Project Implementation

With the full component recycling technology of construction waste as the core, we have created a zero carbon industrial park that integrates zero waste, zero wastewater, zero exhaust gas, zero waste heat, and zero energy consumption, known as the "Five Zero Cycle Systems". Through refined disposal and precise utilization, building solid waste is turned into treasure. The waste separation technology has reached the international leading level, with a separation rate of 98%. This not only achieves full disposal and recycling of waste, but also ensures the quality of building materials from raw materials. On the basis of optimizing and improving basic processes, the object of resource utilization has been expanded from construction waste itself to the entire production process, with key technologies including photovoltaic power generation, multi temperature cracking and recycling, seawater desalination, multi-stage utilization of steam, rainwater collection, cascade utilization of water resources, pure electric transport vehicles, etc., forming a zero carbon energy solution that integrates energy consumption, production capacity, and functionality.

1. Zero waste

The recycling process of the project is based on the principle of refined disposal and utilization. Different levels of aggregates are used to produce building materials with different quality requirements, achieving a closed-loop production process where "upper end waste" is the "lower source material". At the same time, targeted utilization of dust generated during the production process was carried out, adopting a "collection, reduction, collection, and use" design system to achieve 100% recycling and utilization of the entire process and material.

2. Zero wastewater

Realize the intensive utilization of water resources through two approaches: open source and throttling. The wastewater generated during the production process is treated on-site and recycled. Domestic wastewater is treated and reused for production, while organic waste is used to produce organic fertilizers or planting soil. Design a rainwater recovery system that can be used for production after treatment, achieving a 100% rainwater recovery rate.

3. Zero exhaust gas

Cascade utilization of waste steam and heat generated during the production process to achieve orderly circulation of steam and water. The discharged primary steam is used for magnetic levitation power generation, the secondary steam is used for concrete prefabricated oxygen chambers and seawater desalination systems, and the tertiary steam is converted into high-pressure steam through a steam generator for the production of boards and fly ash autoclaved bricks.

4. Zero waste heat

The biomass boiler is designed with a flue gas waste heat recovery system, which adds a seawater circulation system inside the chimney, uses waste heat to preheat seawater, and cools the flue gas to 40 degrees, achieving colorless, heat free, and odorless flue gas emissions, avoiding the heat island effect caused by overheated flue gas emissions, and achieving a waste heat recovery rate of 90%.

5. Zero energy consumption

We have developed a zero carbon energy system by utilizing a series of low-carbon technologies such as photovoltaic integrated systems and biomass boilers. The integrated design of building photovoltaics has a total installed capacity of 6MW, and the total power generation can meet the electricity demand for production and lighting.

At the same time, all concrete mixing trucks and loaders on site are electric vehicles, which use the green electricity from photovoltaics in the factory area for charging and serve as mobile energy storage devices for the photovoltaic system, achieving a zero carbon closed loop from production to transportation.

The park can process 5 million tons of urban construction waste annually, reduce CO_2 emissions by 1.5 million tons, save 4.7 million tons of natural sand and gravel aggregates, save 300 acres of landfill land, reduce pollution of 1600 acres of land and groundwater sources, and achieve significant environmental benefits. The park has turned waste into treasure through comprehensive utilization of waste, achieving "zero" emissions in the production process, fully reflecting the circular economy concept of "taking from building materials and using for building materials", and can serve as a demonstration window for large-scale replication and promotion of resource comprehensive utilization and circular economy.

Project Impact & Sustainability

The full component recycling technology system for construction waste has been proposed for the first time in China, and all production processes used are independently developed. Currently, it has more than 50 patents, among which the waste separation technology has reached the international leading level, with a separation rate of 98%. The entire process of disposing and regenerating construction waste involves zero waste, zero wastewater, zero exhaust gas, and zero waste heat emissions, forming a systematic integrated technology system for the resource utilization, low-carbon disposal, and regeneration of construction waste.

The company participated in the preparation of two national standards, "Recycled Fine Aggregates for Concrete and Mortar" and "Recycled Coarse Aggregates for Concrete", as well as the industry standards "Technical Regulations for the Application of Recycled Aggregates" and the group standard "Evaluation Specification for Zero Carbon Factories", playing a demonstrative role in the research of comprehensive utilization methods and approaches for building solid waste resources. The project has completed the second phase planning and approval. The next step will be to use technologies such as distributed photovoltaic power generation, wind power generation, and maglev power generation to develop production and promote the further upgrading of the construction waste treatment industry.

Expert Comments

The Qingdao Green Sail Zero-Carbon Industrial Park for Comprehensive Utilization of Building Waste exemplifies a holistic zero-carbon energy solution through carbon reduction technologies, such as tiered energy utilization, photovoltaic power generation, and biomass boilers. This solution integrates energy use, production capacity, and functionality into a "five-zero circular system", encompassing "zero waste, zero wastewater, zero waste gas, zero waste heat, and zero energy consumption". Within the park, building waste is transformed into valuable resources, achieving zero emissions of waste, wastewater, waste gas, and waste heat across all stages of building waste disposal and regeneration, and resulting in a systematic, integrated technology framework for the low-carbon disposal, recycling, and regeneration of building waste. This case fully embodies the principles of the circular economy and serves as a replicable, scalable model with significant potential for broader application and promotion.