Issue 01 | May 2020

# Hot Application
## Laser Cleaning & Battery Welding

### THIS ISSUE

What's the challenge?. . . . . .1
Cleaning methods. . . . . .1
Why laser cleaning? . . . . . .2
Applications . . . . . .3

## The Challenge

### Problem:

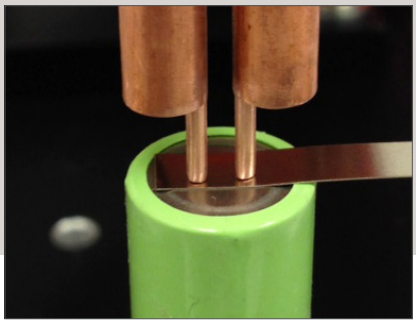
- Weak (or no) welds when joining tabs to cells in battery module or pack manufacturing.
- Contamination on parts results in reduced conductivity at the weld joints, ultimately limiting overall performance of the battery pack.

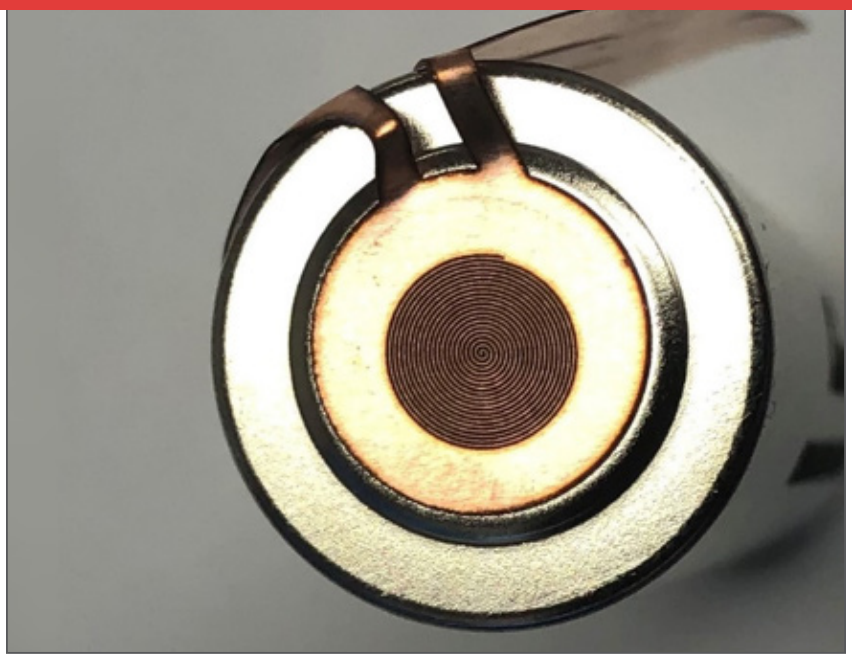
### Cause:

- Transportation and handling of batteries prior to the welding process introduces contaminants and allows oxides to form. This is especially true when batteries are coming from overseas and shipped by boat.

### Solution:

Remove contaminants at the weld joint while avoiding both damage to part and the expulsion of hazardous debris.





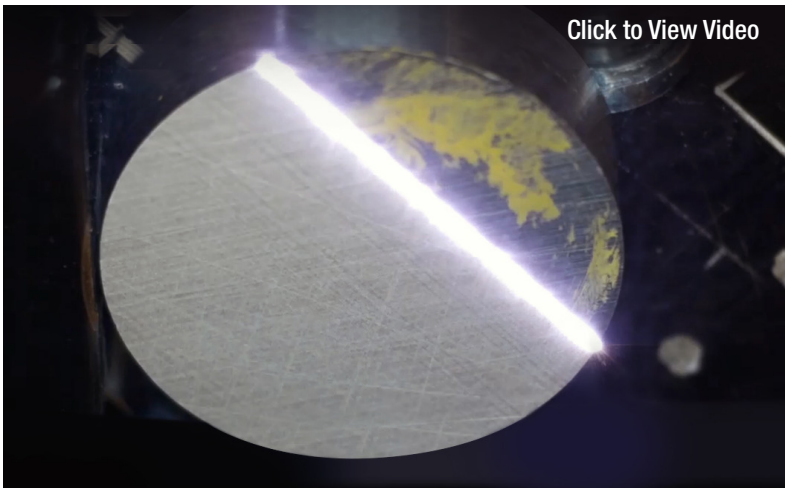
### Surface Cleaning of Anode and Cathode Ensure High Quality Welds

