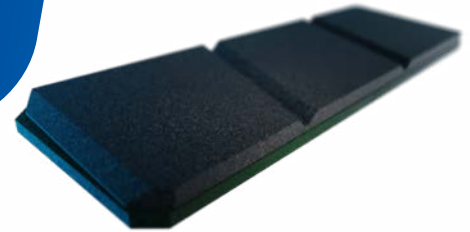


# WIND TURBINE BRAKES

## SOME MATERIAL CONSIDERATIONS



For wind turbine generators to be efficient, the turbine blades need to face directly into the wind and maintain that position even when the wind direction changes. This task falls to the yaw brakes and reliable performance is determined by the materials used in manufacturing the brake pads.

Bjarne Vestergaard Havsteen, Senior Project Manager R&D, at Svendborg Brakes, looks at the features of modern brake materials and their benefits.

The design and construction of modern braking materials have to take into consideration many different factors, including the environmental and political implications that will affect the choice of materials. In addition, certain design features can provide significant benefits in performance and efficiency.

Operators of wind turbine generators (WTGs) require durability and reliability from their equipment and getting the most from the braking system can have a significant impact. From extended service life to reduced noise and optimised maintenance routines, making the right choice in terms of braking components can deliver several benefits for all those involved.

### DESIGN BENEFITS

Manufacturers of parts that need to be changed during routine maintenance should try to make this operation as easy as possible. In the case of WTGs, the majority of the equipment is located at the top of a very long ladder so consideration for the maintenance personnel is always appreciated.

Take for example the current product range from Svendborg Brakes, part of the Regal Rexnord Corporation, where small design developments have made a significant improvement in performance. The yaw brake pads have cut-off corners, which make them easier to remove and install during routine maintenance.

The steel backing plate is now thinner, allowing more friction material to be added and reducing the overall weight of the part. Depending on the size of the WTG, there can be many yaw brake pads which may need changing, and minimising the weight of the replacement parts is appreciated during the ladder climb.

The backing plate itself also has additional corrosion protection in the form of zinc nickel plating that again makes it easier to remove when the brake pad has reached the end of its service life.

### HIGHLIGHTS

- Friction material needs to not only provide for safe and long life, but also needs to take into account environmental and political implications
- Reducing noise and friction wear (dust) is also of paramount importance
- Geometrical features also are prominent in design considerations
- Friction materials should comply with REACH legislation, restricting the use of harmful materials
- All these issues are met and exceeded when using yaw brake friction materials from Svendborg Brakes, our so called 'GREEN PADS'

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This is shown by the visual wear indicator built in to the brake pad, enabling maintenance engineers to assess the best time to change the components.

In addition, the process of replacing the brake pads has been made considerably easier with the introduction of a new lifting tool. Once installed, this time-saving device helps manoeuvre the original brake pad and lower it to the floor. The process is reversed to install the new brake, after which the tool can be repositioned to operate on the next brake. The new service tool significantly reduces the time required to maintain yaw brakes which reduces the downtime of the turbine and minimises running costs.

It is also possible to install pads with electrical wear indication, similar to those used in the automotive industry, which can be used to alert maintenance personnel when the brake pads need to be replaced. This ensures the efficient use of maintenance time and means that planned maintenance visits are as productive as possible.

Svendborg Brakes has also developed a slot and chamfer in the brake material that keeps dust and debris away from the pad area, preventing glazing and reducing noise associated with the brakes. In conjunction with a groove in the disc material, brake noise can be almost eliminated in the majority of cases, irrespective of the original manufacturer of the WTG.

## SVENDBORG BRAKES™

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### ENVIRONMENTAL LEGISLATION

One of the issues with the rapidly developing wind turbine market is that some of the legislation regarding the construction and materials is lagging behind. In some cases, where processes and materials are common, manufacturers are adopting standards and directives from other industries such as automotive.

Friction materials that are used in Europe should comply with the registration, evaluation, authorisation and restriction of chemicals (REACH) legislation. In short, this means that they are free from asbestos and contain less than 0.1 percent of mercury, chromium 6+ and lead as well as less than 0.01 percent cadmium.

### WORKING WITH THE AMERICAN MARKET

For any company that uses minerals in the manufacture of its products, the Dodd-Frank Act, which primarily aimed at improving financial stability, also makes provisions for so-called 'conflict minerals'. This means raw materials such as tin, tungsten, tantalum and gold cannot be sourced from the Democratic Republic of Congo or adjoining countries without a due diligence review.

Manufacturers of brake materials should be able to trace each raw material through the complete supply chain, back to the original source. Each report should then be filed with the Securities and Exchange Commission (SEC), according to the Exchange Act.

Adopting procedures that comply with both European and American legislation will ultimately pay off in other markets as the world continues to exploit wind power. Markets in Asia and South America are growing rapidly and they will need to implement their own standards, which are often based on those already established in existing markets.