

# Water droplet erosion



**Figure 1: Water droplet erosion:** samples located in a high speed rotating arm impact water droplets at speeds in excess of 300 m/s causing erosive wear.

## Machine capability

Maximum design speed:  
9,500 rpm 500 m/s.

Nozzle sizes 0.1 - 2.0 mm.

## Sample specification

Two samples tested  
simultaneously.

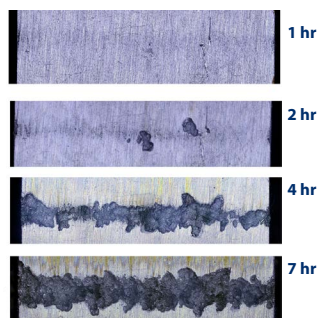
24.0 x 8.0 x 3.3 mm.

## Evaluation

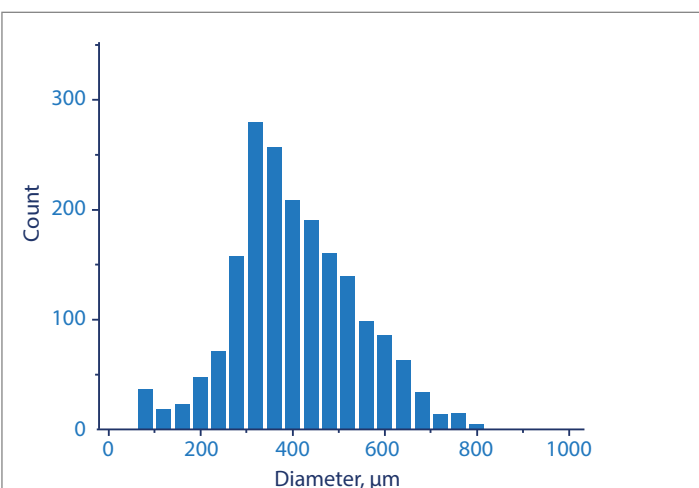
Mass loss measurements.

3D optical microscopy.

SEM with EDX, FIB-SEM.



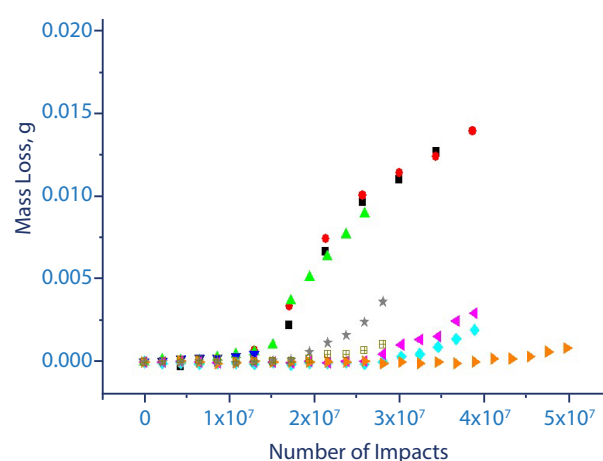
**Figure 2:** Sequential development of wear scars on hardened steel with incremental exposure.



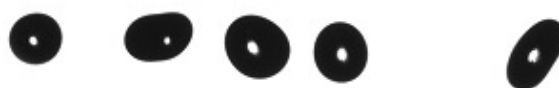
**Figure 3:** Size distribution of water droplets.

## Description

NPL's water droplet erosion test rig is used to investigate the damage resistance of surface finishes when exposed to impact from high velocity water droplets. Two samples are placed at opposite ends of a rotating arm, such that each sample collides with the water jet under a vacuum, as per the ASTM G73 - 10 and ISO 19392 - 2 standards. The test system can generate water droplets of varying sizes and velocities, simulating real-world conditions for wind turbine blades, aerospace components and steam turbines exposed to high-velocity rain. This provides valuable insights into surface durability under different impact conditions. Samples are removed after a set number of impacts, with mass loss recorded and wear scar imaged before further testing.



**Figure 4:** Plot of mass loss vs number of impacts. Black, red and green are repeat experiments with uncoated samples, the remainder have various coatings.



**Figure 5:** Images of water droplets.