

Report by Eurofins

The following report is written by Eurofins about the Rensair air cleaning technology. Eurofins is widely regarded as one of the world's leading laboratories in the pharmaceutical, food, environmental, agriscience and consumer products industries. More information can be found [here](#).

The report references "Busy Bee". Busy Bee was an early brand name of what is now known as the Rensair Hospital-Grade Air Purifier.

The report concludes that: "The test of the air cleaner's excretory degree (efficiency) indicates excretory degrees of 99.89% and 99.96% for 0.3 microns and 0.5 microns, respectively" and "Germ counts indicate that the air cleaner efficiently removes microorganisms from the air."

Kind regards,



H. Hendriksen
Inventor and CTO
Rensair



Report
Busybee
Test of air cleaner
June 2002

Client: **Busybee**
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Date: 10 July, 2002- SB/erd/hla

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The test results relate only to the items tested.

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Enclosures

- Enclosure I - Test set-up
- Enclosure II - Used equipment and methods

1. Introduction

14 June 2002 Eurofins Danmark A/S has carried out a filter efficiency test of the air cleaner BUSY BEE UV-AIR CLEANER. The tests were performed by MSc Søren L. Brødsgaard.

The test was requested by Henrik Hendriksen the manufacture of the air cleaner.

2. Background and purpose

In connection with marketing and sale of the air cleaner in question Henrik Hendriksen request documentation for the air cleaner's efficiency to particles including micro-organisms.

Henrik Hendriksen has contacted Eurofins Danmark A/S to perform the necessary documentation.

The purpose of this test is thus to test the air cleaner's cleaning efficiency to particles including micro organisms.

3. Measurement scope

The measurement scope is laid down by Henrik Hendriksen in co-operation with Eurofins Danmark A/S and include the following:

- Excretory degree for particles > 0.3 μm
- Excretory degree for particles > 0.5 μm
- Excretory degree for airborne germ
- Determination of air quantity through the air cleaner at the two flow positions HIGH and LOW

All measurements are carried out at both flow positions HIGH and LOW. Furthermore, the excretory degrees for particles are controlled at different levels of background particle strain.

The UV-light in the filter unit was light during all tests.

All measurements are carried out in a specifically constructed test set-up described in enclosure I.

4. Measurement methods

The applied methods are described in enclosure II.

5. Results

5.1 Flow determination

The flow at LOW and HIGH respectively is determined by measuring the air velocity in the test pipe's cross section. The air velocities are measured on the exhaust side and the mean velocity is determined based on nine measurements in the cross section. The following results have been achieved:

Flow at the position: LOW 300 m³/time

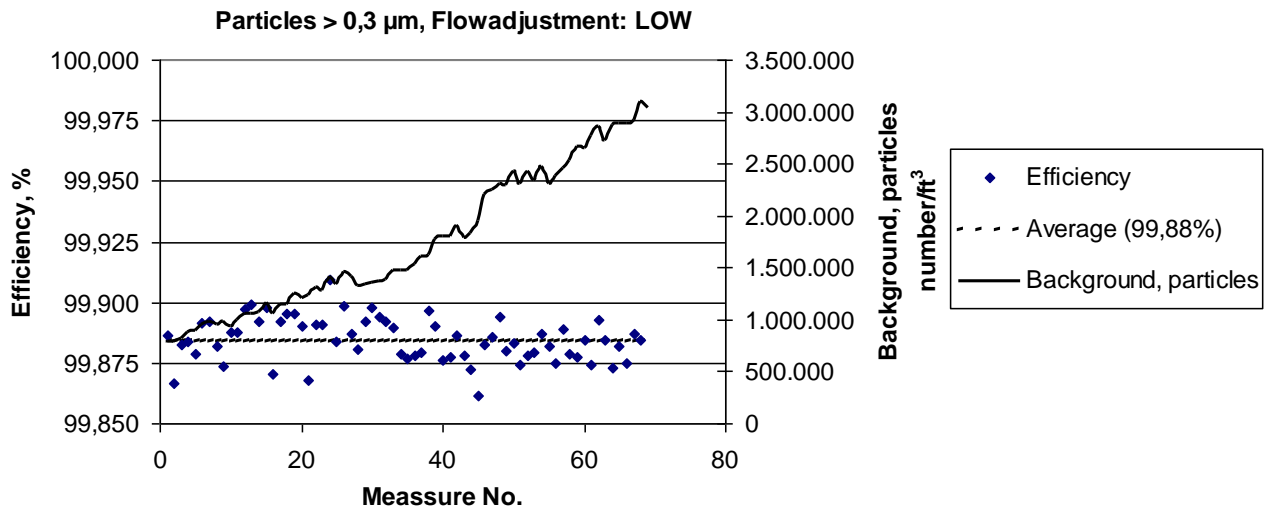
Flow at the position: HIGH 560 m³/time

5.2 Excretory degree for particles

the air cleaner's excretory degrees for particles (efficiency) are determined by adding a controlled background contamination by means of an aerosol generator. Accordingly the particle content is simultaneously measured before and after the filter respectively over a period of where the background contamination increases from less than 1,000,000 particles/ft³ to larger than 3,000,000 particles/ft³. The excretory degree is determined according to the following formula:

