Advanced Vacuum Technology

Upgraded High Voltage Electron Beam Strip Welder Uses InduSoft HMI to Produce Saw Blades

Complete upgrading of this strip welder included a new operator interface workstation running an InduSoft HMI.

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The highest quality band saws, hack saws, reciprocating blade saws and hole saws all use bimetallic blades. In order to produce these blades, the blade maker has to start by welding a continuous ribbon of M2 or M42 tool steel onto flexible backing material. Welding is done by directing a high velocity stream of electrons at the two pieces of metal in a vacuum chamber while the two strips are brought together in one continuous operation.

Welding in a vacuum ensures the precise geometry and integrity of the final weld. The process is complicated by the need to not only move the metal strips past the welder but to maintain the integrity of the workpiece.

- InduSoft HMI, integrated with AB SLC-504 PLC, supervises machine control for all functions on re-manufactured high voltage electron beam strip welder.
- Operator interface enables operators to monitor and control machine status from single station.
- Builder needed a “versatile, powerful, and cost-effective HMI communications package.” InduSoft solution used in upgrade enabled clean and efficient presentation of all needed information.
- InduSoft optimized the investment made in developing this control solution, and will form basis of control system for new product from the manufacturer.

Bimetallic blades with a strip of hardened metal on the cutting edge are used in a wide range of saws, from home utility tools to commercial bandsaws.
of the vacuum and the stability of the welding beam at the same time.

The strip welders used in this process are complicated, expensive, custom-built machines that represent a considerable capital investment. Designing and manufacturing this high-dollar equipment demands extensive technological knowledge. The Advanced Vacuum Technology (AVT) team in East Granby, CT has been servicing and manufacturing electron beam systems since 1987 and is one of the few companies in the world with expertise to take on this task.

**The Challenge**

AVT recently acquired a retired, 6.5 kilowatt strip welder that had originally been built in the 1970’s. It came with good fundamentals such as a stainless steel welding chamber, but lacked any computerized control and safety technology. Finding a customer for this machine required a complete update to modern standards.

**The Solution**

AVT refurbished and rebuilt the complete welding system, updated all of the technology and sold it to an Asian manufacturer.

Control on the refurbished machine is now driven by an Allen Bradley SLC-504 PLC, which communicates with the welder, controls the vacuum and provides full status data. The new control system controls vacuum sequencing, vacuum pressure monitoring, valve and component actuation, all interlocking and safety switches, beam generation and control and all integration of all peripherals. AVT worked with Control Solutions New England, an experienced InduSoft systems integrator, to design and implement the new controls.

The welder now includes two displays: one a closed-circuit TV monitor that shows the operator a close up view of the weld in progress (at magnifications up to 50x), and the other an Xycom Industrial Display with touch screen connected to an Xycom Industrial PC running the InduSoft HMI. In the past, AVT had used other types of HMI software, but InduSoft was chosen because AVT needed a versatile, powerful, and cost-effective HMI communications package.

The HMI displays are designed for the clean and efficient presentation of information and allow the operator to call up a logical series of screens:

- **Logon:** password protected access.
- **Autovac:** vacuum start up and shut down.

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**Below left:**

Various electron beam profile settings can be created and called up from this display.

**Below right:**

Acknowledgement display provides a central point for dealing with system alarms.
Top left:
Logon screen protects against unauthorized access to welder controls.

Center left:
The Autovac display controls startup and shutdown of vacuum.

Bottom left:
The main operator display provides system status during operation.

Below:
Settings and controls for the pumps and various vacuum zones.
**Main operator display:**
an overview displays for continuous running.

**System vacuum levels:**
settings and controls for the pumps and various vacuum zones.

**Beam profile settings:**
controls the welder beam for different types of product, and allows it to store and call up various profiles.

**System alarms:**
acknowledgement screen for alarm conditions.

**System setpoints:**
enables the user to specify details of welder operation.

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**Results**
The refurbished machine has been fully tested at AVT, accepted by the customer and shipped. AVT now plans to build a new machine from scratch, using the same control system with an InduSoft HMI; the next one will include an historical trending display in addition to the features already included. The use of InduSoft optimized the investment that AVT made in developing this control solution.

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**System setpoints can be changed on this display.**

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