

LIGHT METAL AGE

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Elixir Drives for the Green with AlumiCore Framed Golf Cart

By Joseph C. Benedyk, Contributing Editor

Since it began operations in 1986 with a newly purchased 1,800-ton Fielding & Platt press, the Georgia Extrusion Division of Elixir Industries in Douglas, Georgia has provided custom extrusions for a variety of customers and expanded not only in extrusion capability but also in a significant fabrication and assembly operation. In 1996, the company added another 1,800-ton Fielding & Platt press, and it recently installed and is now in the process of starting up a new 2,500-ton R.L. Best press in a new building adjacent to its original extrusion plant.

The Georgia Extrusion Division with 150 employees is one of two extrusion divisions of Elixir Industries, which is based in Mission Viejo, California and is the nation's largest independent supplier to the factory-built housing and recreation vehicle industries. Elixir's other extrusion division is located in Mishawaka, Indiana. These two extrusion divisions supply the construction, transportation, machinery, electrical, consumer durables, and recreational markets with linear and fabricated components made of 6000-series extruded alloys.

Phil Smith, division manager at the Georgia Extrusion Division, estimates their alloy mix at 60% - 6063, 30% - 6061, and 10% - 6463 or 6005. He points out that the Elixir extrusion divisions take pride in quick lead times on tooling (Southeastern Extrusion & Tool supplies his plant) and rapid turnover on production that includes not just cut-to-length linear extrusions but a wide range of fabrication services and powder coatings.

Georgia Extrusion Division Goes Green

The green logo of Elixir's Georgia Extrusion Division seems to represent its commitment to its biggest customer—Club Car of Augusta, Georgia—in supplying fully fabricated frames for Club Car's new golf cart called the Precedent (Figure 1) and some of Club Car's other vehicles. The "green" theme that the Georgia Extrusion Division has chosen extends beyond the game of golf, as Club Car's vehicles are proven energy misers used throughout the world for short hauls and trips, thus providing a green alternative to heavier vehicles. Although Club Car is well known as a manufacturer of golf carts, its utility vehicles can be found delivering the mail in Sweden, ice cream treats at a campground in South Carolina, and weapons and ammunition at FBI training facilities in Georgia and Texas.

Precedent Golf Cart Series

In 1994, to meet the special demands of its customers, Ingersoll-Rand's Club Car business began to modify up to 100 of its utility vehicles to move materials and personnel. The business unit also has produced specially-equipped transportation vehicles for major airports.

As part of the vehicle transformation program, in 1999 Club Car decided to design a replacement for its popular DS model golf cart. Starting with a lighter weight extruded aluminum platform frame and a completely new chassis, the Precedent golf cart was born. Club Car teamed with Engineering Solid Solutions (Detroit, Michigan) in designing the concept cart that would eventually become the Precedent, a state-of-the-art golf cart that features a brand new aluminum frame called AlumiCore™. Club Car prepared an assembly line for the Precedent in their former warehouse, taking up all of 100,000 square feet of space. The Precedent golf cart series is available from

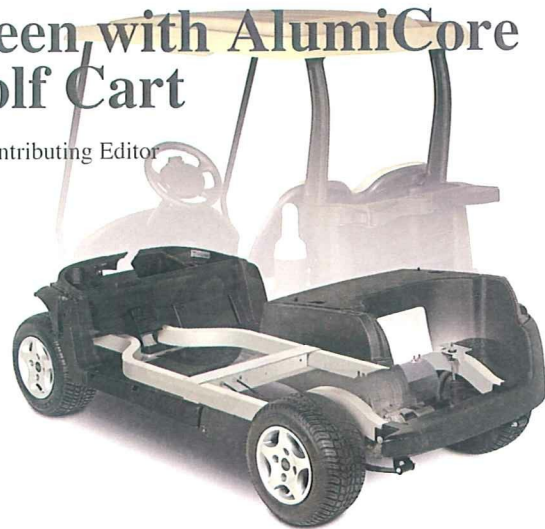


Figure 1. Club Car's Precedent golf cart features an exclusive aluminum frame manufactured by Elixir Industries.

Club Car in electric or gas powered models.

The DS model golf cart, which is also sold by Club Car today, has a frame designed from 6061-T6 I-beam extrusions, altogether weighing 45 pounds. The AlumiCore frame, designed with side rails made from bent 6061-T6 rectangular hollow extrusions joined by a cross member made from a fabricated 6061-T6 I-beam only weighs 33 pounds, yet is stiffer in bending and torsion than the DS frame.

