

Drive & Control profile

WWII Hydraulic Press Gets New Life



Billet load - beginning of cycle.

Universal Alloy Corporation (UAC), a business unit of Alu Menziken Aerospace Group of Switzerland and manufacturer of soft, hard and metal matrix composite aluminum alloys, recently purchased and upgraded the world's largest indirect extrusion press to expand its aerospace market offering. Built in the 1940s in Germany, the 122-foot extrusion press was originally used in World War II. UAC purchased the press from Spectrulite Consortium, Inc., in St. Louis, MO, becoming its fourth owner. The press, which

now extrudes 16,200 tons, was disassembled, shipped and reassembled at UAC's Canton, GA, facility where it began production in early 2005 after an extensive revamp effort by multiple vendors.

Hydraulic Overhaul

According to Paul Scaglione, UAC vice president of engineering, vendors were selected to redesign the massive extrusion press based on UAC concepts to convert the press from water to oil hydraulics and to add indirect extrusion capability. The Bosch Rexroth Hydraulics Systems and

Challenge

Redesign a massive World War II era indirect extrusion press to convert from water to oil hydraulics and add indirect extrusion capability.

Bosch Rexroth Solution

- A 17,000-gallon hydraulic system, featuring a reservoir, pilot system, motor pump groups and manifolds.
- AAVSO500HS variable displacement servo-controlled pumps.
- Proportional directional control valve to control fast advance velocity of the press.
- Logic valve technology for system fluid management.

Benefits

- No major leaks, no stuck valves and no hydraulic problems.
- Savings on transformers, switchgear and future energy costs
- Startup costs only about 30 percent of the service budget allocated to the project.



Press pumps.

Engineering group in Bethlehem, PA provided the hydraulics package for the press, as well as the direct and indirect shears and two stretchers. The package included five hydraulic systems, piping and field startup assistance.

Scaglione explained that the hydraulics conversion was important to modernize the press to meet customer requirements for the next 20 years. “There were unique challenges in the conversion,” said Scaglione. “We had to build the ‘Swiss army knife’ that could run direct extrusions, indirect extrusions and seamless hollows. We also had to be concerned with the large amount of hydraulic operation above and around the heated tooling at the front platen.”

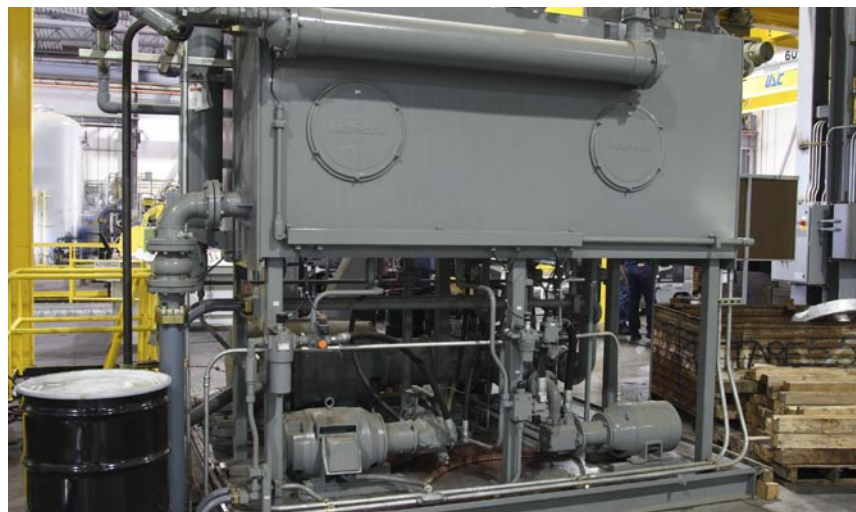
Originally, the 14,000-ton water-hydraulic horizontal three-stage extrusion press was used mainly

to extrude magnesium and aluminum aircraft components. After WWII, the press was shipped from Germany to the United States as part of the U.S. Air Force heavy press program. The press was acquired by Dow Chemical Corporation and reassembled in Madison, IL, where it was used to extrude magnesium alloys mainly for aircraft and missiles. Its third owner was Spectrulite

Consortium, Inc., based in St. Louis, MO, which used the press to produce aluminum and magnesium extrusions. In 2003, UAC purchased the press rights from Spectrulite with the goal of expanding its aerospace business and increasing its competitiveness in the North American aerospace extrusion markets. In addition to the new press, the UAC facility in Canton operates four extrusion presses ranging from 900 to 2,750 tons.

Bosch Rexroth learned of this project through a distributor, Hydraulic Controls, Inc. “Bosch Rexroth was able to solve problems rapidly while under construction and their support team and start-up help that came out of Pennsylvania was excellent,” said Scaglione.

