

Structural Adhesives Eliminate Read-Through Problems in Trailer Design



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As the trailer industry strives to save on assembly costs and provide improved sidewall aesthetics to consumers, it is switching to thinner-gauge, aluminum substrates as a replacement for thicker-gauge aluminum and heavier steel components. A typical utility or freight trailer might have a mixture of various substrates, including several metals and thermoset composites all in one unit.

However, trailers assembled made with thin-gauge materials (composite, aluminum or steel) and adhesives are subject to surface-distortion problems, known as “read-through.” When read-through occurs, you can actually “see” the adhesive used for assembling the sidewall panels/skins through the substrate.

In this interview, Bob Zweng, Regional Sales Manager for Industrial Assembly Adhesives at LORD Corporation, gives his insight as to why read-through occurs and how it can be avoided.

WHY DOES READ-THROUGH OCCUR WHEN USING ADHESIVES ON LIGHTER-GAUGE MATERIALS?

Often the substrate is blamed for read-through problems, but in actuality, it is not always the fault of the substrate material. It is more probable that the adhesive used in assembling the vehicle/panel is too rigid, exotherms too much, and shrinks excessively during cure - all of which contributes to read-through. A visible adhesive bond line on the outer surface of a panel is not satisfactory to trailer OEMs who strive to achieve a world-class finish on their assemblies.



Trailer assembled without LORD® Adhesive showing read-through

HOW ARE SOME TRAILER MANUFACTURERS HANDLING READ-THROUGH PROBLEMS?

To avoid read-through problems, many trailer manufacturers return to using substrates that did not cause read-through issues with adhesives. However, by doing this they lose the benefits of using lighter-weight substrates.

CAN WELDING AND RIVETING BE USED AS JOINING METHODS?

The industry is gradually transitioning from welding and riveting as a joining method to using structural adhesives. As the industry experiments with various substrates ranging from steel and plastics to aluminum, it is necessary to use adhesives that are formulated to balance strength with no-read-through formulations. To build trailers that offer light weight, longevity and quality – and a mixture of substrate materials – manufacturers have begun to rely more on adhesives for bonding.

WERE THERE ANY PROBLEMS ENCOUNTERED WITH USING ADHESIVES AS A JOINING METHOD?

High-strength structural adhesives were engineered to be as strong as possible; they tend to have high-exotherm properties and are very rigid. Thinner gauged substrates, though, are engineered to be very flexible. Read-through occurs when two thin-gauge substrates are joined with a stiff adhesive, and a visible distortion of the metal or composite surface develops. Adding to this problem is the fact that as some adhesives cure, they will shrink; this shrinking further distorts the substrate's surface.

HOW HAVE TRAILER MANUFACTURERS ATTEMPTED TO AVOID THESE PROBLEMS?

As an alternative to rigid structural adhesives and their inherent read-through problems, some manufacturers use a urethane or silicone adhesive. But these formulations have their own set of complications: silicones tend to not have the desired strength for structural applications and urethanes cannot be used on bare metals without first needing excessive surface preparation.

WHAT OTHER SOLUTIONS ARE AVAILABLE TO THE TRAILER MANUFACTURER?

Acrylic adhesives can solve the problem encountered with other types of adhesives. They provide the strength characteristics of a structural adhesive, without the time-consuming surface preparation required for silicone or urethane adhesives, and offer no-read-through properties.

For example, LORD Corporation has an acrylic adhesive, LORD® 810 Low Read-Through Adhesive, which offers no bond-line read-through on most substrates. The flexible adhesive formulation features low-modulus, high-elongation, low-exotherm properties and low shrinkage. It bonds thin-gauge metal-to-metal and metal-to-composites/plastics with little or no substrate preparation.



Trailers assembled with LORD Structural Adhesives eliminate rivets and read-through caused from competitive adhesives.

CAN YOU DESCRIBE SOME OF THE BENEFITS OF USING AN ACRYLIC ADHESIVE?

LORD 810 Adhesive delivers superior peel strength on a variety of metal and plastic/composite substrates, and has excellent bake resistance on thin-gauge aluminum up to typical powder coating temperatures. Good peel strength is especially important on applications such as sidewalls, roof panels and front-nose panels, where wind resistance and deflection capabilities are crucial.