Club Car Contract

Four years ago, Elixir's Georgia Extrusion Division "drove for the green" and won a 10-year aluminum frame contract for the Precedent golf cart against competition from other U.S. extruders. Among the Club Car criteria were ISO certification, which Elixir already had, proximity to the Club Car plant in Augusta, Georgia, participation in Club Car's Advanced Production Quality Planning (APQP) program, and just-in-time (JIT) delivery. After winning the contract, Elixir began the difficult task of tooling up to meet Club Car's production requirements.

Phil Smith was then Elixir's manufacturing engineer, responsible for implementing all of the fabrication and welding operations at Douglas to build the Precedent frames. Buzz Watkins, Elixir's quality manager, worked with Phil Smith and Club Car engineers to assure that quality requirements were met. Currently, some 500 Precedent frames are fabricated, welded, and shipped to Augusta daily from Douglas, although this can double in peak season (Figure 2).



Figure 2. (L-R) Phil Smith, Elixir division manager and Tony Young, Club Car supervisor displaying an assembled AlumiCore frame.

Fabricating the AlumiCore Frame

The AlumiCore platform frame for the Precedent requires significant fabrication, starting with the bending of side rails, welding of brackets to the side rails, and a significant amount of machining of the side rails and punching and drilling of the cross members after both side rails and cross members are aged to full hardness. The side rails have a left and right configuration that must be separately packed and clearly identified. Cross members are shipped separately for bolted assembly to the side rails at Club Car.

All the AlumiCore frame components are fabricated at Douglas, where five out-of-plane bends are made on each side rail (Figure 3) to which extruded 6061 brackets are welded. Elixir installed four Criterion CNC benders to meet the required manufacturing pace (Figure 4).

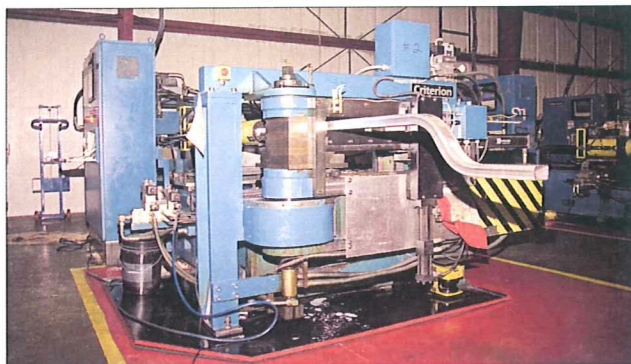


Figure 3. One of the five successive CNC bending operations performed on the AlumiCore side rails at Elixir.



Figure 4. Load of side rails ready for bending operations.

After the side rails are bent, various brackets fabricated from aluminum extrusions are then positioned separately on the right and left side rails for robotic MIG welding with 4043 weld wire (Figure 5 a, b, c, and d). The number of welds on the AlumiCore Precedent frames has been reduced to 38 from 139 on the DS frames.

After welding, the AlumiCore rails are heat treated in an age oven to a -T6 temper (Figure 6), after which they are drilled on special equipment to make holes for the bumper, front suspension, and cross member as well as holes for primary location. About 300 pairs of rails are produced this way per shift. The extruded 6061-T6 I-beam AlumiCore cross member is precision trimmed, punched, and drilled to assure secure bolted attachment to the rails at Club Car. The Quality Control (QC)

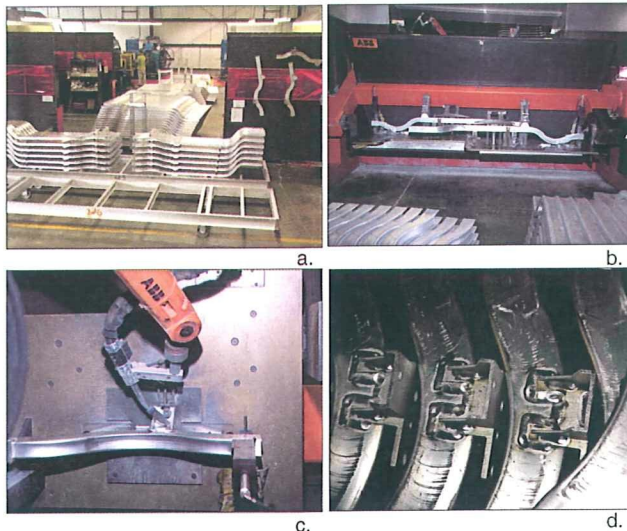


Figure 5. Robotic MIG welding of the AlumiCore side rails at Douglas: a) staging of the bent side rails before bending, b) fixing the attachments to the side rails for robotic MIG welding, c) close up view of robotic MIG welding head before welding, d) finished MIG welded brackets on side rails.

