Rain Erosion Testing | DNVGL-RP-0171

ACCREDITED TESTING

During its lifetime, a wind turbine blade is subject to continual wear - exposed to sunlight and a constant collision with raindrops, dust particles, hailstones, insects, etc. Strong resistance to this highly erosive environment is crucial for the protective surface of the blade, particularly the highly exposed leading edge.

Choosing the right protection strategy is essential to maximise lifespan, fulfill guarantees and control costs.

Independent third party testing

DANAK PolyTech Test Center is accredited by DANAK according to ISO 17025 and acts as an impartial third party test institute.

Superior testing

Turbines are installed in many different environments, it is impossible to simulate the environmental impact on all sites.

PolyTech Test & Validation offers rain erosion tests on a 3-bladed system that rotates 39 cm test specimens shaped like the leading edges of WTG blades. The system generates adjustable rainfalls from 620 nozzles and ensures that very realistic weather conditions can be simulated for accelerated tests.

DNV·GL Our reliable setup ensures documented repeatability and meets DNV·GL's recommended practice (RP-0171) for the testing of rotor blade erosion protection.

POLYTECH TEST CENTER ADVANTAGES

- ✓ Accredited according to ISO 17025
- ✓ Able to combine different test methods inhouse
- ✓ Able to adapt new standards
- ✓ For combined test, an individual test plan is produced
- ✓ Designated customer area at your disposal, if you wish to attend your test sequence
- ✓ Highly qualified staff

More information on PolyTech Test Center:
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620 nozzles simulate realistic rainfall with adjustable droplet size.

Unique options for combination of test sequences

PolyTech Test & Validation offers to combine rain erosion tests with e.g.

- Accelerated weathering test like ISO 20340 for offshore environments, consisting of
  - 3 days exposure to simulated sunlight and moisture (ISO 16474-2)
  - 3 days salt spray (ISO 9227)
  - 1 day at low temperature (-20 °C)

Other options are available, just as the above example can be adjusted to suit your particular need. Request further information about possible aging/weathering tests available at the PolyTech Test Center.

Typical test procedure

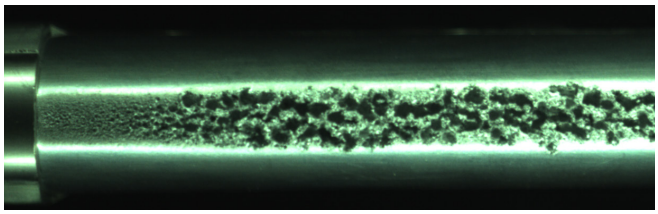
- PolyTech Test & Validation supplies GFRP profiles for rain erosion testing.
- Customer applies leading edge protection material.
- The specimens are shipped to PolyTech Test & Validation for rain erosion testing.
- The specimens are mounted in the rain erosion test machine and accelerated up to a customer defined speed (typically 160 m/s at the tip). When the defined speed is reached, the rainfall is started.
- The test is interrupted at predefined intervals per customer instructions, to document the erosion process by acquiring images of the leading edge.
- The test cycle including high resolution images and data from the test setup is compiled in a Test Report, which is sent to the customer.

Adjustable parameters

- Change between droplet size intervals: 2 - 2.5 mm or 3 - 3.5 mm
- Rain intensity 29 - 56 mm/h
- Water temperature 8°C - 13°C
- Test specimen tip speed 63 - 173 m/s (500 - 1386 rpm)
- Image intervals
- Test duration and sequence

Image options

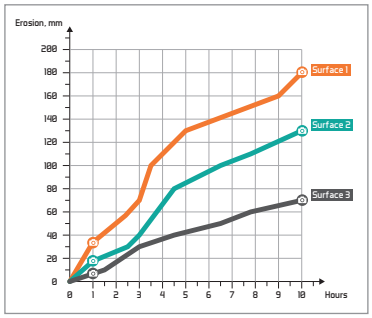
- Automatic high resolution images (20MP - highest resolution in the industry) at defined intervals
- Manual high resolution images
- Manual high resolution images with high contrast setup



High resolution image of uncoated aluminium specimen at the tip end.

A calibration according to DNVGL-RP-0171 is performed after change of critical test parameters.

Suggested evaluation of test results



One way to evaluate the images obtained from the rain erosion test is by converting them to a graph that shows the evolution of the erosion. The images can be analyzed by measuring the erosion progress [mm] at each interval. The erosion progress is plotted as a function of testing hours. Hence, the surface with the lowest slope has the highest rain erosion resistance.

Two good parameters for the evaluation are the incubation time, time before first erosion occur, and break through time, time when erosion has propagated all the way through the evaluated materials.

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