

Nappanee Window—Wide Open to Expansion

Turnkey Solution for New Aluminum Extrusion Facility

By Joseph C. Benedyk, Contributing Editor

Nestled in the quiet countryside of Goshen, Indiana, the new aluminum extrusion facility (plant #4) of Nappanee Window LLC is in business, with a complete turnkey operation, including a new 2,200 U.S. ton (8") press and auxiliary equipment, all supplied and assembled at Goshen by Tecalex—the first Tecalex turnkey aluminum extrusion operation in the U.S. (Figure 1). Founded by Merlin Yoder with headquarters in Nappanee, Indiana and about 200 employees working throughout its five plants, the privately owned Nappanee Window company has an enviable growth record of over 400% compounded within the last three years. According to its ceo and owner Steve Brenneman, its estimated revenue for 2007 should be \$45-50 million, up from \$32 million in 2006. This is a big increase from when Steve bought Nappanee Window in April 2000, when it had only 14 employees and an annual revenue of about \$2 million.

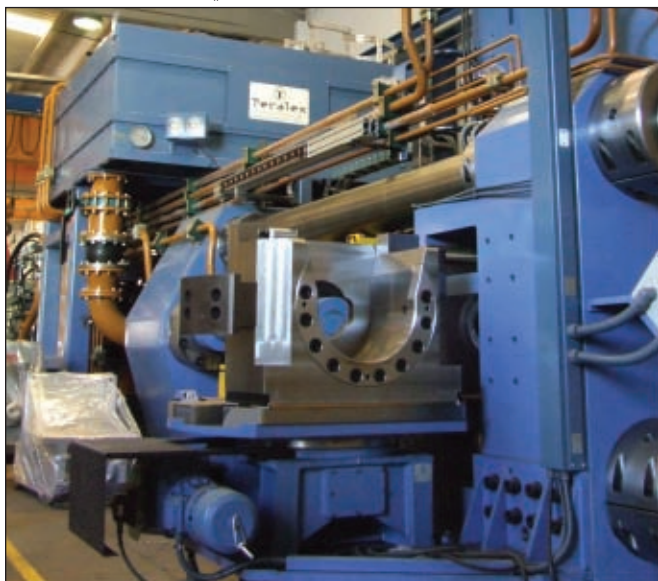


Figure 1. New 2,200 ton super-compact Tecalex press at newly constructed Nappanee Window plant #4 in Goshen, Indiana.

Basically, 95% of Nappanee Window's business involves the manufacture of aluminum doors (Figure 2) and ramps for high-end motor homes, recreational vehicles (RVs), and components for various types of trailers. Only about 5% of its revenue comes from windows.

Most recently, as was described in the June issue of *Light Metal Age* ("Aluminum Extruded Helical Turbine Advances Hydropower" by Nancy E. Klein, pp. 34-36), Nappanee Window acquired part interest in Lucid Energy Technologies LLC for the manufacture of the Gorlov Helical Turbine, a hydroturbine that features specially



Figure 2. Motorized RV featuring Nappanee Window entrance doors (left) and towable RV featuring Nappanee Window entrance, bed, and bunk doors (right).

designed extruded aluminum blades twisted into a compact helical configuration that efficiently generates electric power when immersed in flowing waters.

In September 2005, Nappanee Window moved into their new building (plant #1) comprising 90,000 square feet in Nappanee, Indiana. This building is the Nappanee Window RV Division, devoted to the manufacture of such RV components as entrance doors, compartment doors, cargo doors, bed doors, ramps, and specialty products, all designed to be functional, stronger, lighter, and easy to install thanks to innovative application of aluminum extrusions and craftsmanship for which Nappanee Window is known. In addition to producing customized and higher-end products, Nappanee Window excels in meeting high volume demands with on-time deliveries. Their established priorities of uncompromised service and workmanship are incomparable.

Plant #1 specializes in fabrication and is equipped with Elamatic extrusion saws, seven CNC mandrel benders, TIG/MIG welding equipment, and a profile router. It partners with an outside paint shop, where the mix is 50:50 relative to wet and powder paint, although the trend is to all powder.

Brenneman, a graduate in business administration from Eastern Mennonite University in Harrisonburg, Virginia, is proud of his skilled and dedicated workforce consisting of 60% Amish people (Nappanee, Indiana is basically an Amish community). He noted proudly that there has been almost no employee turnover within the company.

Nappanee Window Decides to Become an Extruder

Since it began manufacturing RV components, Nappanee Window has relied on distributors for supplying aluminum extrusions, which are used as framing and structural components in most of their products. As the RV market grew and Nappanee Window continued to develop new products requiring specialty extrusions, management began looking into the possibility of becoming an independent extruder. Brenneman mentioned that much of his interest in becoming an independent extruder stemmed from reading *Light Metal Age*. He decided to go with a Tecalex turnkey plant after visiting the SerVaas Factories International booth at the ALUMINUM USA/National Manufacturing Week Conference and Exhibition in Chicago in 2005. SerVaas is now the North American representative for Tecalex equipment. At the booth Brenneman met Tecalex gm Josep Barcelo, and was impressed by the Tecalex experience in providing complete solutions to aluminum extrusion projects worldwide.