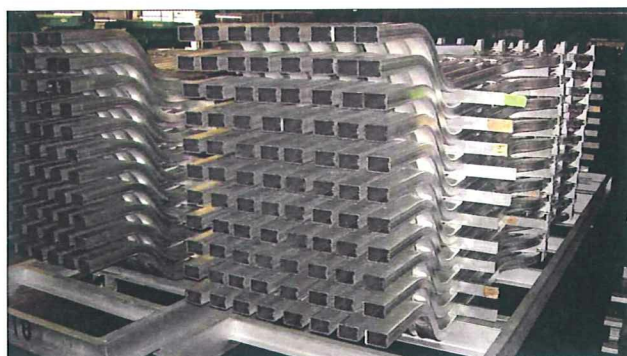


Figure 6. Load of AlumiCore rails ready for the age oven.

department at Douglas continuously checks fabricated dimensions on a coordinate measuring machine (CMM) optical comparator to assure tolerances are met. The QC department also has a Werth CNC optical scanner to quickly read and store digital data on extrusion cross sectional dimensions.

The finished rails are packed on separate racks that distinguish left and right rails. These together with the packaged fabricated cross members are loaded onto a Bowman Transport semi-trailer under a JIT contract with Club Car that ships the product to the Club Car assembly plant in Augusta, only 180 miles away from Douglas. Phil Smith estimates that Douglas will ship about 85,000 AlumiCore units in 2007, up from 72,000 in 2006, 65,000 in 2005, and 60,000 in 2004.

Elixir Receives Inman Award

This year, Club Car Sourcing honored Elixir Industries by presenting it with its Inman Award, an annual award that Club Car presents to a top supplier. Dwight Knowles, vice president of operations for Elixir Industries, accepted this prestigious award. Dwight previously served as division manager of the Georgia Extrusion Division and was the driving force behind securing the Club Car Precedent contract. Every year Club Car Sourcing presents the Inman Award to supply chain executives that have consistently and over a period of years, demonstrated attributes of superior team leadership, a near- and long-term bias for action, continuous improvement, and a keen desire for attention to detail in service to Club

Car as a partner in progress over the years. The Inman Award was initiated in 1996 in honor of the long time Club Car ceo, George H. Inman, who retired in 1995. Inman is considered by many in the golf industry as the "godfather" of the golf cart.

A Value-Added Future

Well past the learning curve on fabricating the AlumiCore frame, the Georgia Extrusion Division plans to expand its value-added business. The AlumiCore contract has become a watershed for the Georgia Extrusion Division, prompting the construction of a new building that adjoins the original plant which houses the newly installed 2,500-ton R.L. Best extrusion press equipped with a new R.L. Best handling system (Figure 7). Additional new equipment included a Granco Clark billet heater (Figure 8) and a Belco vertical powder paint line to supplement the capacity of the original powder paint line and to meet the demand from Elixir's door and lighting business.



Figure 7. New R.L. Best stretcher.



Figure 8. New Granco Clark billet heater.

The two 1,800-ton presses in the original Douglas plant currently extrude 7-inch billets, while the new press will handle 8-inch billets and thereby expand productivity to meet the growing business of the division. Features of the new R.L. Best press include a forged steel main cylinder, flat-type guide ways for main ram and container housing, one piece container housing, butt shear with butt knock-off device, non-welded and preformed hydraulic seamless steel piping, independent cooling and filtration system, an Allen-Bradley SoftLogix Control System, and slow die fill circuit for delicate die breakthrough (Figure 9). The handling system includes a stationary lead-out table, positional hot saw, MK III puller, water wall quench box, under-table fans, and 50-ton profile stretcher.



Figure 9. The R.L. Best press will handle 8" billets.

The new building has plenty of space to house the fabrication line for the Club Car frames (Figure 10) to be moved from the present site at the adjoining plant. Besides the AlumiCore frame, the new fabrication facility will handle the Club Car XRT frame program, which is just gaining momentum. The XRT line of Club Car's rough terrain vehicles includes the XRT 1550, boasting an exclusive frame construction (Figure 11) that, like the AlumiCore frame, is made of fabricated rectangular 6061-T6 tubes but bent to a different configuration.



Figure 10. Empty space in Elixir's new plant facility to be assigned to future fabrication.



Figure 11. Package of fabricated Club Car XRT 1550 frame members ready for shipment.