

are your
wind turbines
well protected
from lightning?



Lightning: A real challenge for wind farms

As wind turbines are typically the tallest structures in the surrounding area of a wind farm, it is expected that they will attract direct lightning strikes several times during their operating life. Lightning produces an intense electromagnetic field that induces transient overvoltages throughout the turbine's wiring system. These powerful electrical surges propagate through the wind turbines' electrical system and can cause severe damage to equipment including power components (generators, transformers, power converters etc.), control electronics, communication and SCADA systems. Damages may be immediate, i.e. during the lightning event, or equipment damage may occur at any time due to the cumulative effect of repetitive exposure to surges.

Lightning creates serious challenges for wind farm operators since replacement of the key power components - generators and transformers - is expensive and in many cases lightning induced failures may not be covered by manufacturers' warranties. Lead-time for replacement parts may be significant and furthermore access to wind farm sites may be restricted for weeks due to weather conditions.

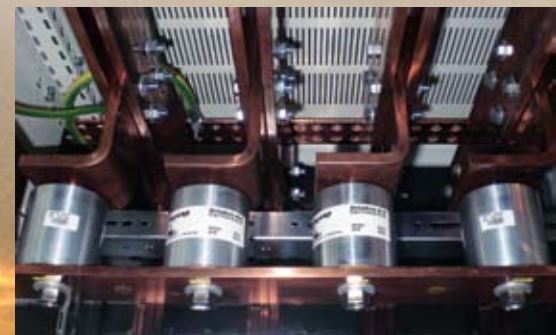
When it comes to offshore installations or in remote rural areas, transportation often poses an extra challenge. Service team costs are also an additional expense but the most significant impact for wind farm operators is definitely the loss of revenue during down time!

Solution

Wind turbines have traditionally been equipped with conventional DIN rail mounted surge protection devices (SPD's). For many years this was the only technology available to wind turbine manufacturers. As these conventional SPD's were originally developed for residential and light industrial use, their application in critical wind turbine applications has not been effective. They have not prevented routine power and control systems failures. In several cases their failure may create critical alarms that stop the operation of the turbine and require service crews to visit the site and restore its operation. This has adversely impacted the profitability of wind farm investments in many cases.

Therefore, reinforcing the surge protection systems integrated in modern wind turbines has become an imperative need and a priority. The solution to the lightning – surge protection problem was given by Strikesorb, a superior industrial grade surge protection technology, designed to provide high reliability in addition to safe and maintenance free operation.

Raycap's Strikesorb modules are based on cutting-edge design parameters, which preclude common failures associated with conventional DIN rail mounted SPD technology. Strikesorb modules incorporate a robust industrial grade metal oxide varistor (MOV) in a distinctive cylindrical aluminum housing. This design provides the ability to offer lifetime protection against surges as it resolves ageing issues which seriously impact the performance of DIN rail mounted SPD's. Strikesorb modules sustain multiple and successive lightning strikes and power surges without requiring maintenance. Strikesorb modules are classified as Class I SPD's according to the international IEC 61643-1 standard for surge protection devices and are fully compliant to the new UL 1449 2nd edition safety standard (February 9, 2007 revision). In addition to Strikesorb's ability to absorb and efficiently dissipate intense power surges, it has been tested for safe operation to high levels of short circuit currents.



Custom-made internal Strikesorb based upgrade kit

Strikesorb®

UPGRADING LIGHTNING & PO

This, in combination with the fact that it does not rely on the use of internal fuses or thermal disconnects provides its users with great installation flexibility.



StrikeSorb modules can be combined in different configurations to upgrade the protection of wind turbines. They can be installed in front of sensitive electronic subsystems or power components (generator, transformer) and prevent damages that significantly impact the turbine operation. Enclosure options are available for indoor or outdoor installations. In space-limited applications where the use of an enclosure is not an option, StrikeSorb modules can be integrated on the transformer LV taps, or inside the various electrical panels of the turbine.

Wind farm operators now have the opportunity to upgrade the lightning/surge protection levels of

their operating turbines by using StrikeSorb-based upgrade kits. These kits are custom designed to meet the specific requirements of a particular wind turbine and allow for easy installation during periods of planned maintenance.

In order to address the needs of the international wind power market, Raycap, the manufacturer of StrikeSorb, has established a worldwide network of specialized partners and provides a full range of professional services including site survey, installation supervision, engineering and design, field analysis and technical training to wind farm operators.

Field Experience

StrikeSorb is a mature and field proven technology with hundreds of thousands of installations worldwide. Applications include, but are not limited to, telecommunication sites, industrial plants, defense systems, airport facilities, radar systems, and oilfields. Leading wind turbine manufacturers have incorporated StrikeSorb modules in their turbines, providing a superior level of protection to their customers.

In addition to wind turbine manufacturers, several wind farm operators around the world, have adopted the practice of upgrading the protection levels of their installed turbines by retrofitting them with StrikeSorb based protection upgrade kits.

A recent example is the case of Rokas S.A. part of IBERDROLA Group. Having experienced a significant number of transformer failures due to lightning, they decided to conduct field trials of the StrikeSorb technology in their wind farms in North Eastern Greece. Actual installations in 24 turbines for a period of 18 months proved that the problems of failed transformers were completely alleviated, whereas in nearby wind farms transformers kept failing. These initial installations were followed by many more in lightning prone areas. StrikeSorb has become the standard technology for the lightning protection of their wind turbines.



Custom-made external StrikeSorb based upgrade kit

WEATHER SURGE PROTECTION IN WIND TURBINES

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A Foundation for the Future

Years of operational experience have proven lightning to be a primary cause of wind turbine failures. Conventional DIN rail mounted SPD's have been proven to be inefficient in preventing damages in wind turbines due to lightning surges. Wind power is the fastest growing energy source today.

To reach its full potential, it must be both affordable and reliable. By adopting Strikesorb based state-of-the-art lightning/surge protection upgrade kits, wind farm operators can significantly extend the operating lifetime of their wind turbines, minimize their operating costs, securing revenue and maximizing their return on investment.

For more information on Strikesorb protection technology visit

<http://www.raycapsurgeprotection.com>

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