new robot technology. The cost to replace the entire system was just too much to justify.

"We had perfectly good physical components that, with a little bit of work, could still handle the positioning of the heavy weldments", said Kent Sorenson, Wolf Robotics project manager. "Building all new structures just didn't seem like a viable alternative especially when cost was playing a major roll in the system."

### The solution –

After evaluating the three alternatives, Wolf Robotics discovered that the actual cost of reconfiguring a new robot with existing positioners was substantially less than building a totally new system and you still gained the advantage of new robotic technology, new software, new and longer warranties and new components.



Existing Heavy Duty 2 Axis Positioner and new Robot Rotating Tower & Travel Track combine old components with new technology at a reduced cost.

The result was an inverted ABB IRB 2400L robot suspended from a rotating travel column with an S4Cplus robot controller, adaptive advanced weld control (AWC) with adaptive fill thru-the-arc capability, Servo Robot laser vision system, SmarTac™ tactile sensing capability, BullsEye® torch calibration, and RobotStudio™ off-line part programming.

In Figure 1 below, two pre-existing Aronson positioners are mounted to the floor, one single axis and one two axis are placed on each side of the travel track. Total integration of the new servo motors for each axis of the positioners made it possible to fully coordinate the welding process and positioner movements from one control unit. In fact, during the weld process the new Wolf Robotics system controls 5 external axes simultaneously, in addition to the robots own 6 axes of movement. The coordinated motion enables the robot and positioners to weld seams that are off center with a fully controlled process speed. With the positioners' acceleration and speed of rotation, they can achieve higher production output and improved quality. The motors used are the same high quality robot axis servo motors utilized on regular systems and offer expert positioning, response and calibrated operation for the necessary precision required in this type of operation.

Features new to the system and only available through the technology offered within the cell included:

Lincoln PowerWave CV 655 power source interfaced to the robot controller.

Coordinated motion between the robot and positioners.

AWC (advanced weld control) seam tracking which monitors the welding process and adjusts the weld path using through-the-arc sensing technology. Includes adapting the weave width and travel speed for varying groove openings.

The S4Cplus controller with an Ethernet card, which enables PC communication and is ideal for program transfer from a PC. This provides an excellent method for off-site data storage in the event of program corruption.

SmarTac tactile sensing which provides initial sensing of the part and joint locations and adjust the program accordingly.

Servo Robot Laser vision seam tracking for scanning the joint while welding to keep the welding torch and seam aligned, and vary welding parameters to assure a uniform fill on varying groove welds (i.e. cast parts).

New AC servo brushless motors on axes of positioners for improved movement accuracy, replace old DC versions and are integrated to the robot controller.

Manual jog capability of positioners, which can be used when the robot is working in the opposite station.

Torch breakaway on robot, protects robot arm from extensive damage due to collisions during cell operation or programming

Robot rotating tower configuration, provides maximum versatility and access for robot to maneuver into position and reach all positions on weldments.

Off-line part programming to maximize robot uptime and reduce downtime of the system. To date several models of parts have been and are currently being programmed, while the system is in production.

System software is motion oriented and process controlled, which allows the system to look ahead and anticipate movements and operations for improved accuracy, smoother operation and more sophisticated control of accessories.

When the project commenced, the existing 2-axis positioner from the first cell was shipped to the Wolf Robotics facility where the system was completely integrated before installation at the customer site. The second positioner was retrofitted in the field eliminating costly teardown and transportation expenses. A lot of effort went into tuning the electronics of the new robot technology to the existing Aronson positioners to attain maximum efficiency and operation. Additional work was done on sight after installation to insure smooth operation of the positioners with maximum weight requirements.

The customer has shown their overall satisfaction with the outcome by ordering additional systems to be converted. Significant savings will be recognized in that the remaining positioners will not have to be removed and sent to Wolf. Instead, the retrofit will take place in the field at the customer site and all integration and tuning will be performed during installation of the new robot systems.

The new technology has improved the overall product weld quality while reducing cycle time. But the biggest factor was a 35-40% savings in the initial investment.

Engineers at Wolf Robotics believe there are other systems in the manufacturing world being under utilized or moth-balled because the systems are outdated and in need of replacement. This project demonstrates there is a viable option to the high cost of replacing entire robotic welding systems when the mechanical part positioning equipment is still sound and robust. Wolf Robotics is currently working with another customer where the entire physical structure of positioners, travel track and overhead boom is being retained and only the robots, controllers, software and axes motors are being replaced.

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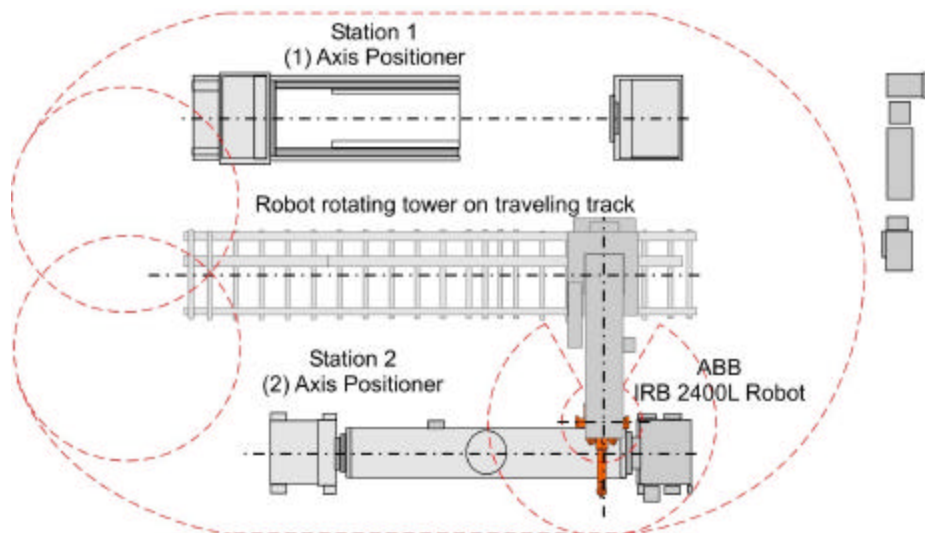


Figure 1. System Layout