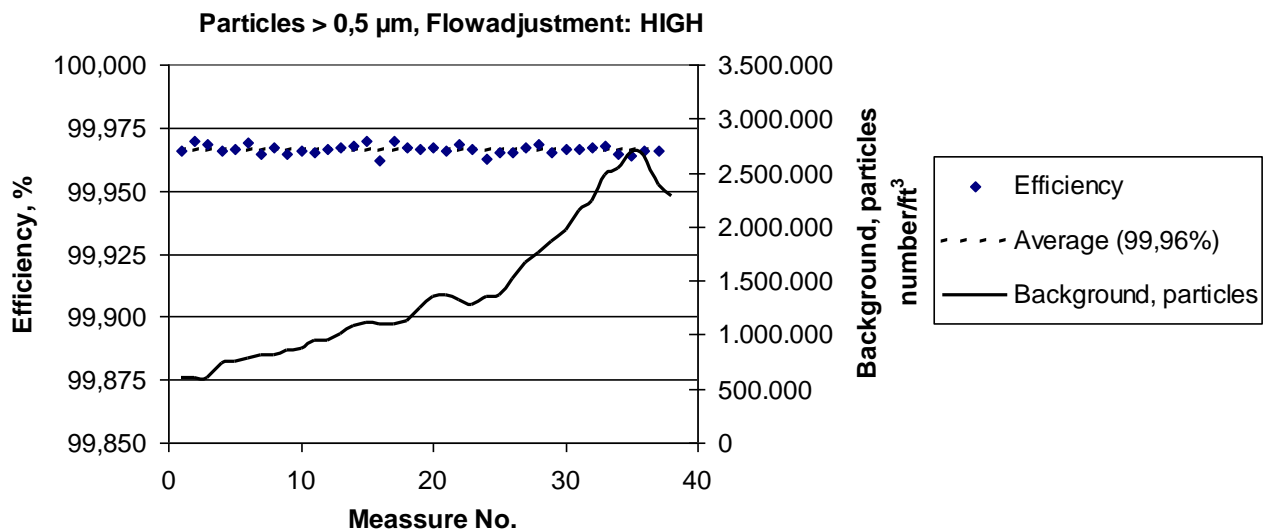
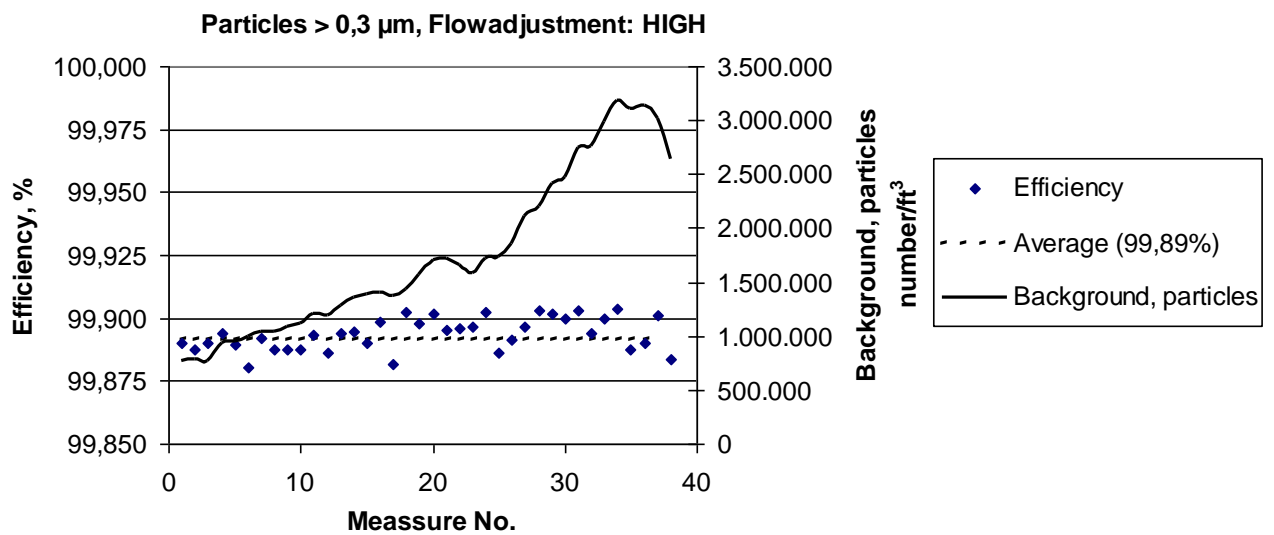
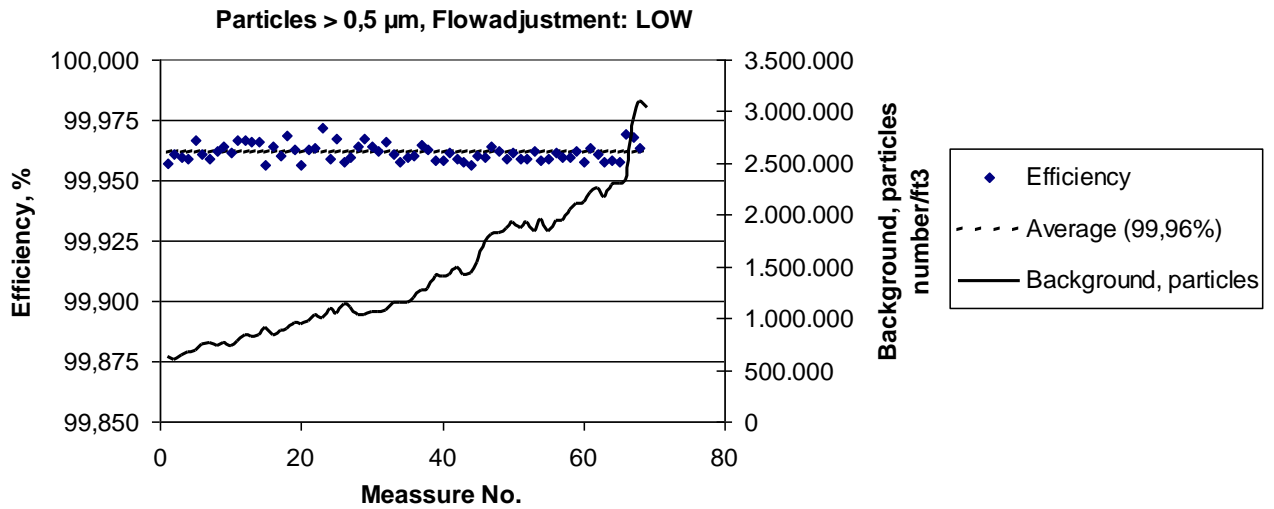
$$\text{Excretory degree, \%} = 100 - \left(\frac{\text{number of particles after the filter}}{\text{number of particles before the filter}} \cdot 100\% \right)$$

