

Introduction

North China Electric Power University (NCEP), directly under the Ministry of Education, is a national key university under the "Project 211" known for its disciplinary characteristics in "energy and electric power." In 2007, NCEP established the nation's first "School of Renewable Energy," which was renamed the **"School of New Energy"** in 2020.



In 2021, to further focus on cutting-edge scientific fields, NCEP **established the Collaborative Innovation Institute of Low-Carbon, Environmental Protection, and New Energy Technology**. Building upon the Energy and Electric Power Innovation Institute, this institute primarily focuses on research areas such as new technologies for sliding bearings in large wind turbines, theory and technology for corrosion protection in waste-to-energy generation, theory and technology for high-efficiency catalyst electrode materials in water electrolysis for hydrogen production, theory and technology for equipment and pipeline protection in hydrogen storage and transportation, key material technologies for compressed air energy storage equipment, green manufacturing technologies for coal mining equipment, key material technologies for braking systems in new energy vehicles, and resource utilization technology of solid waste in the context of carbon neutrality and peak carbon emissions. Internally, the institute actively promotes the interdisciplinary integration of advantageous fields like new energy, materials, mechanical engineering, and low-carbon environmental protection. Externally, it extensively engages in collaborative partnerships with universities, enterprises, and international counterparts.

JiangSu KeHuan Innovation Material Co., Ltd., established in April 2017, is a national-level specialized, sophisticated, and innovative "Little Giant" enterprise, a national high-tech enterprise, an innovation leader, and a company in the pipeline for listing. Integrated across R&D, production, and sales.

The company's founder, Dr. Qu Zuopeng, graduated from the Process and Energy Engineering Department of Delft University of Technology in the Netherlands. He currently serves as a professor at the School of New Energy at North China Electric Power University, Director of the Collaborative Innovation Institute of Low-Carbon, Environmental Protection, and New Energy Technology at NCEP, a recipient of national-level talent programs, a talent under Jiangsu Province's "Innovation and Entrepreneurship Plan," and a second-level talent in Jiangsu Province's "333 Project." The company's customers span industries such as wind power, waste incineration, compressed air energy storage, energy, electric power, transportation, and mining.



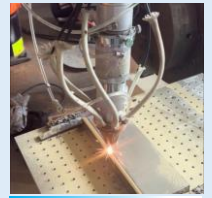
Self-Lubricating Copper Alloy Coating Technology

With the rapid growth in global renewable energy demand, the wind power industry has developed swiftly, and wind turbine equipment has trended towards larger capacities, especially the rapid increase in unit capacity for offshore wind power. Higher unit capacity requires higher load capacity, which has driven the rapid development of **"sliding bearing replacing rolling bearing" technology** in large wind turbines. Sliding bearings have a relatively simple structure and offer advantages such as lightweight design, high load capacity, low friction, and long service life, making them well-suited to the new trends of increasing wind turbine size and offshore wind power development.

Our company utilizes **laser cladding technology** to apply a **self-lubricating copper alloy coating** on the bearing surface, replacing traditional cast copper alloy bearing bushes. This can significantly reduce the amount of copper alloy used and substantially lower the overall cost of sliding bearings. Simultaneously, compared to casting processes, laser cladding technology offers advantages such as zero emissions, environmental friendliness, high efficiency, and a high degree of automation.

Performance Indicators of Self-Lubricating Coating

- Thickness of copper alloy: 0.5-1.0mm (5-40mm for traditional casting)
- Compactness: >99.5%
- Crack: None
- Bond strength: $\geq 250\text{MPa}$
- Heat-affected zone: $\sim 30\mu\text{m}$
- Hardness: 180HV ($\sim 110\text{HV}$ for traditional casting)
- Vibration resistance: No obvious change after 5×10^6 cycles
- Environmental protection: Low energy consumption, no pollution



Laser Cladding Technology



Copper Alloy Coating on the Inner Surface of Sliding Bearings



Copper Alloy Coating on the Outer Surface of Sliding Bearings



Copper Alloy Coating Microstructure

Surface Coating of Flat Sliding Bearings

