

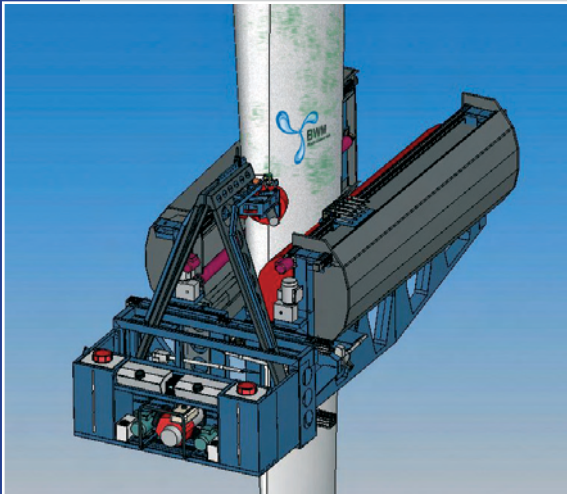
# Optimise efficiency and inspect your blades

## Before it is too late!

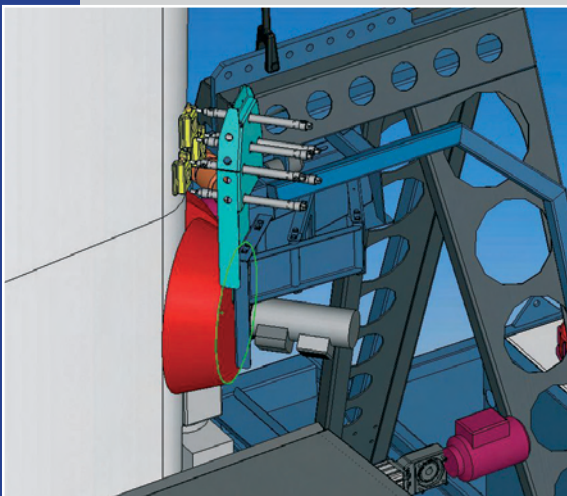


**Can you afford not to have protection, restoring  
and damage inspection on beneficial contract?**

# Keeping your blades clean and polished is a very sound investment



The BWM 3500 pat. pend. in action of cleaning and polishing the blade of a 2,5 MW wind turbine.



BWM with Advanced Ultrasonic System mounted.

## Effective cleaning and polishing in one sweep

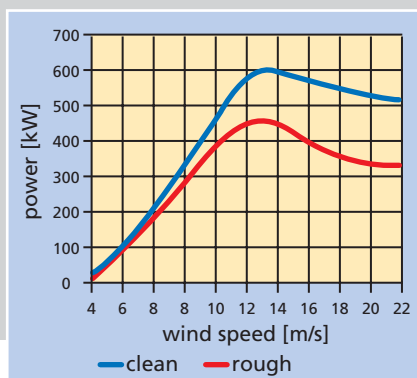
The first full automatic blade wash machine on the market by BWM Blade Cleaner ApS, is able to wash and polish the wind turbine blades in only 40 – 80 min., depending on the size of blade and hub height.

On the site a mobile crane will lift up the BWM, and by a remote control the machine will be monitored and connected to the blade tip. The operator starts the washing of the blade while the machine slowly continues towards the blade root in the top. Sensors on the machine define the wash area on the blades to avoid unnecessary use of washing water. Also the water pressure from the spray nozzles is defined to be the same to avoid damaging the blade surface.

All cleaning materials are environment friendly and waste water will be collected in tanks on the machine. While descending the machine is polishing the blade with bee wax to harden and smoothen the surface to improve the blade efficiency and life time further.

- No environmental damage from washing liquid
- No blade corrosion caused by high pressure water
- No blade damage by hard manual cleaning
- No long turbine stops for washing and polishing
- No external power supply
- Self adjusting to blade profiles
- Stand pat. pend. technology

Double stall situation due to growing layer on the surface of the blade



## DID YOU KNOW THAT:

Onshore turbines agglomerate insect, bird excrements, fungus, dust and sand and may account for up to 20% efficiency loss?

Offshore turbines agglomerate salt and bird excrements, which cause corrosion and an efficiency loss of up to 10%?

# We detect failures and damages while we clean - fast and easy

Courtesy of A2SEA.



## DID YOU KNOW THAT:

BWM operates just as well on offshore sites?

