

Tube Lasers, Teamwork and the Reshoring of Manufacturing Jobs

a case study



Steve Conrad, Manufacturing Engineer of Assembled Products Corporation (APC) of Rogers, Arkansas faced a problem — and not a trivial one. The tubular parts APC was sourcing from its supplier in China met cost objectives, but were failing to meet quality standards. Reject rates reached as high as 20% and part variability created headaches in final assembly. APC was still putting out a quality product, but it was getting increasingly expensive to do so. Each time Steve thought he had things worked out with the China supplier, the quality improvements proved to be temporary.

Background: You may not know Assembled Products Corporation (www.assembledproducts.com), but you surely know its flagship product, the Mart Cart. It's the motorized electric shopping cart that those who struggle to walk use to navigate the aisles of many large grocery and 'big box' retail stores. Bill Sage, a serial inventor and founder of APC came up with the concept of Mart Cart in the early 1980s after observing how difficult grocery shopping was for his elderly grandmother. APC has come to dominate the motorized shopping cart market, but still faces tough competition, so product cost and quality are a constant focus.

Steel tubing is used for the Mart Cart chassis, seat and basket supports, a rear bumper, and the 'gooseneck'

steering column. When assembled into a 'frame', these parts provide structural strength while keeping the cart lightweight and affordable. The lengths, bends and angles of the various tubes must be very precise and domestic fabrication shops had supplied APC with high quality assembled frames for years. But when these suppliers encountered financial trouble, APC turned elsewhere for supply of the tubular frames.

THE PROMISE OF CHINA

Like many American OEMs, APC turned to China. With an abundance of tubular steel, tube fabrication equipment and cheap labor, China was a natural choice. *"The savings going to China were dramatic,"* recalls APC Purchasing Manager, Don McKenzie. *"We found a good, reputable company. They produced acceptable samples for us and would have no problem meeting our quantity needs. Sure, the 15 week lead time was long, but we could easily justify holding some buffer inventory with the cost savings we were getting."*

Unfortunately, over time the cost savings evaporated amidst mounting quality problems. McKenzie explains, *"We started seeing bends where the tube was crushed. Tubes for the left and right side seat supports need to be closely matched 'mirror images'. Instead, they were like*

continued ...

Steve Conrad (left) and Don McKenzie, plus an assembled Mart Cart for which Central Tube and Bar supplies a fully finished frame.

Mart Cart is the only motorized shopping cart to be certified by the Underwriters Laboratories (UL).



mart¹ car[®]

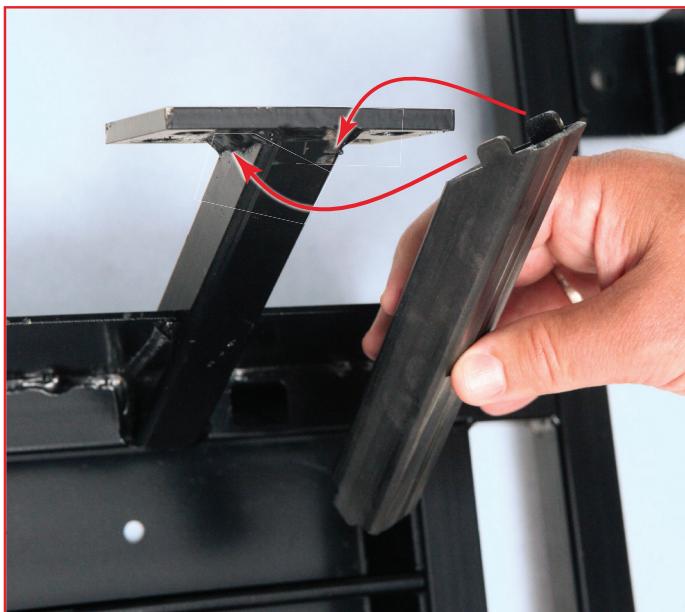


snowflakes – each one different. We had to sort through and inspect each one by hand to pair up tubes that were close enough to use together. There were problems with welds. Reject rates and lost productivity were eating up the cost savings."

