How Cold Heading Slashed EV Battery Lifting Sleeve Costs by 60%

— and Made Them Stronger

From Pure CNC to Cold Heading + Minimal Secondary Machining in Aluminum 6061

Every engineer in the EV battery pack supply chain knows the squeeze: tight tolerances, strict safety specs, massive volume — and relentless pressure to cut costs.

I recently took a deep dive into the cost structure of a central lifting sleeve — the component used to lift and secure battery packs during assembly. It was a classic case of over-engineering. The traditional route? Pure CNC machining from solid 6061 bar stock. It worked, but it was slow, wasted nearly half the material, and carried a price tag of ~50 RMB ($7 USD) per piece. Multiply that by the thousands of units a single production line demands, and the numbers get painful fast.

The Insight: This Shape Screams "Cold Heading"

So we looked at the geometry — a hollow sleeve with a flange. That profile is a textbook candidate for cold heading. Instead of hogging out 50% of the metal from a solid bar, we switched to a cold heading + secondary machining process.

1. The Blank

Cold heading forms the base shape in seconds — fast, highly repeatable, and using nearly 98% of the raw material. Zero chips, zero waste.

2. The Finishing

From that blank, only a few quick CNC passes are needed — threading the top and cleaning up the seating face. Minimal material removal, maximum precision where it matters.

The Numbers: Cost, Speed, and Output

Metric	Pure CNC (Before)	Cold Heading + CNC (After)
Cost per Piece	~~**~50 RMB ($7)**~~	**~20 RMB ($3)（-60%）**
Cycle Time	20 min / piece	**< 4 min / piece**
Daily Output (per line)	~60 pieces	**300+ pieces**
Material Utilization	~50%	**~98%**
Grain Structure	Broken (cut through)	**Continuous (follows part shape)**

60%	**5x**	**98%**	**30 RMB**
Cost Reduction	Faster Output	Material Used	Saved per Piece

That 30 RMB saving compounds rapidly across a full production line. And the 5x output increase means you deliver 300+ pieces per day from a single line — without adding machines or floor space.

The Unexpected Bonus: Structural Integrity

If you're making a lifting point for a battery pack, strength isn't optional — it's a safety-critical spec.

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

Cold heading does the opposite. The metal is formed under high pressure, forcing the grain flow to follow the contour of the part. The grain lines remain continuous and unbroken — wrapping around the flange, the body, and the hexagon.

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's not a nice-to-have — it's a safety feature.

Bottom line: The cold-headed sleeve is cheaper, faster to produce, and stronger. All three at once — no trade-offs required.

A Reminder for Design Engineers

If you're currently designing or sourcing battery pack lifting points, brackets, or similar mechanical fasteners, stop automatically defaulting to "CNC."

The combination of cold heading (for the rough form) and minimal CNC (for precision mating surfaces) is a proven cost-killer, time-saver, and strength-booster. We've validated it with Aluminum 6061 — and it's saving a significant chunk of BOM cost while delivering a safer, stronger part.

About the Author

YF Zhichengjia brings over 20 years of expertise in precision fasteners, serving as a long-term partner to global Top 5 consumer electronics and EV brands. We are now leveraging our core technologies — lightweighting, anti-loosening, and high strength — to expand into the low-altitude economy and humanoid robotics segments.

Powered by proprietary products such as Grade 6.8 high-strength aluminum alloy

bolts 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 customers' total lifecycle costs.