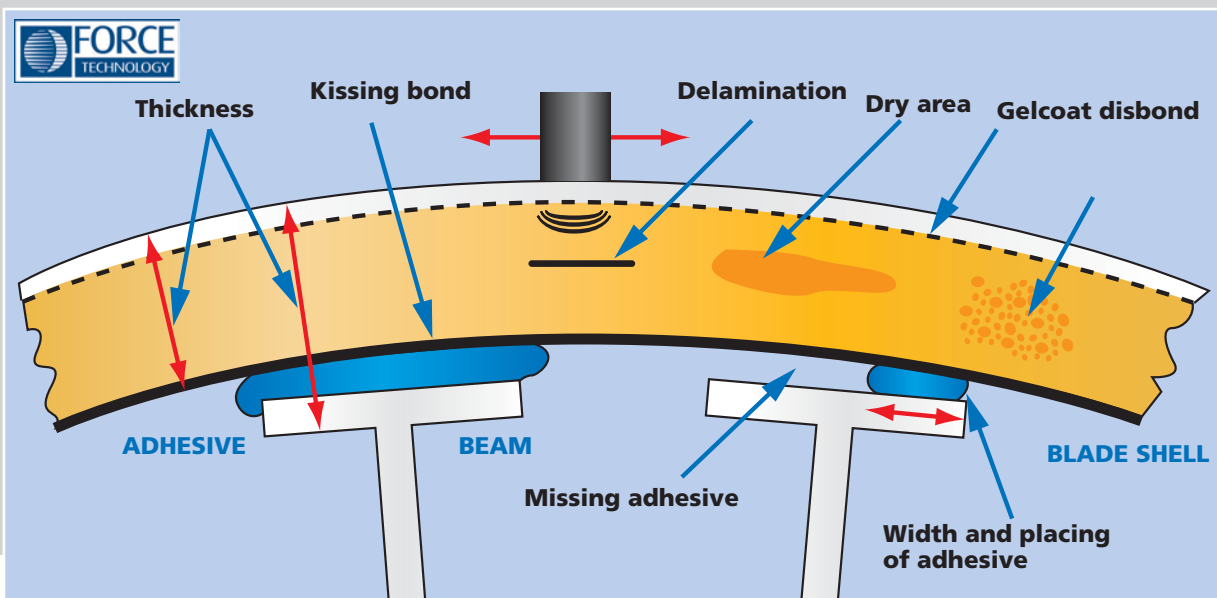
## Inspecting of the blades

BWM Blade Cleaner Aps also offers the customers to check the inner blade condition by an Advanced Ultrasonic scanning to identify the damages in the blades and to determine the quality status before end of warranty period. BWM Blade Cleaner Aps and Force Technology, a private institution approved by the Danish Ministry, have joint the forces and are working together on this issue.

With a large number of methods and equipment to inspect fibre composite materials, the Advanced Ultrasonic scanning has been proven especially suitable for use on a wind turbine blade. The reason for this is the physical nature and geometric orientation of the critical faults as; delamination, dry glass (porosities), adhesion of gel coat, absence of adhesive, lack of bond to adhesive and lack of coverage of adhesive.

- Find failures before the warranty expires
- Find damages while they can still be repaired
- Find weaknesses caused by lightning in time
- Avoid the risk of damaging the entire turbine

Illustration of what can be detected when using Advanced Ultrasonic inspection on blades



**DID YOU KNOW THAT:**

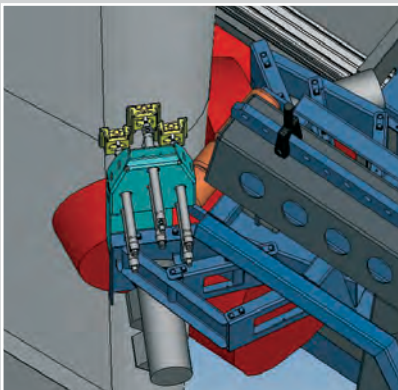
**BWM can clean, polish, inspect and report in only 40-80 minutes?**

**Increase the lifetime of the high investment**

A wind park represents a value of many mio. of dollars. It is the responsibility of the park owner to get the maximum output of the wind park for the minimum costs, to obtain biggest possible profit.

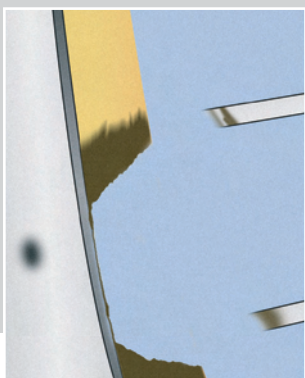
We at the BWM Blade Cleaner offer you to wash, polish, inspect and control your blades, in a quick and safe manner, to improve the power output of the blades, and to determine the quality status of the blade condition to prolong the lifetime and to avoid unscheduled breakdowns of the turbines, all this to give the park owner the best possible return of the high wind park investment.

Furthermore, during the wash and polishing, the operator will prepare a report and video scanning of the visual condition of the blades.



*Advanced Ultrasonic System scanning the front edge of blade*

*Drawing of blade hit by lightning*



**DID YOU KNOW THAT:**

**When a lightning strike hits the blade it only leaves a small stain on the surface of the blade, but may completely burn the interior materials away in a large area leaving the blade severely weakened.**



# WARNING!



**Have you discovered an 1x1 inch mark from lightning, meaning that your blade might be damaged?**



**Solution: The BWM inspects the condition of your blades using scanning, video and visual report of the damaged part**



**The output from your turbine could be as low as merely 75% of capacity!**



**Solution: BWM cleaning and polishing will bring the turbine back to optimal condition and efficiency**



**The life span of your wind turbine is reduced when your blades are not clean!**



**Solution: BWM cleaning and polishing is fast and easy, so you can clean your blades frequently and increase the lifespan.**



**Do you have an overview of any hidden flaws inside your blades before the warranty expires?**



**Solution: A BWM inspection will discover even the smallest flaws in your blade, even delamination and areas with porosity.**



**Do you postpone maintenance and cleaning of the blades because it is time consuming, expensive and hazardous?**



**Solution: A BWM cleaning, polishing and inspection can be done within 40-80 minutes - reducing the down time compared to the competitors**



**Did you know that a breaking blade will damage the other blades with a 90% certainty?**



**Solution: A BWM inspection will help you find damages and repair them before the disaster happens.**



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