CTB AND TUBE LASERS TO THE RESCUE

Tasked with getting the quality issues under control, Steve Conrad was contemplating different approaches when, on a warm October day in 2008, a visitor asked if he could speak with Steve for a few minutes. That visitor was Dustin Ward, President of **Central Tube and Bar** (CTB), a growing steel tube supplier and processor located in Conway, Arkansas. Conrad remembers, "*Dustin came into my office, explained a little about what his company does, then opened his laptop and showed me videos of a tube laser making several cuts and holes on different sizes of steel tube. It was super accurate ... and fast! I was blown away and realized that this technology could solve our quality problems.*"

Steve went to work redesigning a number of the tubular components, adding cutouts and tabs that, if made with the accuracy of a tube laser, could be aligned for consistent fit up. He sent CTB new drawings of the 'gooseneck' tubes. CTB produced prototypes on their Adige LT712D Tube Laser and Adige E-Turn CNC Tube Bender. When they presented the prototypes to Conrad, he was elated: "*They matched the drawings perfectly. We tested the fit up and it was dead on and repeatable. In fact, we figured you would no longer need a welding fixture to hold the handlebars to the gooseneck. They mated so well, you could just snap them together and start welding.*"



Laser tube cutting offers the flexibility to produce tabs (highlighted above) and matching slots in frame parts that are so precise, the pieces snap together for perfect positioning for welding. This speeds up frame assembly.

CTB's Dynamic Duo of Tube Processing

The tubes for the Mart Cart frame are processed on advanced technology machines from BLM.

The multi-axis 2500 watt Adige LT712D Tube Laser cuts profiles up to 6" with wall thickness up to 3/8". It's fast and precise, doing these tasks formerly done on separate machines: *sawing, punching, drilling, notching, deburring.*

After the LT712D, tubes go to the all-electric Adige E-Turn CNC Tube Bender. This state-of-the-art bender makes precision right and left bends of round and rectangular tubes – flexibility that creates new possibilities for product designers. It even has a vision system that 'sees' a reference point scribed by the LT712D Laser, so it knows exactly where to grip the tube and initiate the bend.

Eric Chambers, General Manager of CTB's Tulsa, Oklahoma Division was, at that time, the Technical Sales lead in charge of the APC account: "*After Steve tested the prototypes, Don McKenzie asked us to quote several of the parts and the entire assembled frame. I know we were higher on price than their China supplier, but we offered two week delivery and they had seen our quality, so they gave us a first order of 100 frame assemblies ... then 600 ... then 1200. Over the course of that trial, the reject rate on product we provided was less than 1%.*"

Today, CTB supplies all the tubular frame assemblies for the Mart Cart. "*Yea, I know the term 'partner' is overused nowadays, but we truly see Central as a partner,*" says McKenzie. "*They care, they're responsive, and they look for opportunities to create savings without being asked.*"

ADDING VALUE WITHOUT BEING ASKED

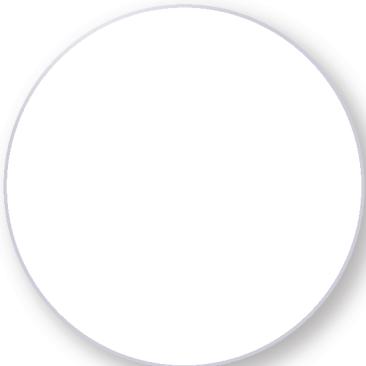
One such opportunity was the rear bumper of the Mart Cart. This 3/4" round tube was bent into a wrap-around rail, then welded to the chassis tube. If the bumper got bent or crushed in service, a field repair was costly. "*We found a better way,*" recalls Chambers. "*We laser cut round holes in the chassis tube and notches in the bumper tube, then made a bracket to weld onto the bumper tube at the notch locations. This bracket is used to bolt the bumper onto the chassis. No more welding. It saves time in assembly and makes a field repair very simple. The APC repair tech used to grind off the welds to remove a damaged bumper and weld on a new one. Now he just loosens four bolts and changes out the bumpers.*"



Steve Conrad observes, "Central Tube is now integral to our design process. I use them on new projects that are not even related to Mart Cart because they are excellent problem solvers. They help value engineer a design by figuring out features they can add - using their high technology machines – that will save us time in final assembly.

And the quality cannot be beat. In fact, Mart Cart was exhaustively tested by the Underwriters Laboratories recently. I am proud to say that it will be the first motorized shopping cart to carry the UL seal."

Has Central Tube and Bar met APC's cost goals? "Absolutely!" McKenzie claims. "The delivered price of the Chinese frame is cheaper on paper, but where it counts – in quality and on the assembly floor, the CTB frame is a much better value. There are plenty of companies out there with tube lasers, and we have checked some out, but no one can match the value we get from CTB. We are glad to have them part of our team, and proud we were able to bring this manufacturing work back to the States and especially to our home state of Arkansas."



