Erosion

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Erosion tests by solid particle impingement

- These tests are performed in TECNALIA typically to evaluate if a material/component can be stored and operated under blowing sand conditions without degradation of its performance, effectiveness, reliability and maintainability due to abrasion/erosion.

- This test method is routinely used in the laboratory to measure the degradation due to solid particle erosion of different materials (paints, composites, metallic alloys, coatings, etc.), e.g. as a screening test for ranking materials in simulated service environments; component life estimation; etc.

- Tests are typically performed under procedures based on the indications of the following standards:
  - ASTM G40 Terminology relating to wear and Erosion.
  - MIL-STD-3033 Particle / Sand erosion testing of rotor blade protective materials
Erosion tests by solid particle impingement

- Tests are carried out with *jet nozzle type erosion equipment*.
- This equipment can be operated **under different conditions**:
  - **Different nozzles**, which allows the use of a variety of abrasives efficiently.
  - Working pressure **from 0.1 bar to 7 bar**.
  - **Remote** control.
  - **Calibration and precise control** for the flow of incident abrasive particles.
  - **No decompression** of the tank containing the abrasive material, i.e. regular and continuous particle flow.
  - **Different angles** of incidence.
Erosion tests by solid particle impingement

Methodology

Test procedures are typically tailored to the working conditions / specifications.

- **Particle selection:** They can be client specific or defined based on on-site particle sample analyses: composition, size, morphology, etc.

- **Test conditions:** They can be client specific or defined based on experience, literature, etc.

- **After-test sample evaluation:** It is performed following clients’ indications or otherwise defined based on the material characteristics, application and an ample set of analysis techniques, e.g. weight loss, profile analysis, spectrophotometric analysis, etc.
Erosion tests by solid particle impingement

Examples

Particle erosion test are relevant and have been performed for a number of sectors:

- Electrical transmission OH lines.
- Wind mills.
- Solar power stations.
- High speed trains.
- Aircraft components.
- …
Erosion tests by rain erosion
Erosion tests by rain erosion

- The aim of the rain erosion test is to evaluate the erosion generated by rain droplets on blade coatings at high speed.
- A 3 arm rotating apparatus has been designed according to ASTM G73-10 “Standard Test Method for Liquid Impingement Erosion Using Rotating Apparatus”.
- Wind energy and aeronautic sectors as main potential users of the device.
Erosion tests by rain erosion

- Samples are placed on each of its **three arms**.
- Different pre and post **weathering** processes can be performed at Tecnalia (UV, saline chamber, climatic chamber, ...)
- Up to **175 m/s** speed in arm’s tips.
- Rain density between **30 and 35 mm/h**
- Rain droplet size: **1-2 mm**
- Room **temperature**
- **Different “rain” compositions can be tested** (deionized water, tap water, artificial sea water, ...).
- Highly **versatile** configuration (both services and RTD projects)
- Test is stopped **each 30’** and damages in the profiles are quantified

*Tecnalia is participating as national expert in the working group that is defining the new ISO Standard “Determination and evaluation of resistance to rain erosion using rotating arm” (ISO/TC 35/SC 9/WC 32 working group).*
Erosion tests by rain erosion

Rain erosion test has been designed to test materials coated in two types of profiles:

225 mm long U-shape: while linear speed at the tip of the profile is 175m/s, the inner part of the profile will remain at 114m/s, with a complete range of intermediate speeds along the profile. This allows to identify the exact speed at which erosion will initiate in wind blade.

50 mm diameter plain profiles: test at a single speed for the whole profile, which can be disposed in different angles simulating several real use situations.
Erosion tests by rain erosion

Rain erosion test are relevant for a number of sectors:

- Offshore wind mills.
- Aircraft components.
- Coating manufacturers.
- …
Testing & Analysis
Lab Scale
Testing & Analysis · Lab Scale

Labs equipped with testing facilities allowing a large number of corrosion tests in atmosphere, immersion or under mechanical solicitation to be performed according to standardized or specific demands.

Materials Testing & Failure Analysis

- Material testing and characterization (i.e. chemical composition determination, microstructure, mechanical properties: tensile test, fatigue, …).
- Surface properties, i.e.: surface roughness, coating adherence, wettability, hardness, …).
- Failure analysis
- Corrosion analysis, forecasting, assessment, control and monitoring.
- Wear and friction characterization.
- Paints and paints characterization.

Standards and Accreditations

Materials testing under NADCAP, ASTM, NACE, DIN, UNE, …)

ENAC Accreditation
Labs equipped with testing facilities allowing a large number of corrosion tests in atmosphere, immersion or under mechanical solicitation to be performed according to standardized or specific demands.

- Accelerated atmospheric corrosion testing
- H₂S Corrosion testing
- Corrosion/degradation under stress & corrosion fatigue
- In immersion (aggressive media) with or without mechanical load.
Thank you for your attention

For more information, please contact:

Iñigo Braceras / inigo.braceras@tecnalia.com
Pablo Benguria / pablo.benguria@tecnalia.com