

Design and construction of a testbed for the application of real volcanic ash from the Eyjafjallajökull and Grimsvötn eruptions to microgas turbines

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It is well known that volcanic ash clouds emitted from erupting volcanoes pose a considerable threat to the aviation. The volcanic ash particles can damage the turbine blades and their thermal barrier coatings as well as the bearings of the turbine. For a detailed investigation of this damaging effect a testbed was designed and constructed, which allowed to study the damaging effects of real volcanic ash to an especially for these investigations modified microgas turbine. The use of this microgas turbine had the advantage that it delivers near reality conditions, using kerosene and operating at similar temperatures as big turbines, but at a very cost effective level. The testbed consisted out of a disperser for the real volcanic ash and all the equipment needed to control the micro gas turbine. Moreover, in front and behind the microgas turbine the concentration and the distribution of the volcanic ash were measured online by optical particle counters (OPCs). The particle concentration and size distribution of the volcanic ash particles in the intake in front of the microgas turbine was measured by an optical particle counter (OPC) combined with an isokinetic intake. Behind the microgas turbine in the exhaust gas additionally to the measurement with a second OPC ash particles were caught with an impactor, in order to enable the later analysis with an electron microscope concerning the morphology to verify possible melting processes of the ash particles. This testbed is of high importance as it allows detailed investigations of the impact of volcanic ash to jet turbines and appropriate countermeasures.