Low-Carbon and Sustainable Innovation in the PET Fiber Industry

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Introduction

As environmental conservation becomes a critical concern for industries worldwide, the textile and apparel industry, which contributes approximately 10% of global industrial carbon emissions, faces an urgent need for transformation. **Jiangsu Guowang High-Technique Fiber Co. Ltd.** and the **Beijing Institute of Fashion Technology** have pioneered low-carbon and sustainable innovations within the **PET fiber** sector. This report highlights their achievements in developing green technologies, focusing on carbon recycling and sustainable production processes.

The Environmental Challenge

The textile industry is one of the largest contributors to global carbon emissions, trailing only behind the oil industry. With the increasing global population, the industry's carbon output is expected to rise, potentially surpassing other sectors in its environmental impact. Current life cycle assessments reveal that fiber production alone accounts for 12% of the textile industry's carbon emissions, largely due to synthetic fiber production.

China's Role in the Fiber Industry

China dominates global chemical fiber production, with an impressive 70% share of the market. In 2023 alone, China produced 68.72 million tons of chemical fibers, 57.02 million tons of which were **PET fibers**. This production accounts for 85% of global PET fiber output, positioning China as a pivotal player in the global fiber industry. However, this large-scale production also highlights China's responsibility in transitioning toward a low-carbon, sustainable fiber industry.

The Shift Toward a Circular Economy

In response to the Chinese government's "Dual Carbon" vision—aiming to peak carbon emissions by 2030 and achieve carbon neutrality by 2060—the fiber and textile industries are embracing the **circular economy**. This approach promotes resource efficiency, environmental protection, and economic growth through

technological innovation. The goal is to establish a modern fiber industry that is **high-end, intelligent, and green**.

The Carbon Recycling Project

At the heart of **Jiangsu Guowang High-Technique Fiber Co. Ltd.'s** efforts is a pioneering carbon recycling project, which captures and converts **CO2 emissions into PET fibers**. Collaborating with the **Beijing Institute of Fashion Technology**, the project focuses on the sustainable transformation of industrial waste into valuable resources.

Key Technological Innovations:

1. **CO2 Capture and Purification**: Industrial emissions are captured and purified to food-grade levels for further processing.
2. **Chemical Conversion to Ethylene Glycol (EG)**: The purified CO2 is converted into high-purity ethylene glycol (EG), a key raw material in PET fiber production.
3. **Melt Direct Spinning**: A novel production technique is employed, where EG is polymerized with purified terephthalic acid (PTA) and directly spun into PET fibers, reducing energy consumption and environmental impact compared to traditional pellet spinning.

Quantified Benefits of Carbon Recycling

For every 1,000 kilograms of polyester fiber produced, the process requires 335 kilograms of high-purity ethylene glycol and consumes approximately 840 kilograms of CO2. Moreover, the melt direct spinning technology employed in this process reduces energy consumption by 37.4%, resulting in a 100-kilogram reduction in CO2 emissions per ton of fiber produced. This system not only creates a pathway for sustainable fiber production but also significantly cuts down the carbon footprint of the textile industry.

Future Expansion and Social Impact

Currently, the project converts **120,000 tons of CO2 annually** into **48,000 tons of ethylene glycol**. Future plans include expanding this capacity to convert **300,000 tons of CO2** into **120,000 tons of ethylene glycol**. The project not only demonstrates significant energy savings and emission reductions but also sets a leading example for sustainable development within the textile industry.

The success of this initiative serves as a model for establishing sustainable supply chains and promoting low-carbon systems in textile production. By leveraging technological innovations, **Jiangsu Guowang High-Technique Fiber Co. Ltd.** and **BIFT** are contributing to the development of industry standards and accelerating the transformation toward a greener future.

Conclusion: The New Textile Road

The future of the textile industry lies in **low-carbon innovation** and **sustainability**. These advancements represent a new path for the industry, one that is driven by environmental responsibility and technological progress. The collaboration between **Jiangsu Guowang High-Technique Fiber Co. Ltd.** and **Beijing Institute of Fashion Technology** sets a powerful example for the entire sector. Together, they aim to reduce carbon emissions, recycle industrial CO2, and build a better, more sustainable world.

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This report showcases the significant advancements in low-carbon PET fiber production, highlighting the role of innovative technologies in driving sustainability in the global textile industry.