The fully assembled Mart Cart frame supplied to APC by Central Tube and Bar. In addition to tube processing, welding and powder coating services are provided.

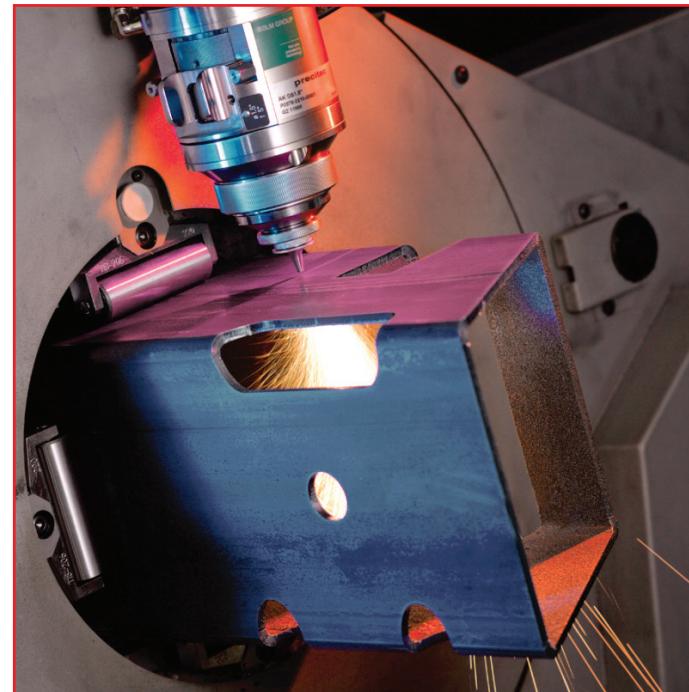
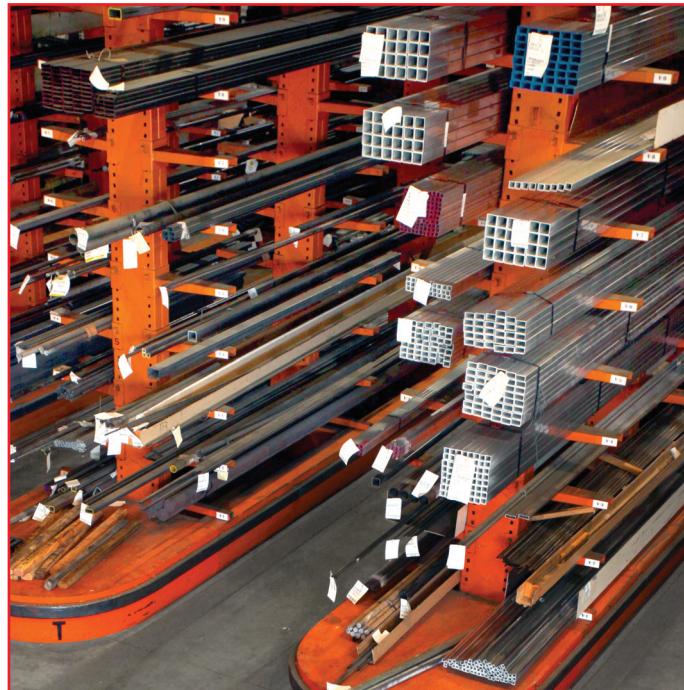


www.centraltubeandbar.com

Central Tube and Bar was founded in 1997 in Conway, Arkansas. We started with one saw and one customer. Today, we serve customers in eight states from Conway and a second facility in Tulsa, Oklahoma. Both are ISO 9001:2008 Quality Certified.

We offer a full range of high quality, prime tube and bar, including round, rectangular and square tube. We stock the following products in several grades:

- *Carbon ERW Tubing*
- *Carbon & Alloy Seamless Tubing*
- *Carbon & Alloy Bar Cold Finish*
- *Carbon & Alloy Bar Hot Rolled*
- *Aluminum Tubing, Bar/Rod*
- *Stainless Tubing and Bar*



What truly sets us apart from other steel suppliers is our processing capability, especially our three state-of-the-art tube lasers, capable of processing up to 10" OD tube. Our other processing capabilities include:

- *CNC Tube and Bar Bending*
- *CNC Bandsaw Cutting & Mitering*
- *High Speed Tube Shear Cutting*
- *Brush & Vibratory Deburring*
- *CNC Drilling and Tapping*
- *End Forming*

We also perform reverse engineering, prototyping and assembly services and have an exceptional capability to value engineer products made from fabricated tube. Please call either CBT location to discuss your project.

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