

TELSONIC D.O.O.

ADVANCING ULTRASONIC TOOL DESIGN WITH SOLIDWORKS SIMULATION PROFESSIONAL



Using SOLIDWORKS Simulation Professional software during the development of its ultrasonic industrial equipment, TELSONIC has shortened FEA calculation and design cycle times, and cut performance errors, enabling the company to double its ultrasonic metal welding products offering.

Challenge:

Accelerate and expand the development of ultrasonic welding tool products for increasingly complex applications while improving product performance.

Solution:

Implement SOLIDWORKS design software, SOLIDWORKS Simulation Professional analysis software, and SOLIDWORKS Enterprise PDM product data management software solutions.

Benefits:

- Reduced tool development lead-times by 30 to 40 percent
- Shortened FEA calculation times by 50 percent
- Cut performance errors by 80 percent
- Doubled ultrasonic metal welding products offering

TELSONIC is a leading manufacturer of industrial ultrasonic equipment, which supports different processes in a wide range of industries. Activities are recorded in basically two different groups: joining technology and process technology. Joining technologies mainly refer to plastic and metal welding applications, while process technologies include cleaning, screening, and some special applications of high frequency mechanical vibrations, often called ultrasonic. Ultrasonic welding applications range from processes in the production of digital devices, electrical equipment, and components to manufacturing operations in the automotive, aerospace, and medical industries. Founded in Switzerland in 1966, the company has grown substantially—with additional facilities in China, Germany, Serbia, the United Kingdom, and the United States—and has established a wealth of international ultrasonic expertise.

TELSONIC d.o.o., the company's subsidiary in Serbia, produces tooling for TELSONIC's customers worldwide. The Serbian organization consists of highly qualified specialists, who take advantage of advanced design, engineering, and simulation technologies to continually boost productivity and efficiently handle acoustical designs of increasing complexity.

Ultrasonic welding utilizes high-frequency acoustic vibrations produced by ceramic converters (piezoelectric transducers) to weld two work pieces held together under pressure. Historically used for joining plastics and dissimilar materials—with no connecting bolts, fasteners, soldering, or adhesives—this technique has increasingly been applied to joining metals (aluminum, copper, brass) in recent years, particularly in the wire harnessing industry. Developing TELSONIC ultrasonic tools demands fast, powerful modal analysis capabilities, according to Managing Director Darko Jovanović.

"Our tools operate in resonance, and we need to control resonance moments by altering the tool design in order to achieve homogenous amplitude of vibration oscillations on the welding surface which is dependent on the geometry of the tool, which in turn relates to the geometries of the work pieces to be welded together," Jovanović explains. "We have to design our tools to resonate at a certain frequency. Given the fact that customer parts are becoming more complex—both in terms of shape and surfaces—conducting modal analyses while we design is the only practical means for getting it right."

TELSONIC utilizes SOLIDWORKS® Simulation Professional finite element analysis (FEA) software because it is deeply integrated with the SOLIDWORKS CAD system, provides fast solvers, and is more efficient, all while providing robust capabilities and accurate results. The company also uses the SOLIDWORKS Enterprise PDM product data management system.

"With SOLIDWORKS Simulation Professional, our designers create design geometry and run modal analyses within the same window," Jovanović notes. "Without these capabilities, it would not be possible to be competitive in our market."



"Using SOLIDWORKS Simulation Professional, we can change a feature or dimension, then run a modal study, make another change, and run another simulation, all from within SOLIDWORKS. This iterative, single-window approach enables us to adapt and refine our tools to perfectly match each customer's unique parts."

— Darko Jovanović, Managing Director



FAST MANIPULATION OF CUSTOMER GEOMETRIES

The combination of SOLIDWORKS CAD modeling and SOLIDWORKS Simulation Professional FEA tools enables TELSONIC engineers to quickly import customer part designs, rapidly create tooling models, and efficiently simulate custom ultrasonic tooling based on the specific parts that the customer wants to weld together. With this approach, the company has cut lead-times for delivering products to customers by 30 to 40 percent.

“We take the 3D geometry from the customer into SOLIDWORKS to develop each tool design,” Jovanović explains. “Using the customer’s two adjacent parts as a guide, our designers model tool designs and simulate their modal frequencies as they design. Using SOLIDWORKS Simulation Professional, we can change a feature or dimension, then run a modal study, make another change, and run another simulation, all from within SOLIDWORKS. This iterative, single-window approach enables us to adapt and refine our tools to perfectly match each customer’s unique parts.”



TELSONIC’s ultrasonic tools weld pieces together by using vibration oscillations to generate intramolecular frictional heat, and the company’s engineers rely on SOLIDWORKS Simulation Professional software to quickly run modal analyses and predict frequency modes with a high degree of accuracy to support this process.

ACCURATE MODAL ANALYSIS IMPROVES QUALITY

TELSONIC's ultrasonic tools weld pieces together by using vibration oscillations to generate intramolecular frictional heat, which produces an initial melt on the contact surfaces. This heat, together with tool pressure, expands the melt through the welding contour in a fraction of a second to produce a molecular bond as it solidifies again. SOLIDWORKS Simulation Professional software allows the company's engineers to quickly predict frequency modes with a high degree of accuracy to support this process.

"When a tool gets more complicated—such as those involving multiple acoustical parts (composite sonotrodes, horns)—accuracy becomes critical," Jovanović stresses. "With SOLIDWORKS Simulation Professional, we can be sure that we are within one kHz of having the desired oscillation mode. Not only has the software helped us become more accurate—reducing performance errors by 80 percent—it's also made us faster, reducing FEA calculation times by 50 percent."

SHORTER LEAD-TIMES SUPPORT EXPANDED PRODUCT DEVELOPMENT

With the productivity gains provided by SOLIDWORKS Simulation Professional software, TELSONIC has expanded its product offering, extending the use of ultrasonic technology to support metal welding, packaging, and a range of innovative manufacturing applications.

"Our tools are application-driven, and every application is different," Jovanović points out. "With SOLIDWORKS Simulation Professional, we can more quickly resolve the most challenging customer requirements and expand the use of ultrasonic technology. For example, SOLIDWORKS solutions have helped us double our product offering in metal welding by innovations in torsional welding technique."

Focus on TELSONIC d.o.o.
VAR: SOLFINS Solution Finders, Belgrade, SERBIA

Headquarters: Atar 95
21241 Kać
SERBIA
Phone: +38 121 6210 010

For more information
www.telsonic.com

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 | The **3DEXPERIENCE**® Company

Corporate Headquarters
Dassault Systèmes
10, rue Marcel Dassault
CS 40501
78946 Vélizy-Villacoublay Cedex
France

Americas
Dassault Systèmes SolidWorks Corporation
175 Wyman Street
Waltham, MA 02451 USA
Phone: 1 800 693 9000
Outside the US: +1 781 810 5011
Email: generalinfo@solidworks.com

Asia-Pacific
Dassault Systèmes K.K.
ThinkPark Tower
2-1-1 Osaki, Shinagawa-ku,
Tokyo 141-6020
Japan