



Linweld is one of the largest independent suppliers of welding, medical and specialty gases in the USA.

→ CTR, Inc. is a company in Rock Hill, SC, that designs and builds industrial gas plants for customers who supply high-pressure bottles of welding and medical gases. Since 1992, the company has constructed gas plants in Minnesota, Oklahoma, Nebraska, Alabama, Illinois, and New Mexico, and projects are under construction in Ohio and California. As a leader in cylinder fill plant equipment design and manufacturing, CTR relies on products from Beckhoff USA to help them automate the operation of the completed plants that CTR builds for its customers.

## PC control puts gas cylinders under pressure

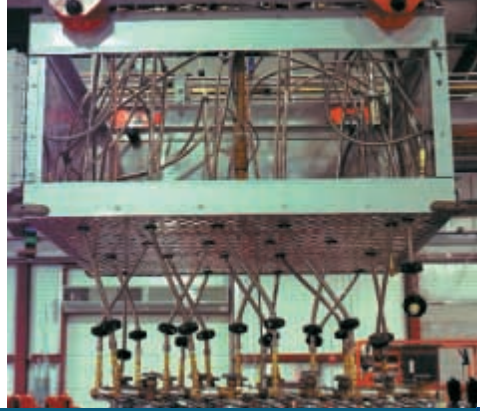
One such CTR customer is Linweld, one of the largest welding supply distributors and independent processors of industrial, medical and specialty gases in the US. Linweld's new gas fill plant in Lincoln, NE, is a state-of-the-art example of an automated facility that reduces labor expense, and improves productivity and product quality. In the Linweld plant, CTR is making use of Beckhoff Industrial PCs, remote touch-screens and IP 20 I/O systems to automate and control all gas filling operations.

"We use PC-based products from Beckhoff in the entire cycle of process control at the plant we built for Linweld," says John Greene of CTR, Inc. "We selected Beckhoff because they offered features that we couldn't find anywhere else. We first went to them for a customer who needed a remote-mounted touch-screen, and Beckhoff provided a nice, easy solution. The modularity of their systems is great for replacements, flexibility and expandability."

### Controlling the process

The Linweld plant is an industrial gas fill plant that fills high-pressure bottles (3,000 to 5,000 psi) with single gases – typically, argon, nitrogen, oxygen, acetylene, CO<sub>2</sub> and helium – or mixed gases. The primary use of these gases is in the welding industry. In the filling process, an operator sets empty cylinders in a filling rack and hooks them up to the supply connection. Then, he uses the Beckhoff CP7002 15-inch touch-screen Control Panel to select the proper gas or recipe of gases that are stored in the Beckhoff C6130 Industrial PC.

If there is residual gas in the cylinder, the system will vent it and pull a vacuum. When the vacuum reaches a predetermined set-point, a series of valves open, and the gas pump starts filling the cylinder. The cylinder rests on a sensitive scale which weighs the amount of gas being pumped in. Greene says that the PC-based controls permit this "gravimetric" filling system – a big improvement over tradi-



Once the empty cylinders are connected to the filling manifold, the automated filling process can begin.



The entire gas fill operation can be controlled using Beckhoff CP7002 – 15 inch touch-screen Control Panels.

The heart of the automated gas fill operation is the C6130 cabinet mounted Industrial PC.



tional cylinder filling methods that rely on temperature/pressure charts and operator skill.

“The gravimetric system saves a lot of labor and is ideal for quality control,” says Greene. “In a conventional plant, as you fill the bottles, their temperature (and pressure) rises due to the heat of recompression. The operator has to watch the temperature of the bottle, and then constantly go to a chart and equate that temperature with what the pressure (and, therefore, the volume of gas) would be at ambient temperature. You’re at the mercy of how fast the bottle is transferring heat, and it’s just not that accurate.”

“With the gravimetric system, Linweld is able to actually weigh the gas with a scale that the cylinder sits on. This weight is not affected by temperature and is much more precise than traditional manual systems,” he says. “This accuracy is very important in making a consistent product, batch after batch.”

#### Advantages of a PC-based system

There are many advantages in using an Industrial PC for process control. Not only does it allow better control of complex industrial processes, it provides a production data stream that is not possible with PLC systems. Of prime importance to Linweld is that data on each filled cylinder is stored in the PC and can be printed out for a complete record of the production run. “This production reporting leads to better quality control and better control of the bottom line,” says Greene. Another advantage is that the system reduces labor and operator errors; and it is easy to learn. With standard Windows based programming, even operations where there are multiple shifts or high operator turnover, training can be accomplished more easily than with proprietary control systems.

The Beckhoff Control Panel and the control cabinet PC C6130 make an ideal combination, representing a powerful platform for a variety of plant engineering applications. The CP7002 Control Panel has a CP-Link interface that allows it to be located up to 100 meters from the remote-mounted IPC C6130 – permitting maximum flexibility for the operator and plant production design.

The remote-mounted CP7002 Control Panels are an integral part of the Linweld process, according to Greene. Being able to locate the operator interface near to the filling process and distant from the PC, creates greater flexibility for the operator. Since the filling process requires the operator to mount the gas cylinders prior to filling, having the Control Panel nearby saves steps and time. Also, remote-mounting of the Control Panel permits the PC to be located in a more protected environment.

#### Other CTR applications at Linweld

While the Linweld’s major application is PC-based and is capable of complex operations, expansion and flexibility, other CTR gas-fill applications in the plant don’t require that level of automation. For the filling of medical gas bottles, the CTR-designed system features the Beckhoff Bus Terminal Controller BC9000 IEC 61131-3 PLC running TwinCAT PLC software with locally connected Bus Terminals. While the BC9000 can easily manage gas cylinder filling for the lower-volume medical gas application, it does not have the production reporting capability of the PC-based system.

The integration of a full range of Beckhoff Industrial PCs, Control Panels, I/O, and PLC controllers into CTR-designed gas fill production facilities has improved Linweld’s productivity, flexibility and product quality.