

Project Summary

Organization:

Xinjiang Goldwind Science & Technology Co., Ltd.

Solution:

Structures

Location:

Dezhou, Shandong, China

Project Objective:

- Develop an integrated steel and cement hybrid tower design for wind turbine generators operating in low-wind areas.
- Implement a BIM strategy to achieve collaborative design, multi-discipline model review, and construction simulation.

Products Used:

ProStructures, RAM, STAAD.Pro

Fast Facts

- Goldwind is the world's leading manufacturer of wind turbine generators, with more than 38 gigawatts of capacity worldwide.
- This research and development initiative delivered a hybrid tower design that increases the utilization rate for wind energy by 23 percent.

ROI

- Bentley's design and analysis applications saved the project team more than 400 resource hours during development.
- Integration between ProStructures and STAAD.Pro enabled an iterative design and analysis process that reduced modeling time by 35 percent, resulting in a savings of CNY 900,000.
- Interoperability with models from other software applications in related disciplines reduced design coordination time.

World-leading Wind Turbine Manufacturer Saves CNY 900,000 on Hybrid Tower Project

ProStructures and STAAD.Pro® Integration Cuts Goldwind's Research and Development Time by 35 Percent

Innovation Drives Product Research and Development

Headquartered in Beijing, China, Xinjiang Goldwind Science & Technology Co., Ltd. (Goldwind) is a global wind energy solutions provider responsible for 12 percent of newly installed capacity worldwide. The company achieved its position as the number one international wind turbine manufacturer with a unique business model that spans the whole product lifecycle. Goldwind's commitment begins with research, development, and manufacturing and continues through investment, sales, and service. This commitment produces wind energy solutions such as the recently developed hybrid tower for use in low-wind areas. The innovative design increases the utilization rate for wind energy by 23 percent. Goldwind's research and development team used Bentley's structural analysis and detailing applications to develop the tower with a cement base and steel upper section. As a result of the technology integration, the team shortened design time by 35 percent, resulting in a savings of CNY 900,000.

Optimized Low-wind Turbine

In 2016, Goldwind held 27 percent of China's market share for newly installed capacity, making the company the largest wind turbine generator manufacturer in the country for the sixth consecutive year. Goldwind continuously upgrades its product line through

technical innovation to meet market demand. This demand is fueled by China's 13th Five Year Plan (FYP), which set a nationwide target of 250 gigawatts of cumulative connected wind capacity by the end of 2020. For this project in Dezhou, Shandong, China, the hybrid steel and concrete tower was designed to make the wind turbine more effective in low-wind

areas. The complex implementation process for the CNY 1 million project prompted Goldwind to adopt a BIM strategy.

The hybrid tower project involved multiple participants and stakeholders, including managers, designers, contractors, vendors, and subcontractors. Familiarity with the new product development process varied widely among this audience. Using BIM technology allowed the project team to provide transparency enabling collaborative design, multi-discipline model review, and construction simulation.

Integrated Modeling and Analysis

The project team implemented Bentley's BIM advancements including ProStructures for steel and concrete design, STAAD.Pro for 3D structural analysis and design, and RAM® for load calculation. These interoperable applications allowed the team to assemble 3D design models for each discipline, then use the models to calculate quantities and statistics. Goldwind performed comprehensive collision detection for the multi-discipline models both jointly and separately, and made any necessary design changes. A construction simulation and animation provided insight and direction to the contractors.

Bentley's integrated applications provided the solutions necessary to resolve issues that arose during the project. Goldwind used the interface between

ProStructures and STAAD.Pro to shift from modeling to structural analysis and then back again. Model information passed seamlessly between the 3D design applications, allowing the team to analyze and compare different structural designs. Goldwind used RAM and data from STAAD to analyze a wide range of loading conditions.



To meet China's target of 250 gigawatts of cumulative connected wind capacity in three years, Goldwind used Bentley software to develop a tower generator that increases the efficacy of wind turbines in low-wind areas.

“Using Bentley software accelerated our research and development and improved the quality of our work.”

