Challenergy Inc.

Sumida, Tokyo, Japan

The Model WLS Low-Torque Shaft Unit is Crucial in Making the Magnus Vertical-Axis Wind Turbine a Reality

Shocked by the Fukushima Daiichi nuclear disaster caused by the Great East Japan Earthquake in March 2011, I wanted to realize a world that does not rely on nuclear power. I looked into renewable energy, but what I found was that wind power generation was lagging behind in Japan. Despite its great potential for wind generation, Japan's wind conditions are unstable, and typhoons or sudden winds can easily cause accidents and malfunctions. With that knowledge, I embarked on the challenge of making the Magnus Vertical-Axis Wind Turbine, the first in the world of its kind, which enables steady power generation even in a harsh environment like Japan.

The Magnus Vertical-Axis Wind Turbine has cylinders in place of propellers. The rotation of the cylinders in the wind generates a Magnus effect, which causes the whole turbine to spin. This is the same principle that causes curveballs to swerve in baseball.* The adjustment of the cylinders' rotation based on the wind speed allows power to be generated in the presence of both normal and strong, typhoon-like winds. An additional benefit of the vertical-axis structure is that inconsistent wind directions have no effect on its performance. I obtained a patent in 2013, and made the leap to establish Challenergy in 2014.

I first got in contact with THK when I saw their Model WLS at WIND EXPO. THK is the only manufacturer that sells shaft units with such low-torque rotation, which is essential for efficient power generation, so I felt like I had found exactly what I was looking for.

We faced a series of difficulties during development, but during our trial of the turbine in Nanjo, Okinawa Prefecture, which began in August 2016, we successfully achieved stable rotation even during near-typhoon level winds with instantaneous wind speeds up to 25 m/s. Various problems have occurred during the trial, but THK's shaft unit has withstood the sea breeze with almost no rusting, and even now, it has maintained its performance with no change in torque.

Our current goal is to utilize mass-produced turbines with a power output of 10 kW by 2020. In the future, we would like to make 1 MW turbines a reality, but that would require a bearing unit dozens of meters long. We will have to rely a lot on THK's technical expertise, but I hope to continue our successful collaboration in the future.

Challenergy Inc.
Founder, President & CEO
Atsushi Shimizu

Magnus Vertical-Axis Wind Turbine set up in Nanjo, Okinawa Prefecture

***The principle behind the Magnus Vertical-Axis Wind Turbine**

1. When a pitcher puts spin on a ball, the ball encounters a headwind as it flies to the catcher.
2. The curveball rotates counterclockwise when viewed from above.
3. The left side of the ball is rotating in the same direction as the headwind, so air flows faster on the left.
4. The right side of the ball is rotating in the opposite direction of the headwind, so air flows slower on the right.
5. The ball curves to the left because of the difference in the flow of air on the left and right sides of the ball.
6. When spin is applied to a turbine cylinder instead of a ball, the force of the cylinder trying to swerve in the wind rotates the whole turbine.