

4-STAR TRAILERS - A WOLF IN SHEEP'S CLOTHING?

Butch Patchell, Director of Research & Development, 4-Star Trailers, Inc.

Over the past few months I've been reading various internet forums which include discussions about horse trailers. One that I really like is www.horsetrailerworld.com. Most of

The entire exterior of those trailers were rife with scars and distortions caused by the intense heat associated with welding. (See Fig. 1) The side walls were lined with corrugated slats that displayed the torture of MIG welds in the form of heat warps and burn throughs. The aluminum panels above the slats were covered in heat tracks where they were welded to the side posts.

revolution in aluminum trailer design. Virtually every manufacturer is now using some form of this design.

We eliminated heat tracks in the slats and now our attention was directed toward the bare aluminum side skin panels. The welded skins were riddled with burn throughs and heat distortion which continued to be a major source of complaints.



Fig. 1

the time, whenever I've seen our name mentioned, it is to praise our products. Recently however, I've been seeing posts that imply that we've cheapened or lightened our trailers. Several such posts began with, "I read somewhere.", or "Someone told me...".

In 1992 when I started working in the Engineering department at 4-Star Trailers, I took my first walk through a 4-Star Trailer. I recall thinking, "This is the most over-built trailer I've ever seen!" I had worked at 2 other trailer manufacturers before coming to 4-Star, so it wasn't like I'd never seen a trailer. But these things! My god! The top rails were bigger than anything I'd seen on semi trailers. The bottom rail comes directly from designs made for semi trailers with G.V.W.R.s of 60,000lbs. The side posts are tubes! Not c-channels or hat posts. This is one awesome trailer!

They were actually pretty ugly to look at. (My opinion)

Apparently, I wasn't the only person who thought that weld scars on a trailer's exterior weren't very attractive because we had a pile of correspondence from dealers and trailer owners asking us to do something about the 'unsightly' scars. We did; We developed the patented Concept II Slat to replace the corrugated slats that had been used since the development of aluminum trailers in the 70's. Unlike corrugated slats whose single-wall design did nothing to conceal weld marks and heat distortion, the Concept II completely eliminated all visible weld marks on the outside of the trailer. In addition, the interlocking, double wall design that makes the new slat water resistant also strengthened the trailer sides. The Concept II slat started a

We stopped welding aluminum panels above the slat stack and began using a combination of rivets and 3M VHB® tape to install the panels. No more weld scars, but the panels themselves were too perfect. Unlike the welded panels which were expected to be scratched and burned from welding and handling, the riveted panels were so smooth and shiny that even the tiniest imperfection stood out like a sore thumb. These imperfections had been there all along, but now that the weld scars were gone they were more visible. The more we refined our processes to eliminate imperfections the more we found. Our sheet metal vendor became involved as we worked to eliminate imperfections, some of which were caused by the way the metal is processed at the vendor.

Through a combination of our's and our vendor's efforts we began obtaining flat sheet which was near flawless. The complaints about scratches, stains, and hand prints increased. Our scrap rate on flat sheet reached an all time high.

At that time, bare aluminum was our standard material for exterior panels, but an increasing number of customers were ordering

pre-painted panels. Our scrap rate on these was minimal due to their inherent resistance to scratches and stains. We made, what for us was, a tough decision. We changed our standard of 12 years from bare aluminum to pre-painted white side skins.

The introduction of Concept II slats and pre-painted side skins started us down the path to a more 'automotive' appearance. Our trailers were more appealing than ever and our sales numbers reflected it. We decided to keep going.

At this time, the side skins overlapped the side posts around doors and windows leaving a large area of each post visible. (See Fig. 2) We needed this area of the side posts to be visible and accessible because we were still welding our door hinges to them. We didn't like the appearance of all this bare aluminum because we felt it now looked crude in contrast with the clean looking slats and side skins.

We redesigned our exterior doors after experimenting with a structural adhesive from the Lord Corporation with the reputation of being as strong as a MIG weld in certain applications. By pre-hanging the doors in a jamb

and extending the side skins right up to the door openings, the jamb then overlaps the side skins all around them when it is welded to the trailer frame. This eliminates the exposed aluminum which had always



Fig. 2

surrounded our doors and, contrary to what some have opined, actually strengthened our trailers because we maintained the same frame members around the door openings and added strength to those members by welding the door jamb to them. (See Fig. 3)

The newly developed doors, assembled using the adhesive, were far superior to the previous designs. The bonded doors were stronger, stiffer, and more water resistant. In carefully controlled testing, they proved to be over 400% stronger than the previous doors. The elimination of welds and their accompanying heat warp created a much flatter door. The elimination of rivets, which had been used to attach the aluminum skin, made for a much cleaner appearance.

Following our successful adoption of structural adhesives for bonding doors, we began to evaluate its use for replacing the riveted and taped side skins. We had been battling water leaks off and on since adopting riveted and taped side skins. We tried various thicknesses of tape, different types of rivets, including those with integrated o-rings, and a laundry list of RTV and urethane

sealants. The use of adhesive to bond the side skins allowed us to eliminate all the holes, rivets, and VHB tape. With the adhesive's shear strength of over 2000 psi, the bonded skins not only solved the problems created by drilling rivet holes, it increased the rigidity of the trailer by a significant amount.

We lead the horse trailer industry when it comes to introducing

new technologies and manufacturing processes. We listen to our customers and make every attempt to satisfy their needs and desires. The vast majority of the changes we made to our trailers were in response to customer suggestions or complaints. We view every suggestion as an opportunity to improve our product. Every complaint as a problem in need of a solution.

We were asked to reduce the amount of visible welds from our exteriors. We did, and in doing so we created a completely new look for our trailers that minimized the amount of visible structure underlying the exterior facade.

Some people have surmised that we cheapened and/or lightened our trailer in the process. The truth is, its just a little harder to validate the fact that the **size and number of side posts in our trailers has remained the same throughout our history.** The underlying framework and structure of our trailers has remained unchanged except for the following improvements:

- The bottom rail has been thickened and the shoulder resting on the cross members is longer.

- The thickness of our under-floor cross members has been increased by 20% and center to center distance has been reduced from 12" to 9". Its cross section

We quit welding and started attaching our hinge butts to the rear corner posts with structural fasteners to reduce the amount of welds visible on the exterior of the trailer. Look, welding is the



Fig. 3

has been modified to resist bowing or twisting under loads.

- A web added to our extruded top rail transformed it from an open sided shape to a fully enclosed structural strength tube.
- Floor sheets are corrugated for added stiffness.
- Bottom rail reinforcements added in gooseneck floor.
- Openings for large side ramps and slide out rooms are reinforced by a massive extruded aluminum extrusion, replacing a steel angle once used.
- The 3/16" (was 1/8") aluminum drop plate is a single solid plate with integrated, extra large gussets formed to accurately square the gooseneck to the trailer body.

I almost forgot. Someone said something about how we started bolting our rear door hinges onto the trailers as a cost cutting measure. That's absurd!

cheapest, fastest method to join 2 pieces of metal, but it is not always the best choice. We have never 'bolted' a hinge butt to one of our trailers. What we have done is use a steel blind fastener that is, by far, stronger than the parts being joined. In test after test the blind fastener outperforms welded hinges. It is specially engineered by Alcoa Fastening Systems to be used in areas subject to high stresses and vibration, and I can tell you this, it is certainly not cheaper to use than welding.

The latest models built by 4-star Trailers are beautiful to look at, yet stronger and more durable than they have ever been. In fact, a 4Star Trailer is, by customer demand, a **Wolf in sheep's clothing!**