3M™ Wind Vortex Generators

Aerodynamic Performance Upgrade

www.3M.com/wind
Enhancing Efficiency at Every Turn with 3M™ Wind Vortex Generators

The Challenge
Due to shape and operation limitations, the blades of large pitch-regulated wind turbines often have suboptimal aerodynamic properties at the root. This frequently leads to undesired airflow separation – known as aerodynamic stall – and can have a significant impact on wind turbine efficiency. Surface roughness and leading edge erosion even amplify the issue.

The ideal structural twist and chord length of the blades that would be required for avoiding this effect is hard to realize and therefore the design compromise taken by blade OEMs generally offers the potential for aerodynamic improvement of blade performance.

The Solution
3M has joined forces with Smart Blade and UpWind to develop and field-test a maximum performing, highly reliable and quick-to-install aerodynamic enhancement system called 3M™ Wind Vortex Generators.

3M Wind Vortex Generators are tailored to each specific blade type and help improve the blade performance by energizing the flow around the surface. This helps reduce flow separation and increases the performance of the entire turbine in terms of power, loads and service life.

Maximum Performance
Vortex Generator physics were designed and tested in the wind tunnel by Smart Blade, a German engineering company with expertise in wind turbine aerodynamics

Quick and Accurate Installation
The installation process has been verified and optimized by UpWind, a US wind turbine service provider offering a full range of O&M and performance services

High Reliability
The product design and supply are ensured by 3M, a global technologies company with key competencies in material science, bonding technologies and long term outdoor weathering experience

3M Wind Vortex Generator
Several of these are attached to the root section of a wind turbine blade on defined spots that are determined using a proprietary analysis process.
Superior Customer Value Through 3M Bonding Technology and Materials Expertise

As reliability is the key to achieving a long term, profitable investment, the material selection and evaluation is based on 3M’s extensive knowledge about polymers, bonding technologies and weathering. 3M™ Wind Vortex Generators are made of a highly durable thermoplastic with dimensional stability and strength which has a proven track record of superior weathering resistance. Furthermore, our Vortex Generators are equipped with 3M™ Acrylic Foam Tape die-cuts that provide excellent long-term durability and holding power while treating the blade surface with care.

Your Benefits

Address aerodynamic blade issues caused by limited twist and chord length at blade root

- Increased AEP, typically of 2 to 3%, has been confirmed in different case studies
- Stabilized aerodynamics which balance load effects of unsteady wind conditions
- Reduced noise due to less stall

Profit from an economically viable upgrade opportunity that gives you peace of mind

- Designed for highest reliability and fast roll-out to wind parks
- Relying on joint competency of 3M (material knowledge), Smart Blade (aerodynamic expertise) and UpWind (O&M expertise) as well as a global network of O&M companies for installation
- Adaptable to different blade types independent of turbine OEM
- Proven in hundreds of existing installations and backed by case studies about actual performance improvement
- Payback time of approximately 1 to 2 years including installation, materials and downtime

The optimized assets help achieve a significantly higher energy yield and higher profitability. The increase is dependant upon the turbine site, the turbine type and the turbine condition. As our long term field tests have shown, an increase in annual energy production of 2.0% or more can be expected.
3M Renewable Energy Division: Unmatched Capabilities

3M's commitment to the renewable energy industry includes a global organization of research and development, sales, marketing, manufacturing, and technical service—all dedicated to developing reliable materials that are designed to reduce costs and improve performance.

Expertise
Founded in 1902, 3M has extensive experience developing durable materials for outdoor applications in transportation, commercial graphics and optics. This includes world-class facilities for simulated and real-time weathering exposure and testing.

Innovation
At 3M, the innovation is never-ending. Whether the free-flow of ideas and solutions is occurring among our people, our technologies, our industries or the geographies where we operate, the human and technological connections within 3M enable infinite combinations and applications of expertise as ideas multiply and solutions expand.

For more information on our wind energy product line, contact 3M Renewable Energy at 800-755-2654 or visit us at www.3M.com/wind.

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