

Joining technology for lightweight automotive construction

Ultrasonic welding for the materials of the future

PLASTIC WELDING

METAL WELDING

CUTTING

CLEANING

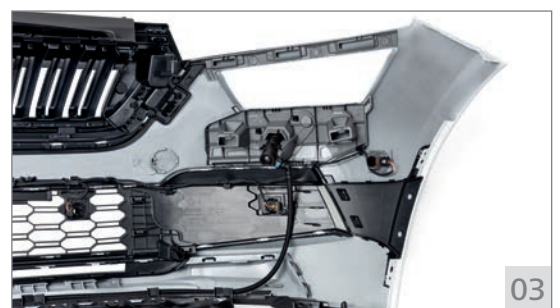
SCREENING



Bronschhofen (CH), 10/2019

Lightweight construction is an important trend in the automotive industry. As well as cutting down on weight, it enables significant cost savings. However, traditional welding and adhesive methods struggle to meet requirements in applications that involve wall thicknesses of less than 3 mm and demand high-quality surfaces. It is against this background that ultrasonic technology is often seen as a joining method that offers both technical and financial advantages – and it is undoubtedly set to continue gaining acceptance into the future. This versatile method is also equipped to meet the needs of the new materials that are now emerging on the market and come with features such as nanoparticle, fiberglass, or carbon reinforcement.

“Ultrasonic plastic welding can be used for practically all thermoplastics. Alongside its proven longitudinal welding process, Telsonic offers SONIQTWIST® torsional ultrasonic welding, whose low component load is a standout feature,” explains Claus Regenber, CEO of Telsonic Germany. Developed and patented by Telsonic, the process has demonstrated its outstanding performance in numerous applications



- 01 Volkswagen ID.Roomzz study (image: Volkswagen AG)
- 02 Sensor holders, welded with ultrasonic torsional technology
- 03 Growing numbers of reinforcement and function modules are being installed

including polypropylene (PP) vehicle bumpers. “In this case, torsional ultrasonic welding is able to reduce the wall thickness to less than 2.5 mm – that’s a significant amount,” adds Regenber. To take one case study, Magna Exteriors – a global tier 1 supplier of paneling components and systems – started using the method in its production process as early as 2017 and the following year received the Automotive SPE and ACE Innovation Award, scooping first place in the Enabler Technology category.

Where do we go from here?

Lightweight construction is set to become an increasingly popular choice as the automotive industry seeks to cut down on weight and costs while adding more and more functions to vehicles. There are also important considerations such as autonomous driving and alternative drive concepts to factor in. “Today’s bumpers serve as much more than just paneling,” says Dr. Joseph Laux, technology expert and former Global Director of Material Science at Magna Exteriors. “Increasingly, they are incorporating features such as sensors and have to cope with the growing demands being made on design. Lightweight materials already offer a wide range of options in that respect, and will continue to do so in the future. It is important for vehicles as a whole to look great, with smooth outer shells and small gaps between parts, for instance.”

Intelligent bumpers and rocker panels

“In some of the new vehicle designs being introduced by OEMs, we are seeing significant changes in the front bumpers and grills,” continues Dr. Laux. “This indicates a convergence where the bumpers are becoming larger and the grills are being converted into sensor holders. To accommodate all the safety and comfort innovations we are going to see in the future, the number of components attached to the rear sides of bumpers will have to increase.”

New trends are also evident in rocker panels. Although they have never been particularly pleasing to look at on limousines and coupes, the success of SUVs has increased their appeal – and they are now considered an important style feature. “They have become a design statement, not just a way of protecting the metal underneath them,” says Dr. Laux. “It’s much cheaper to replace a damaged plastic panel than repair damage to a metal body.” This is another area in which function and design will become even more intertwined in the future. The fastenings that these components require are robust yet inexpensive – thanks to ultrasonic welding, it is easy to produce holder fastenings and sensor or light clips, for instance, in an industrialized process.

Plastic tailgates and fenders

Today, tailgates represent by far the fastest-growing segment in exterior plastic paneling, especially where SUVs are concerned. In this area, Telsonic has plans in place to validate materials processed using SONIQTWIST® and conduct in-depth investigations of modern techniques, such as flame treatment, adhesion priming, and the use of 2K polyurethane adhesive. “Through our ultrasonic systems, we want to provide a reliable, inexpensive way of welding the necessary brackets to the interiors and exteriors of tailgates,” explains Claus Regenber.

Front and rear fenders are in a period of transition as well – while punched metal and OEM paint shop processing are currently the material and method of choice in manufacturing them, there is a growing movement in favor of global system platforms in which manufacturing takes place at multiple locations worldwide. “The OEM pressing facilities and paint shops in these new systems are becoming vital items for plants to invest in, and reach their break-even points after 10 to 15 years,” says Dr. Laux. With these new methods, plastic fenders can add real value to vehicles when they are combined with state-of-the-art designs.

New material compositions require innovative and alternative joining technology

As lightweight materials become more popular, OEMs and system suppliers are continually encountering requests to test them, validate them, and use them in their vehicles and components. This comes alongside significant investments that material suppliers are making in an attempt to create sustainable circular economies. As a result, there is a growing awareness that more needs to be learned about these new materials and the processes that will make them commercially viable (such as shaping, painting, and joining).



- 04 Dr. Joseph Laux, technology expert and former Global Director of Material Science at Magna Exteriors
- 05 Claus Regenber, CEO of TELSONIC GmbH, Germany

“Lightweight construction is a broad sector and ultrasonic joining technology is sure to have a solid future in it,” continues Dr. Laux. “This means we need to test all these new materials, such as those with nanoparticle, fiberglass, or recyclable carbon reinforcement. We also need to start involving new processes that are set to become more and more important as time goes on, like 3D printing and compound technologies for custom materials.” As a pioneer in ultrasonic technology, Telsonic is in an excellent position to develop production-ready ultrasonic solutions for the applications of tomorrow – and has already seen successful results in its initial tests of today’s lightweight construction materials.

by Dr. Joseph Laux, technology expert and former Global Director of Material Science at Magna Exteriors; Claus Regenber, CEO of TELSONIC GmbH, Germany; and Ellen-Christine Reiff, Redaktionsbüro Stutensee