

# Ultrasonic Welding with Real-Time Quality Control



**INVENTORS** • Xiaochun Li, Hongseok Choi, Hang Li, Wayne Cai, Jeff Abell, Jingzhou Zhao

**WARF:** P120081US01

[View U.S. Patent No. 8,672,211 in PDF format.](#)

**The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an ultrasonic welding system that uses thin-film sensors to monitor temperature and heat flux.**

## OVERVIEW

In ultrasonic welding, work pieces are clamped between a horn and anvil and then joined using high-frequency vibration energy. Friction and heat between the surfaces causes them to soften and meld together upon cooling. Battery tabs needed for electric vehicles are formed in this way using ultrasonic energy. However, factors like temperature and heat flux are difficult to assess and control, leading to poor weld quality and reduced battery life.

Introducing a new sensor into the process could help monitor and control factors that are crucial to weld quality.

## THE INVENTION

UW-Madison researchers and others have developed an ultrasonic welding system that uses thin-film sensors to measure control values, like temperature and heat flux, at the working surface.

The system includes an anvil, welding horn and process controller. The process controller receives measurements taken by the sensors. It then can determine weld quality as the joint is being formed or record the results to help evaluate tool wear.

The thin-film sensors can be commercially available microelectromechanical systems (MEMS) sensors. They may be inserted into slots or attached in the welding device adjacent to the working surface.

## THE WARF ADVANTAGE

Since its founding in 1925 as the patenting and licensing organization for the University of Wisconsin-Madison, WARF has been working with business and industry to transform university research into products that benefit society. WARF intellectual property managers and licensing staff members are leaders in the field of university-based technology transfer. They are familiar with the intricacies of patenting, have worked with researchers in relevant disciplines, understand industries and markets, and have negotiated innovative licensing strategies to meet the individual needs of business clients.



## APPLICATIONS

- Quality control and monitoring
- Battery bus bar fabrication for electric cars

## KEY BENEFITS

- Temperature and heat flux is monitored *in situ*.
- Enables real-time process control
- Measurements can be recorded and compared over time.
- Can signal the need for tool repair or replacement

## ADDITIONAL INFORMATION

### Related Technologies

[WARF reference number P09303US02 describes embedded photonic sensors that can sense workpiece properties in hostile conditions.](#)

### Tech Fields

Analytical Instrumentation - Sensors

Micro & Nanotech - MEMS & NEMS

## CONTACT INFORMATION

For current licensing status, please contact Michael Carey at [mcarey@warf.org](mailto:mcarey@warf.org) or 608-960-9867.