A battery's performance is only as good as the joint between the cell and the tab. There are a number of technologies utilized for this purpose: laser welding, resistance welding, MicroTIG welding and ultrasonic wedge bonding. The quality of the joint, however, will vary depending on the cleanliness of the parts. Surface contaminants such as grease, oil, corrosion inhibiting agents and other compounds typically used in manufacturing can be found on battery components resulting in poor fusion, cracks, and porosity in the joints. The solution? Clean the surfaces prior to welding!

## What Methods Can Be Used to Clean Batteries?

There are two primary methods used to clean batteries: media blasting (sandblasting or dry ice blasting) and laser cleaning.

Media blasting options use abrasives to literally rip contaminants off the surface of the part. While effective, these processes can also result in micro denting which can affect both the weld strength and appearance of the finished product When used properly, laser cleaning will not mar the finished product. It is this ability to clean surfaces without damaging them that makes laser cleaning so effective at improving the overall process.

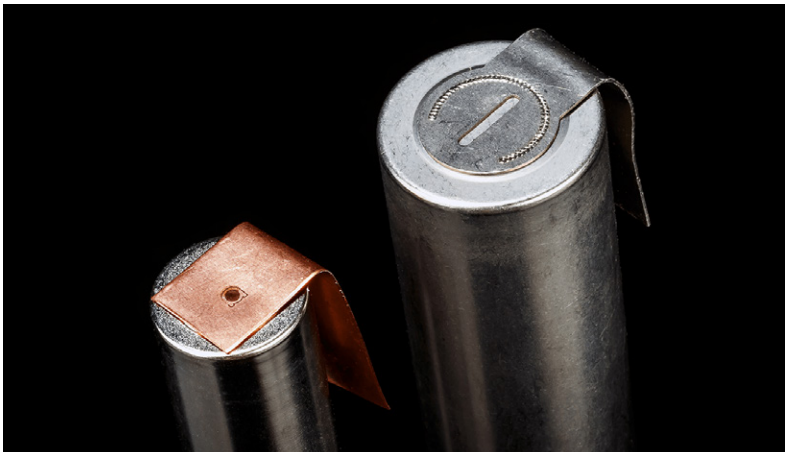



## What is Laser Cleaning?

Cleaning of the battery anode and cathode can greatly improve success of the welding process by creating a pristine, repeatable surface for joining. Whether using resistance welding, laser welding, or another joining method, laser cleaning before welding can significantly improve the process and quality.

Laser cleaning works by focusing a laser onto a substrate to remove material on its surface (see image/video above). The amount of material removed depends on the intensity, pulse width and wavelength of the laser, as well as the material itself which absorbs the laser light and breaks down the chemical bonds in the area. It can be achieved with either a pulsed nanosecond (fiber) laser or a continuous wave laser, although the former is more commonly used due to the high level of laser intensity.

Laser cleaning has many benefits over traditional media blasting methods like sandblasting and dry ice blasting which are time-consuming, inflexible, expensive, multi-step processes that also carry risks to the environment. Laser cleaning, by contrast, is fast, safe and cost-effective.



*The industry is moving to laser cleaning battery connections prior to joining to improve quality and reduce costs.*

### Fast

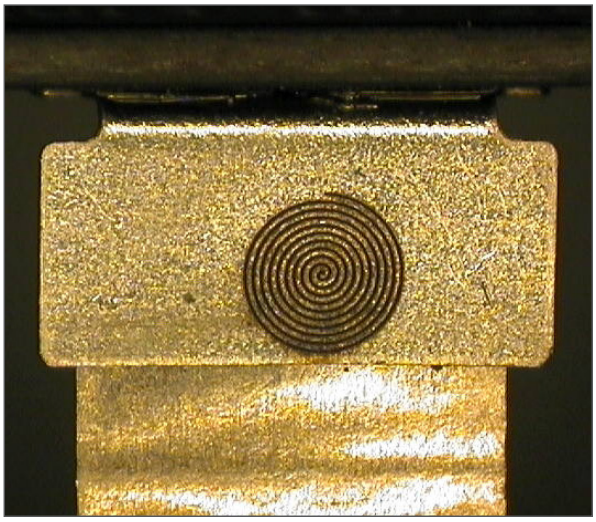
Laser cleaning removes surface contaminants quickly and cleanly, reducing the need for downstream post-processing. Reports suggest that laser cleaning can be as much as 15x faster than media blasting options. That's less time spent cleaning products, and more time making them at reduced costs.