*– Hao Huageng,
Design Manager, Xinjiang
Goldwind Science &
Technology, Co., Ltd.*

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Iteration Strengthens Design Quality

Using an iterative design process accelerated the pace of the hybrid tower project. The result was an integrated structural steel and cement model that was closely scrutinized for connectivity, interferences, and constructability. Team members were easily able to understand the status of the current design scheme and participate in making improvements. Goals such as optimizing the size of the wind turbine blade and the use of materials were accomplished as part of the collaboration among disciplines.

At every step of the process, Goldwind had assurance that the project's design specifications would comply with applicable regulations and safety guidelines. Bentley applications included the Chinese design specifications, material libraries, and other information to be considered during design, which helped ensure that the final structural design would fulfill these requirements.

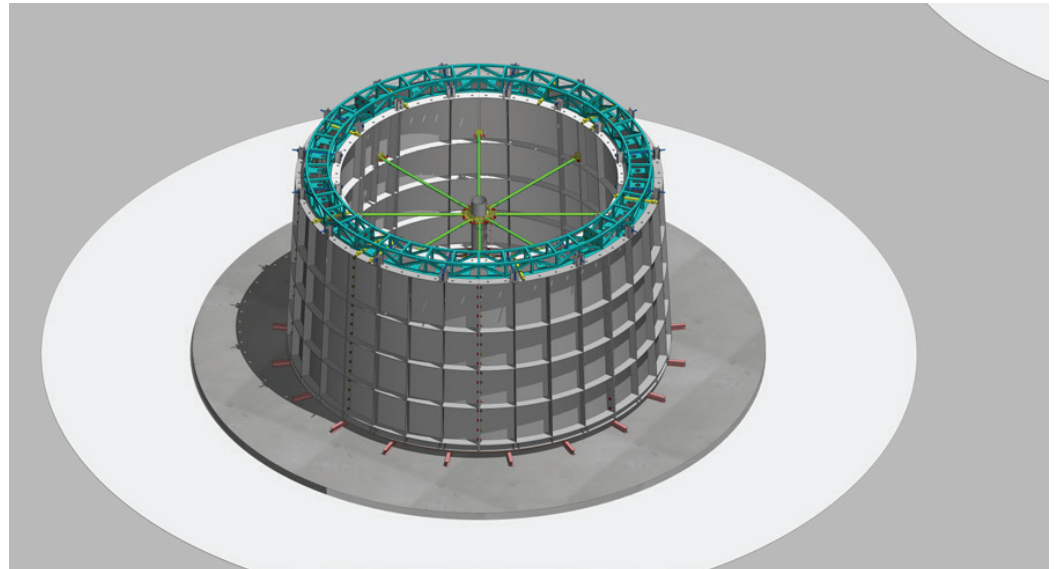
The federated BIM approach ultimately allowed the team to deliver a hybrid tower that uses wind energy 23 percent more effectively. Moreover, integrating Bentley's 3D technology saved the project team more than 400 resource

hours during the research and development process, reducing labor time by more than a third and saving the company CNY 900,000.

World-leading Product

With a presence on six continents, Goldwind is one of a few wind turbine manufacturers in the global market to offer a hybrid tower solution. The company is initially targeting Central, Eastern, and Southern China as well as East Asia. The product not only uses wind energy more effectively but also costs less to construct. Because the tower uses less steel, construction costs are reduced by 15 percent, which accounts for nearly 3 percent of the total installation cost according to industry observers.

BIM-driven development of innovative technologies such as the hybrid tower is producing cost-effective solutions on the global market for wind energy. Goldwind's new products cement the company's status as a world-leading wind turbine provider and advance wind power as an alternative to fossil fuels. The company will continue to play a leading role in the country's 13th FYP commitment to source at least 15 percent of its primary energy from non-fossil fuels by fiscal year 2020.



Goldwind's hybrid tower design uses less steel, therefore decreasing construction costs by 15 percent and increasing the utilization rate for wind energy by 23 percent.