How Cold Heading Slashed EV Battery Lifting Sleeve Costs by 60% and Made Them Stronger

Subtitle: Moving from pure CNC to Cold Heading + Minimal Secondary Machining for Aluminum 6061

Image 1: The finished Aluminum 6061 lifting sleeve. It requires precision threads and a smooth top interface.

Every engineer working in the EV battery pack supply chain knows the squeeze: components need to hold tight tolerances and meet strict safety specs, but the volume is massive, and costs have to come down.

I recently took a deep dive into the cost structure for a central lifting sleeve (used for lifting and securing battery packs during assembly). It was a classic "over-engineered" part. The traditional route was pure CNC machining from solid 6061 bar stock. It worked fine. But it was slow, wasted a lot of material, and the price tag reflected that—we were looking at roughly 50 RMB (around $7 USD) per piece.

Considering the thousands of units needed for a single production line, that adds up fast.

Image 2: The cold-headed raw blank. Roughly formed and ready for minimal machining. No chips, no material waste.

So we looked at the geometry. It's a hollow sleeve with a flange. This shape screams "Cold Heading". Instead of hogging out 50% of the metal from a solid bar, we switched to a cold heading + secondary machining process.

The process is simple:

1. The Blank: We use cold heading to form the base shape (see Image 2). It's fast, highly repeatable, and uses nearly 98% of the material.

2. The Finishing: From that blank, we only need a few quick CNC passes for the threads on top and to clean up the seating face (see Image 1).

The Result on the Bottom Line

The cost difference is staggering. The total process now runs at about 20 RMB (under $3 USD) per piece. That's a 30 RMB saving on every single lifting sleeve.

But the savings don't stop at cost.

Efficiency: 5x Faster Production

The old pure CNC route took 20 minutes per piece. Now, with cold heading, the rough form is done in seconds. Even after adding the minimal CNC finishing, the total cycle time is under 4 minutes.

What does that mean in real terms? A single production line can now deliver over 300 pieces per day instead of 60. That's a 5x increase in output—without adding extra machines or floor space.

The Unexpected Bonus: Structural Integrity

If you're making a lifting point for a battery pack, strength is non-negotiable.

Pure CNC machining from a 6061 bar cuts through the grain structure of the aluminum. The grain lines are broken, which can create weak points—especially under repeated stress or heavy lifting loads.

Cold heading does the opposite. It forms the metal under high pressure, forcing the grain flow to follow the shape of the part. The grain lines are continuous and unbroken, wrapping around the flange, the body, and the hexagon-see image 3.

Image 3: The grain lines not broken and make the structure stronger.

In our pull-testing, the cold-headed version showed higher resistance to stress fractures compared to the pure CNC version. For a critical lifting point on a heavy EV battery pack, that is not just a nice-to-have—it's a safety feature.

Bottom line: The cold-headed sleeve is cheaper, faster to produce, and stronger.

A Reminder for Design Engineers

If you are currently designing or sourcing battery pack lifting points, brackets, or similar mechanical fasteners, stop automatically assuming "CNC".

The combination of cold heading (for the rough form) and minimal CNC (for the precision mating surfaces) is a proven cost-killer, time-saver, and strength-booster.

We've pulled it off with Aluminum 6061, and it's saving us a significant chunk of the BOM cost while delivering a safer, stronger part.

Want to test this approach on your own components? Feel free to reach out for a quick DFM (Design for Manufacturability) review. Sometimes the biggest savings come from simply changing how the chip is made.

About author:

YF ZCJ,
with over 20 years of expertise in precision fasteners, is a long-term partner to global Top 5 consumer electronics brands and EV
brands. We are now leveraging our core technologies—lightweighting, anti-loosening, and high strength—to enter the low
altitude economy, and humanoid robot segments.

Powered by proprietary products such as 6.8-grade high-strength aluminum alloy bolt s and tailless wire thread inserts, along with process

Innovations like cold forging replacing CNC machining, we deliver one-stop precision connection solutions from prototype design to after-sales, consistently reducing custo mers' total lifecycle costs.