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LightAir AB
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Testing of air purifier

Work requested

On behalf of LightAir AB, SP has tested the performance of an air purifier with respect to particle reduction performance on particles from cigarette smoke.

Item for testing

LightAir IonFlow 50

The air purifier was delivered to SP by LightAir AB on August 13th 2008, and was without visible defects on arrival.

Date and place of testing

Testing was performed on August 19th at and by SP's Energy Technology Department in Borås.

Test procedure

The test method, described below, has been developed in collaboration with LightAir AB.

The air purifier was placed on a pallet, 72 cm above the floor, in the middle of a test chamber 3,5 m x 3,0 m x 2,5 m in size, and constructed from a wooden frame with polyethene plastic sheet walls. The chamber included a speed-controlled fan for the supply air, connected to a HEPA filter, a humidifier and an oscillating fan, directed slightly upwards, that was running throughout the test operation. The number of airborne particles was measured by an Electrical Low Pressure Impactor (ELPI), having 13 impactor stages with the following interval of particle sizes:

0,007-0,028 µm; 0,028-0,056 µm; 0,056-0,094 µm; 0,094-0,156 µm; 0,156-0,264 µm; 0,264-0,384 µm; 0,384-0,616 µm; 0,616-0,953 µm; 0,953-0,161 µm; 1,61-2,4 µm; 2,4-4,01 µm and 4,01-10 µm.

A probe connected to the ELPI was positioned in the chamber at a height of about 150 cm.

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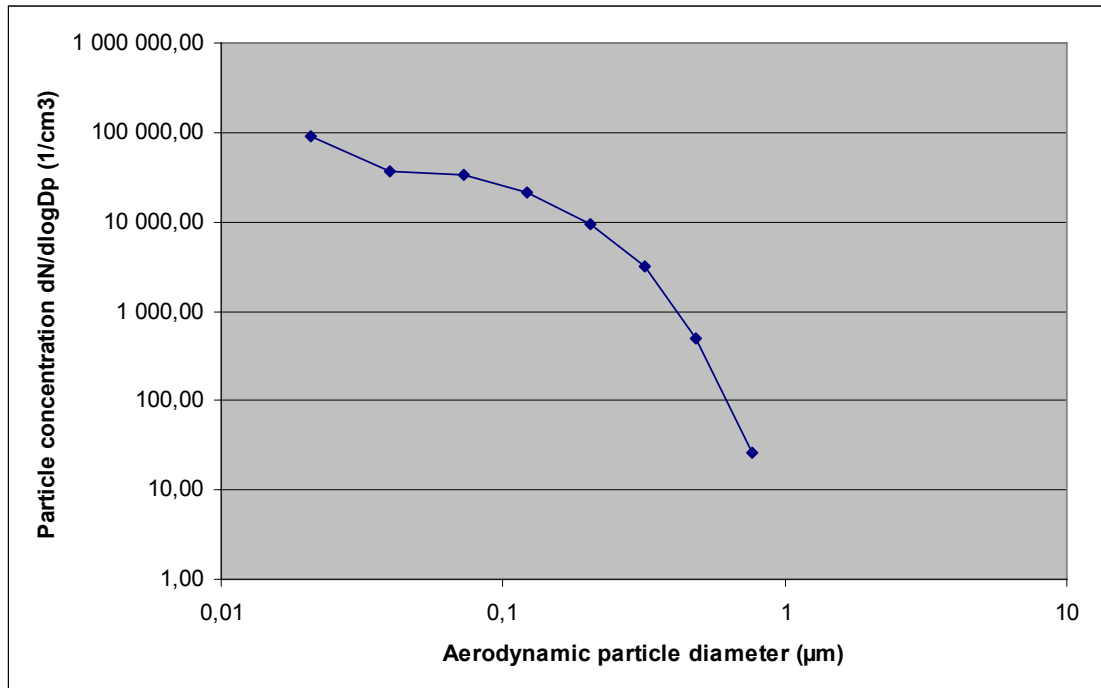


Fig. 1. Particle size distribution from cigarette smoke at a representative measurement

Prior to the measurement test (both natural decay and particle reduction), the air in the chamber was cleaned to less than 100 particles/cm³. A burning cigarette was used as the source of pollution, to give an initial particle count of about 80 000 particles/cm³. Temperature and humidity was measured.