After visiting several Tecalex installations in Europe and reviewing the feasibility studies for a complete turnkey operation, Nappanee Window signed a contract in May 2006. Initial deliveries were received in November of 2006, during which time construction of plant #4 was initiated (Figure 3). Reminiscent of an Amish barn-raising, plant #4 (87,500 square feet) was completed in January 2007. The commissioning of the Tecalex turnkey operation began immediately after plant #4 was completed, and the facilities are now fully operational. "It was quite a challenge from depending on distributor supplied extrusions to being an independent extruder," says Brenneman.



Figure 3. Installation of new equipment at Nappanee Window plant #4.

He explains the decision to go with Tecalex: “Not having done this before, we wanted to deal with a company that could supply all pieces of the extrusion equipment, a turnkey operation if you will. We also wanted a company that could lead us through the process and yet be flexible with us. As a small company, we needed some special help in getting the project done. Tecalex helped us through that process immensely” (Figure 4).



Figure 4. (L-R) Evan Bontrager, president of Nappanee Window, Steve Brenneman, CEO of Nappanee Window, and Joaquim Palau, technical manager of Tecalex.

Now, with the plant operating experience behind them, Nappanee Window includes being an independent extruder in its business model, making mostly 6000-series extrusions for its RV and cargo components built in its own plants and selling custom extrusions to outside customers. Brenneman is looking forward to satisfying the aluminum extrusion market in the immediate vicinity of plant #4. He notes, “Within a ten mile radius of this plant, there is a huge extrusion market.

Tecalex Delivers Its First Turnkey Operation in the U.S.

Based in Girona, Spain, Tecalex Aluminum Extrusion Technology SL grew from humble beginnings to becoming a leading turnkey manufacturer of aluminum extrusion equipment, with projects in Spain, Turkey, Poland, Russia, Argentina, and Algeria. Tecalex is renowned worldwide for its super-compact press design which minimizes both idle time and energy consumption while occupying a reduced footprint. Presently, Tecalex also offers complete turnkey solutions tailored to individual customers’ requirements. The comprehensive service includes feasibility studies as part of the up-front business planning process through design, manufacture, installation, and start-up, and then concludes with a variety of service and support activities aimed at maintaining the competitive advantage of their customers.

The complete Tecalex turnkey installation at Nappanee Window is their first in the U.S. The operation includes

the following automated equipment: gas die heating system, press feeding system (billet loader, billet furnace, and hot shear), super-compact front loading extrusion press with tandem hydraulic cylinders, air quench system, puller and flying saw, runout table, stretcher, finishing saw, stacker, and aging oven.

During the installation and commissioning phases of the Nappanee Window project, a total of 11 technical personnel from Tecalex worked closely with personnel from Nappanee Window. As this was a new venture for Nappanee Window, two consultants assisted in training and transferring technical skill in die correction and extrusion production optimization to Nappanee Window personnel. Incidentally, Youngstown Tool & Die supplies dies and tooling for all Nappanee Window extrusion operations.

Presently, the plant purchases 8” billet logs of 6063 and 6005 aluminum alloys. As business expands, the alloy mix will change. In fact, some of the components of the hydroturbine manufactured by their partly owned Lucid Energy Technologies division utilize 6061 aluminum alloy extrusions.

Tecalex Billet Heating and Press Feeding System: Normally, the billet heating furnace in extrusion plants consumes the greatest amount of natural gas aside from a melting furnace and can be a bottleneck in the operation. The Tecalex “jet”-type billet furnace, like the one installed at Nappanee Window’s plant #4, combines flexible operation with low fuel consumption. Recirculation fans blow hot gases from the combustion zone over the cold log at the entrance (preheating zone), significantly improving efficiency, and then the log proceeds through three controlled heating zones to achieve uniform and optimum extrusion microstructure in the log before it is sheared into billet and fed into the press. The billet furnace at plant #4 has a capacity of 2,500 kg/h (~5,500 lbs/h).

The Tecalex billet feeder automatically loads the hot sheared billets into the press with a telescopic system that allows extrusion of different lengths of billet and two-piece billets, thus reducing scrap rates at the billet feeding station.

Tecalex 2,200 U.S. Ton Super-Compact Press: The new Tecalex press (Figure 5) that was installed and is now in operation at plant #4 features critical components made of high quality forged steel, reduced cylinder movement, minimum idle time, and increased structural rigidity, all of which yield higher productivity and improved product quality. As requested, a liquid nitrogen die cooling system was installed prior to delivery. The Tecalex press design is unique in its tandem hydraulic cylinder and compact front-loading system. The tandem cylinder design



Figure 5. Billet loading on the Tecalex 2,200 U.S. ton super-compact press in operation at plant #4.

consists of two cylinders with different diameters on one axis, thus allowing for reduced dead cycle time, during which only the small cylinder acts, while both cylinders act during extrusion.