### Safe

Laser cleaning doesn't use abrasives. Abrasive blasting operations can create high levels of dust and noise. Sand blasting in particular can cause silicosis, lung cancer, and breathing problems in exposed workers. Laser cleaning creates only a small amount of dust material (removed from part). This material can easily be handled by fume extraction units. The operating laser and fume extractor are relatively quiet and do not need safety gear to dampen the sound.

### Cost-effective

The total cost of ownership of a laser is significantly less than that required for media blasting options. It's been reported that laser ablation systems can pay for themselves within one year.



# Application Examples

## Example #1

Laser ablation cleans grime off of a battery can surface significantly improving wire bond reliability

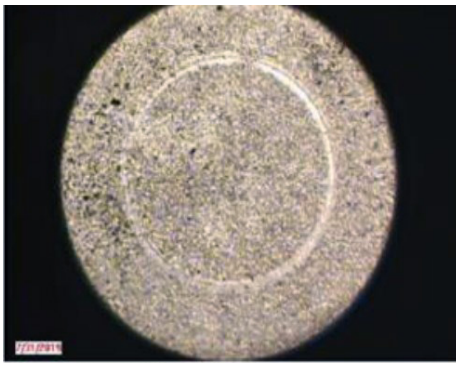


Image of battery cell surface before ablation

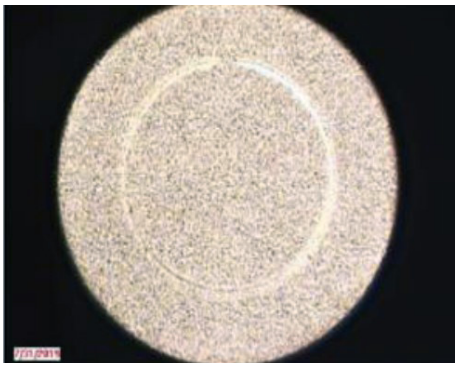
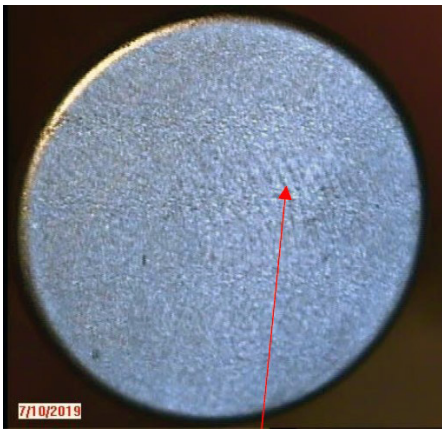


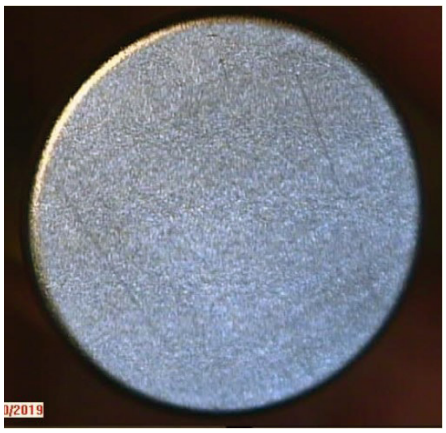
Image of same surface after ablation

## Example #2

Battery cans with fingerprint. Battery can on the right subjected to laser cleaning before welding. Customer welded parts with and without fingerprints and performed pull test. Samples subjected to laser ablation showed significantly improved weld strength.




Before – Note fingerprint



After – Clean and no fingerprint

**Recommended Equipment for Laser Ablation**

Click On the Links Below to View Products

• Fiber Laser • WL-300A • Laser Conveyor System

Learn more about all of our manufacturing technologies in our Learning Center.


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