Fast cure times are another benefit of this acrylic adhesive. The adhesive has a handling time of as little as 20 minutes and is 90 percent cured in 30 minutes at room temperature. By applying modest heat, <150°F/<66°C, users can customize cure rates to their application. The adhesive also offers environmental resistance to dilute acids, alkalis, solvents, greases, oils, and moisture; and provides excellent resistance to UV-exposure and weathering.

WHAT ARE SOME IMPORTANT POINTS TO CONSIDER WHEN USING ADHESIVES?

Adhesives are ideal for bonding dissimilar materials such as steel-to-aluminum and aluminum to composites and plastics. It is important to know the composition of the substrates you are using so that you can choose the adhesive that best meets your aesthetic, strength and manufacturing needs.

WHY ARE ADHESIVES A BETTER ASSEMBLY METHOD OVER TRADITIONAL ASSEMBLY METHODS?

Welding and holes drilled for mechanical fasteners leave residual stresses in substrates. With acrylic adhesives, the load is better distributed across the bond-line eliminating stress in the underlying substrate. This ensures a stronger bond that will not sacrifice substrate integrity. Over time, welds also tend to corrode and rust due to moisture seepage. Adhesives offer resistance to corrosion and environmental conditions, while providing assembling and sealing properties.

HOW ARE THE ADHESIVES APPLIED IN THE MANUFACTURING PROCESS?

Automated dispensing systems are available for high-production environments and assembly lines. Hand-held applicators are ideal for smaller jobs. Adhesive dispensing systems are offered for both high- and low-volume applications. The various dispensing options allow the advantages of acrylic adhesives and low read-through to be accessible to any truck trailer manufacturer who is concerned about aesthetics in the final product. There are no “trade-offs;” the low-read-through adhesive can be used on any substrate or mixture of substrates required by the component design.

HOW HAVE ACRYLIC ADHESIVES SOLVED PROBLEMS FOR TRAILER MANUFACTURERS?

I have two examples of how acrylic adhesives helped truck trailer manufacturers achieve manufacturing success.

In one application, a utility trailer manufacturer had a major quality issue with sidewall distortion. Although the customer had switched from rivets to adhesives several years ago and enjoyed measurable benefits with reductions in assembly costs, plus significant improvements with water-leak warranty issues, the desire to have a smooth, read-through-free sidewall appearance was not met. The manufacturer struggled with various remedies and initially thought the only solution was to increase the panel thickness to prevent distortion. However, when the trailer builder switched to using LORD 810 Low Read-Through Adhesive, the distortion problem was solved.

In another example, a trailer manufacturer had issues with the excessive surface preparation required prior to using tape and/or adhesive to bond bare aluminum and galvanized metals. Additional labor, along with heavy grinding/sanding and extra bare metal primers, was necessary which increased build costs. After trying LORD 810 Low Read-Through Adhesive, the manufacturer discovered that the adhesive bonded without fail to the substrates. Only minimal surface wiping was needed, thus saving significant work time. The manufacturer also reaped the benefits of no read-through on sidewall surfaces.

HOW CAN THE ADHESIVE SUPPLIER HELP THE TRAILER MANUFACTURER?

An adhesive supplier should be knowledgeable enough to work with a manufacturer to provide a complete solution to assembly problems. It's more than just selling a product. The supplier should learn about your process and help you to make the transition to using acrylic adhesives. Eliminating read-through takes commitment on the part of the adhesive supplier and the manufacturer. It's important to find a supplier that will partner with both the substrate producer and the trailer manufacturer to develop solutions through to the final assembly.

WHAT SHOULD TRAILER MANUFACTURERS KEEP IN MIND WHEN CHOOSING A BONDING PRODUCT?

Trailer manufacturers are tasked with designing high-quality trailers that must not only offer longevity, but also look good. The consumer is also seeking a trailer with a long service life and a "Class A" finish. Adhesives are becoming more popular as a joining system, as trailer OEMs switch from traditional joining methods such as welding, riveting and fastening. In addition, the use of thinner-gauge substrates is also causing trailer builders to take a closer look at manufacturing-friendly adhesives that do not compromise aesthetics. Acrylic adhesives offer low read-through, low shrinkage, low exotherming, and fast cure times, with the strength of structural adhesives, and can deliver an aesthetically-pleasing and highly durable trailer.

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