Compared with conventional back-loading of billet, the Tecalex tandem hydraulic cylinder and front-loading press design allows:

- Symmetrical billet upsetting to minimize entrapped air and provide for uniform metal flow in extrusion
- Stroke length reduced by 50% (Figure 6)
- Less column length and structural stresses on press components, including significantly reduced bending stresses on the front plate
- Optimized dead cycle time
- Less energy consumption and oil volume in cylinders

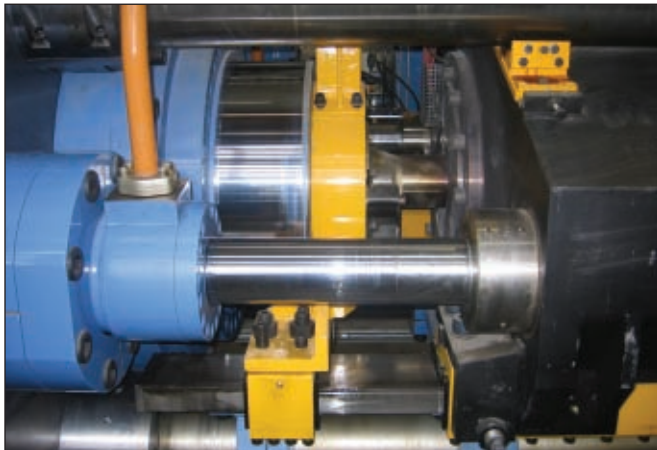


Figure 6. Tecalex super-compact press during the extrusion stroke, with the ram most of the way in, i.e., toward the end of the stroke.

Quench Table: The Tecalex quench table utilizes water spray or air for cooling extrusions with controlled nozzle flow to optimize cooling rates so as to achieve maximum age hardening properties without shape distortion.

Double Puller with Flying Saw: The Tecalex double puller features a precise guiding and positioning system utilizing infrared communication between pullers (Figure 7). Puller forces range up to 375 kg (827 lbs). The flying saw precisely cuts the extrusions in synchronization with the position of the pullers.

Semiautomatic Stretcher: The 70 U.S. ton Tecalex stretcher operates semiautomatically by laser and infrared communication between the heads, requiring no external interface and minimal manual control.

Finishing Saw and Automatic Profile Stacker: The Tecalex finishing saw includes a vacuum cyclone for effective chip removal and produces low noise levels while operating at high cutting speeds. In finished lengths, the extrusions at plant #4 are loaded in layers into skips with the Tecalex automatic profile stacker that utilizes a skip handling crane to prevent damaging the profiles.

Aging Oven: The high speed longitudinal air flow system in the Tecalex aging oven improves heat transfer and



Figure 7. Tecalex puller in operation at plant #4.

provides for homogeneous temperature distribution. The oven can handle profile lengths of 7 m (23 ft) and is equipped with variable burner control that quickly and precisely follows the temperature setting. The guillotine type doors on the oven are fitted to reduce floor space and improve layout and material flow. Aging conditions for each load are monitored and recorded electronically.

SCADA Production System: Tecalex has installed a modern production system (SCADA) in plant #4 (Figure 8) to receive extrusion orders and communicate real time production data to press operators. At the same time, SCADA easily connects to business management systems of customers.



Figure 8. SCADA production system at plant #4.

Restructuring of Nappanee Window into Terra Group

In our interview with Steve Brenneman (Figure 9), he shared with us the corporate plan for restructuring the business, which was prompted by the rapid growth of Nappanee Window away from window manufacture, especially now with the addition of their own extrusion operation and the Lucid Energy Technologies joint venture. The new enterprise will be called Terra Group LLC and will consist of four divisions:



Figure 9. Steve Brenneman beside a stack of extrusions produced on the new Tecalex press, handling equipment, and age oven at plant #4, which supplies extrusions for all four Nappanee divisions.

1. Nappanee RV Components (plant #1 in Nappanee, Indiana, #3 in Riverside, California, and plant #5 in Caldwell, Idaho)
2. Nappanee Cargo Components (plant #2 in Nappanee, Indiana)
3. Lucid Energy Technologies LLC in shared ownership with GCK Technology (plant #4 in Goshen, Indiana)
4. The Mill Extruded Products (also at plant #4 in Goshen, Indiana)

These four divisions, all dependent in one way or another on aluminum extrusions to be supplied from plant #4, will establish the future of Terra Group. With the skill and acumen shown in building the substantial business base of Nappanee Window in a few years' time, the future of Terra Group looks bright indeed.