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Meidensha Corporation

To members of the media

Demonstration experiment begins on lightning protection parts designed to prolong the lifespan of wind turbine blades at Setana Offshore Wind Farm

Meidensha Corporation (Meiden) has begun a demonstration experiment on receptors, essential parts for protecting wind turbine blades from lightning, at the Setana Offshore Wind Farm in Setana-cho, Hokkaido. The newly developed receptors have excellent conductivity and mechanical strength, allowing them to withstand wear caused by lightning. This innovation reduces the risk of damage to the blades and minimizes operational stoppages. Consequently, these products help wind farm operators increase electricity production, while reducing maintenance and repair costs. (Patent Nos 7355142 and 7525008)

Tip receptor

Rod receptors

*1: Receptors are installed at the tip of a blade to attract and capture lightning, with the aim of protecting the blades and other equipment. The down conductor located inside the blade directs lightning current to the ground through the nacelle and tower.

■ Challenges faced by the wind power industry

According to the International Energy Agency (IEA), the amount of wind power generation is projected to increase 38 times in Japan and 15 times globally by 2050 compared to 2020 levels. As more wind farms are constructed worldwide and turbines become larger, mitigating damage to blades caused by lightning has become a significant concern, as such damage can lead to extended operational downtime. This issue is more acute in offshore wind farms, which face higher maintenance and repair

costs compared to their onshore counterparts.

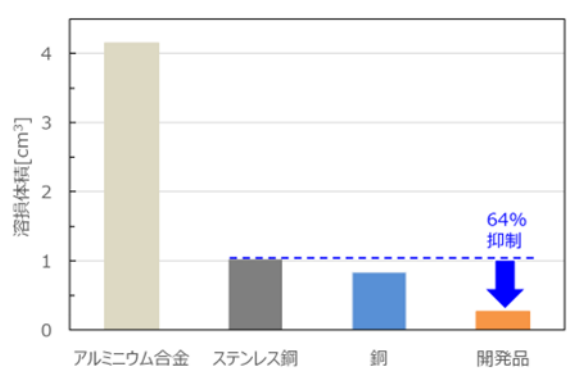
■ Blade standards and risks for wind farm operators

In testing carried out in accordance with the lightning protection standards for blades set by the International Electrotechnical Commission (IEC), blades equipped with receptors must withstand up to 600C (Coulomb: current multiplied by time) of lightning energy per strike. However, there have been numerous instances of lightning exceeding 600C during the winter in locations such as the Sea of Japan coast. This situation has forced wind farm operators to incur high repair costs for blades damaged by lightning exceeding 600C or to invest in expensive insurance policies to cover such damage.

An example of damages done to a receptor and blade after a lightning strike.

■ Features of Meiden’s receptors

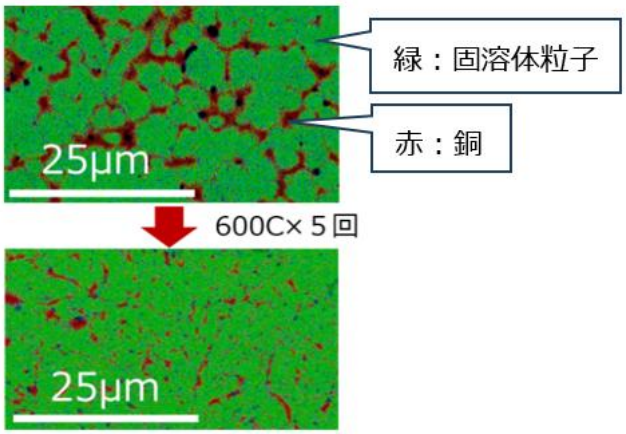
1. Less damage and wear caused by lightning



Aluminum alloy　　Copper　　Developed material

The receptors are made from a composite alloy of highly heat-resistant solid-solution particles and highly conductive copper. When struck by lightning, metals such as copper can vaporize and wear down as their temperature increases. However, these receptors significantly reduce wear caused by vaporization because they direct the heat from lightning toward the solid-solution particles. Additionally, the receptors prevent major dents on the blade surface, thereby minimizing erosion-related wear and reducing abnormal sounds, even at high speeds, where significant air pressure is applied to the tip of the blade.

2. Capable of withstanding multiple lightning strikes



<Diagram>
Green: Solid solution particles
Red: Copper

Composition diagrams before and after a lightning strike

After a lightning strike, the highly heat-resistant solid-solution particles undergo further

miniaturization, forming a composition that is homogeneous with copper. This process enables the blade to withstand multiple lightning strikes.

■ Outline of the demonstration experiment

We initiated the demonstration experiment at the No. 1 Wind Turbine of the Setana Offshore Wind Farm after confirming the operational safety of the receptors during a two-year demonstration experiment at the onshore Hachiryu Wind Farm, which began in 2022. Moving forward, Meiden will assess the lightning resistance of the receptors and measure lightning energy at both the Hachiryu and Setana wind farms. The experimental wind turbine at Hachiryu has already endured multiple lightning strikes, but the wind farm has continued to operate normally.

■ Future prospects

The Meiden Group operates wind farms at three locations in Chiba, Akita and Ishikawa prefectures, with a combined output of 51,000kW. At the same time, the Group has engaged providing maintenance and repair services to wind farms owned by other companies, allowing it accumulate significant expertise in wind power generation systems.

Offshore wind power generation facilities require numerous pieces of equipment and parts sourced from a diverse range of supply chains. The Group is committed to achieving the Japanese wind power industry's goal of domestically procuring 60% of the necessary components by 2040*2. This commitment involves efforts to produce blade lightning protection systems domestically through the demonstration experiment of the receptors. The Group will also explore the potential synergy effects that the domestic production of these systems could have on its maintenance and repair services.

*2: Supplementary material (from the website of the Ministry of Economy, Trade and Industry)

Vision for Offshore Wind Power Industry (1st)
https://www.enecho.meti.go.jp/category/saving_and_new/saiene/yojo_furyoku/dl/vision/vision_first_en.pdf

■ Setana Offshore Wind Farm

Location: Setana-cho, Hokkaido
Maker: Senvion
Rated output: 660kW x 2 wind turbines
Start of operation: 2004

■ Hachiryu Wind Farm

Location: Mitane-cho, Akita Prefecture
Maker: Senvion
Rated output: 1,500kW x 17 wind turbines
Start of operation: 2006

Location: Oga-shi, Akita Prefecture
Maker: Samsung Heavy Industries
Rated output: 2,500kW x 1 wind turbine
Start of operation: 2013