

PE17) Performance of Gas Turbine Intake Air Filter Made of Depth Filter Media TFM2 at Various Inlet Dust Concentration

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1. Introduction

To keep the intake air which is required for running the gas turbine dust free, air filters made of cleanable filter media are widely used. Recently there is a growing interest of installing the filter cartridges with depth filter media instead of the cleanable media, also known as surface filtration media. Different from the surface filtration the process of particle retention inside the filter mat is more complex (Park, 2008; Hutten, 2007). Particles are collected by means of interception, inertial impaction, diffusion, gravitational settling and electrostatic attraction mechanisms (Hinds, 1982). Depth filtration filter media must have the ability of retaining the particles inside the layer and provide efficient particle collection at low pressure drop for long period of service. During this study, tests with the filter cartridges made of depth filter media have been performed. The concentration of the dust injected determines the test duration. This test has been conducted to evaluate the performance of newly developed depth filter media TFM2 regarding filter pressure drop characteristics and particle collection efficiency by varying the dust inlet concentration.

2. Experimental Method

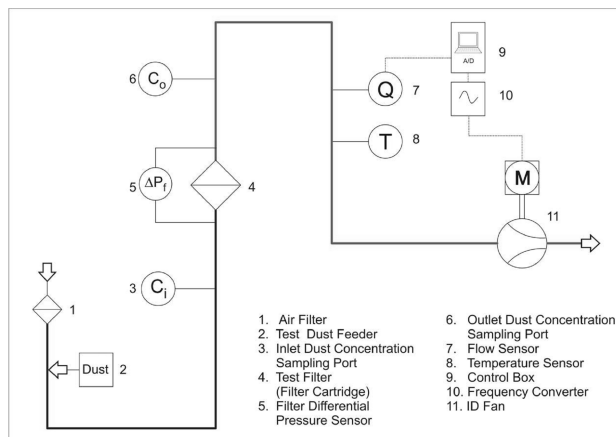


Fig. 1. Flow chart of the gas turbine filter cartridge test unit.

The test was made using cartridges with newly developed depth filter media. Test is conducted under ambient air temperature and humidity conditions. Test dust was the standard AC Fine. Pressure drop (DP) of the filter cartridge is evaluated by varying the flow rate below and above the values of the nominal flow rate, in this case $1,000\text{m}^3/\text{min}$, without dust loading. Dust holding capacity (DHC) test is made by loading the cartridge with dust of high and low inlet concentration

Ci. DHC is expressed in amount of the dust collected during dust loading time which is determined by gravimetric measurements of the cartridge made before and after the test. During the DHC tests, collection efficiency is calculated from the measurements of particle concentration in feed air upstream and downstream of the filter cartridge. Figure 1 shows the experimental setup with main functional units.

3. Results and Discussion

At the pressure of 62mmAq the test filters have similar DHC values with 517.15 g for test with high Ci and 551.94 g for the test with low Ci. There is a great difference in testing time evident. At test conditions with low dust concentration the duration is round 5 times longer than that of the test with high inlet dust concentration. Dust loading characteristics are almost similar since the amount of the dust injected is projected on the filtration area as displayed in Figure 2.

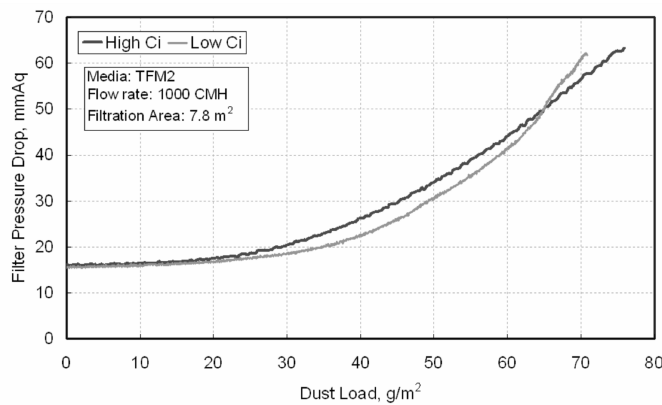


Fig. 2. Filter pressure drop characteristics as function of dust load.

The collection efficiency shows slightly noticeable difference especially in the range of particles 0.5 to 5 microns. Overall collection efficiency shows only small difference in the values for mass and number based efficiency. Therefore we can conclude that the concentration of the dust has not such a significant effect on the performance of the tested filter cartridge. To understand and fully confirm the effect of the dust inlet concentration on the performance of the depth media filter cartridges it is necessary to perform further tests with other media as well.

Acknowledgements

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