Measurement of natural decline

Sedimentation, agglomeration and the fastening of particles to surfaces¹ result in a natural decline in the particle concentration in the chamber.

A burning cigarette was lit and placed in the chamber until the selected particle concentration was reached. The cigarette was then removed, and the air mixed for five minutes, after which the test measurement of particle concentration was started.

Measurement of particle reduction

The chamber was opened, the air purifier put into it, and the chamber closed. A cigarette was lit and placed in the chamber until the selected particle concentration was reached. The cigarette was then removed, and the air mixed for five minutes, after which the air purifier was started and the power supply voltage adjusted. Measurement of the particle concentration was started, and allowed to continue until the air in the chamber was clean (less than 500 particles/cm³), but in no case for more than two hours.

¹ Nordtest Method, NT VVS 106

Test conditions

Conditions during the test were a temperature interval of 23,0 °C – 23,3 °C, relative humidity 46,0 % - 47,3 %, and power supply voltage 230 ± 1 V.

Results

The result for particle reduction performance are shown in diagrammatic form, with the particle concentration as a function of time. The particle concentration represents all particle sizes. The diagram also shows the natural rate of decline of particle concentration.

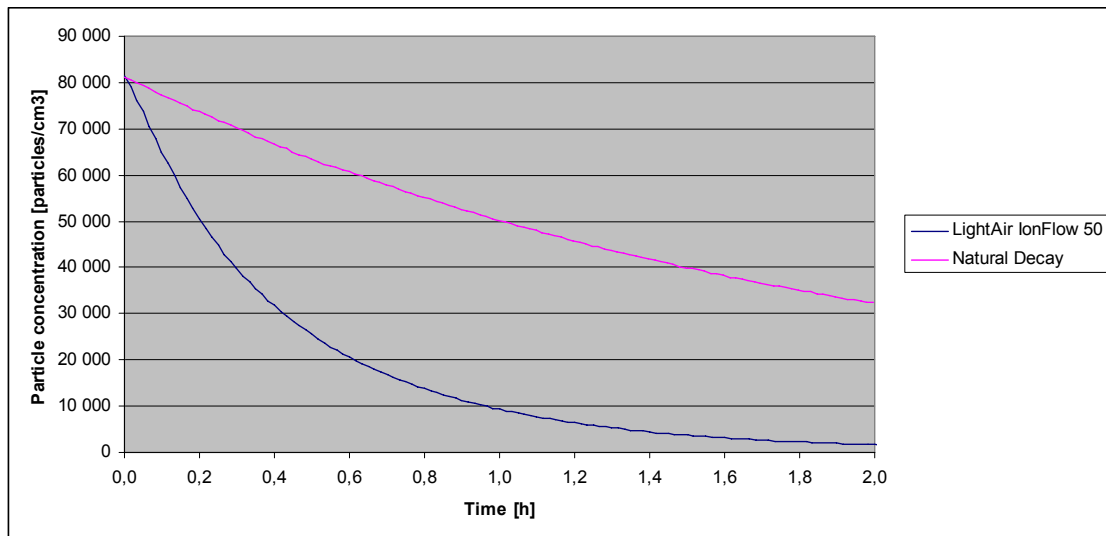


Fig. 2. Particle reduction for LightAir IonFlow 50

Table 1

Air purifier	Particle reduction [%]							
	0,25 h	0,5 h	0,75 h	1,0 h	1,25 h	1,5 h	1,75 h	2,0 h
Natural decay	12	22	30	38	45	51	56	60
LightAir IonFlow 50 / -	44	68	81	89	93	95	97	98

Note that the results quoted in this report apply only to the specific items tested.

Test equipment

Particle counter, ELPI (Electrical Low Pressure Impactor), Dekati	(SP inv no. 202 260)
Wattmeter and energy meter, Landis & Gyr, EMU 1.44	(SP inv no. 201 684)
Temperature and humidity sensor, Vaisala, HMP36	(SP inv no. 201 389)

Uncertainty of measurement

Relative humidity	$\pm 3 \%$
Temperature	$\pm 1 \text{ }^\circ\text{C}$
Voltage	$\pm 0,5 \text{ V}$

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