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# FF Journal

The magazine for today's metal fabricating & forming technologies

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## SURVIVAL MODE

WELDING & SPINNING ALUMINUM  
INTO A SPHERE OF SAFETY

### WATERJET CUTTING

Fabricated submersibles dive thousands of feet into the Atlantic Ocean

### BENDING/FOLDING

Reduced lead time helps manufacturer ramp up production faster



# Staging system

Automated press loading reduces die change time from two hours to 10 minutes for continuous aerospace parts production

“**Y**ou say you got a real solution,” the Beatles sang in their famous rock anthem, “Revolution.” A machinery builder and automation expert recently teamed up to craft a fix for a mutual customer in the aerospace supply chain.

Beckwood Corp. builds custom hydraulic presses, automation systems and the Triform line of precision forming equipment for a variety of industries. The company’s specialty is engineering the accuracy and repeatability aerospace suppliers covet. In describing the sophistication of machine designs for this challenging market segment, the company mantra reads: “It is rocket science.”

One metal fabricator that produces components for commercial and military aircraft, brought Beckwood their challenge. The client wanted a turnkey package consisting of two 1,400-ton hydraulic presses and two automated stamping die handling systems to load and unload presses more efficiently than the conventional forklift and manual labor-intensive system currently in use.

The presses and quick die change (QDC) workcells would form different parts at relatively low volumes, so the system required a more automated die handling system. In addition, the client needed a 42-in.-diameter deep draw sheet hydroforming press with staging table. Such a press, when built, would be the largest of its kind in the world.

## Large load

A critical part of the challenge involved the need for a QDC system with 15,000-lbs. of capacity to feed each of the two



The QDC must service the presses with table staging devices, allowing the next die to be prepped and ready to insert upon completion of the previous production run.

1,400-ton presses.

“We conducted a thorough review with all our local die cart suppliers and all passed on the bid, citing too many obstacles on that large a load,” recalls Beckwood’s lead electrical engineer, John Harte. “So—as we often do—we decided to design, engineer and build the system ourselves.”

Each press has a 30-ft.-sq. footprint and the QDC must service the presses with T-table staging devices, allowing the next die to be prepped and ready to insert upon completion of the previous run cycle.

Because of the degree of automation involved, Beckwood worked with the customer’s engineers to devise a workcell concept comprising twin four-post presses, each with a QDC system including a cart, rack and T-table with 15,000-lb. load capacity. Each press would be over 33 ft. tall and positioned in a 10-ft.-deep pit.

## Electronics integration

As Beckwood’s customer was a long-time user of Siemens motion control and human-machine interface components, it specified Siemens as a key vendor for the project. Harte connected with Derek Eastep, his account manager for Siemens, and the product list for the project began to take shape, specifying various drives, PLCs, displays and motion controllers. The latter was a critical component, as the motion controller was required to operate all press movements, as well as the motor starters, QDC integration, light curtains that protect the workcell and operators, plus area scanners that maintain the integrated safety condition monitoring on the entire cell.

The system logic and data logging



The twin 1,400-ton presses feature Beckwood’s four-post frame with solid chrome-plated posts that help to ensure precision ram guidance.

“Because the end user was a long-time customer, we were confident the system would be running in a short time.”

Derek Eastep, Siemens

setup was performed by the customer, which had considerable experience with Siemens controls, while the Beckwood team integrated the QDC and managed the project to completion.

The QDC operates in tandem with the two presses, using four 15-hp motors to drive the lead screws on this massive die-handling system. They are electrically geared through the onboard Siemens PLC to move the ram and shuttle. Additional motors and drives on the feed tables allow the next die to be positioned during press operation. When a press cycle is completed, the air bags on the feed tables lift the next die for positioning onto the QDC, then a shuttle inserts the die inside the press, with all motion controlled by the PLC.

These T-tables and the QDC were designed, engineered, built and tested by Beckwood at its Fenton, Missouri, factory prior to shipment and installation at the customer’s facility. Beckwood and Siemens personnel together commissioned the entire dual press line.

## Controlling functions

The PLC is a Siemens S7-1515. It integrates function control, safety and condition display in a single module with Profinet protocol for bus communication. Through the TIA Portal and Step 7 software provided by Siemens, the end user can customize the operation of the devices remotely, integrating multiple part files and related safety commands in one controller.

This “library” feature allows the end user, as operators run a variety of parts during a shift, to use a single software package to program jobs quickly and more efficiently. Likewise, the safety switches on the entire system are programmed using this secure and redundant safety backup



software through the TIA Portal.

All motor movements on the twin four-post presses are controlled with Siemens drive technology. Once fully ramped up, the Beckwood presses with the QDC systems are expected to reduce die setup and changeover from about two hours to 10 minutes.

“Because the end user was a longtime customer, we were fully confident that the system would be set up and running in a relatively short time, as all parties had good familiarity with our protocols,” Siemens account manager Eastep says.

Harte outlines the project planning features that fit together so well. “We used the Selector, Sizer and Starter engineering tools from Siemens to specify and then commission the drives, which saved us a substantial amount of time. It made our lives a lot easier.”

The twin 1,400-ton presses in the workcells feature Beckwood’s four-post frame with replaceable, graphite-impregnated bronze bushings and solid chrome-plated



posts to ensure precision ram guidance. Designed to form parts with challenging geometries in low-volume, high-mix production environments, the 42-in.-diameter Triform deep draw sheet hydroforming press is the largest press of its kind in the world.

Due to the versatility of a “built to order” business model and long experience serving so many industries, Beckwood can often recommend process improvements

that customers may not have known about or ever considered. The adoption of such ideas may potentially revolutionize a customer’s manufacturing operations for the better. **FFJ**

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## Pushing the Limits of Sheet Hydroforming

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- ✓ Rapid part development.
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