Jim Lane and Otto Weber, systems engineers for Bosch Rexroth Hydraulics Systems and Engineering, worked closely with UAC to design multiple hydraulics systems for the massive press.



Glycol system - pumps and reservoir.

The package included a 17,000-gallon hydraulic system, featuring a reservoir, pilot system, motor pump groups and manifolds. The main pumps are Bosch Rexroth AAVSO500HS variable displacement servo-controlled pumps. The system also uses a Bosch Rexroth 4WRZE32 proportional directional control valve to control fast advance velocity of the press as well as a complete complement of the logic valve technology for system fluid management. Bosch Rexroth logic valve models include the LCT25 and LFT25, which are rated for operation at up to 14,500 psi. The valves control the stripping function of the press up to 8,000 psi.

According to Lane, billet and die handling on the press are aided by a 1,000-gallon water/glycol hydraulic system, which operates at 4,500 psi on the hot side of the press. Weber noted the press was also outfitted with a new piping layout, using a weldless piping system. Piping sizes used in the new layout include up to 20-inch low-pressure piping and 4.5-inch high-pressure piping. All piping and connections for the 8,000-psi circuit were designed and tested specifically for the press application.

Additional systems in the extrusion press overhaul include a 60-gallon hydraulic power unit and manifold to control the clamping and feed of the large run-out saw used to cut extrusions coming off the press. Also, an 850-gallon hydraulic system with reservoir, motor pump groups and manifolds were



1,500-ton stretcher headstock.

provided to drive the 1,500-ton stretcher used to further process the extrusions. A custom-designed prefill adapter was also added to allow mounting of the prefill valves in limited space and permit high-speed advance and return of the stretcher. Likewise, cylinders specially designed to fit in the existing stretcher frame were provided for the fast advance and return functions of the stretcher. Finally, rounding out the hydraulics package is a 1,200-gallon hydraulic system including reservoir, pilot system, motor pump groups and manifolds to drive the press's 350-ton stretcher.

From a cost standpoint, UAC elected to reuse the original prefill surge tanks and prefill valves. The company also wanted to operate the press approximately 18 months from the purchase order date, so the goals were set very high for Bosch Rexroth. To help the transition, UAC hired the maintenance manager from the Spectrulite Consortium in St. Louis. "He relocated with the press,

so he has the unique experience of seeing the before and the after," noted Scaglione. "In the first six months of operation there have been no major leaks, no stuck valves and no hydraulic problems of any sort. The most he's had to do is change a couple of o-rings. Bosch Rexroth exceeded all our expectations for the project."

Scaglione added, "I knew Bosch Rexroth had the best big hydraulic pumps in the world, and I liked their capability for effective horsepower limiting. This allowed us to save money on transformers, switchgear and future energy costs in the new plant. I also felt that their systems and engineering group had the best experience with large hydraulic packages, not just with presses but with stretchers as well, which was important because we had a 1,500-ton and a 350-ton stretcher in the job that needed systems."

UAC's California plant has 11 presses serving the West Coast. By adding the converted extrusion



Final product: Heavy press aerospace extrusions.

press in Georgia, UAC now provides greater service to East Coast aerospace markets. The addition of the press expands UAC's aluminum extrusion offering from aircraft fuselage components to wing components, including stringers, planks and panels for military and commercial applications. "Currently, the extrusion press can produce a 32-inch billet in the direct mode

and will operate billet to billet with maximum diameters up to 22 inches and up to 70 inches in length," detailed Lane.

All major aircraft manufacturers recognize UAC as a manufacturer of choice for aluminum extrusions. These manufacturers include the company's largest customer, Airbus, as well as Boeing, Cessna, Lockheed Martin and their

subcontractors. UAC operates a total of 15 presses from 170 to 4,800 tons with extrusions from 1/16 inch to 10 inches in circle size and maximum length of 42 feet. Its operations primarily produce hard alloy aircraft fuselage extrusions up to 40 feet in length and weighing up to five pounds-per-foot with circle sizes up to 11 inches. Wing extrusions slated for the new extrusion press are 105 feet in length and weigh up to 90 pounds-per-foot with circle sizes up to 40 inches.

"Our company is very cost sensitive," reflected UAC's Scaglione. "Prior to the heavy press expansion, we had no experience with Bosch Rexroth hydraulic systems. Rexroth got their foot in the door by being very competitive up front, and they were fair throughout the project. None of the change orders were out of line, and we had such a great startup that we used only about 30 percent of the service budget allocated to the project. Since this part was time and materials, this meant further savings for UAC."

Rexroth
Bosch Group