The results of the performed measurements are stated as the air cleaner's excretory degrees for particles larger than 0.3 μm and 0.5 μm respectively below and on the following page. The measurements are carried out at flow positions HIGH and LOW.



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5.3 Germ measurements

Germ measurements have provided the following results corrected for blind values.

Germ, unit: number/m³	Before filter	After filter	Excretory degree, %
LOW	>250	<1	>99.6
HIGH	>250	<1	>99.6

>: the growth medium is overgrown and quantification is impossible.

<: less than the limit of detection.

6. Conclusion

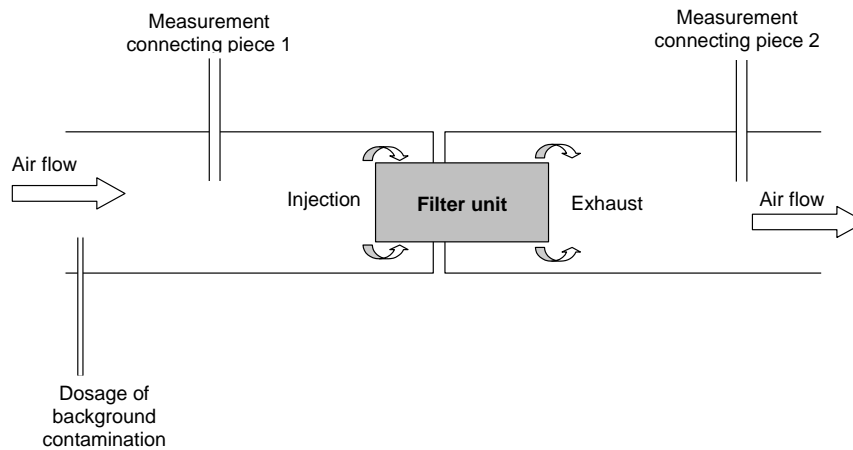
The test of the air cleaner's excretory degree indicates excretory degrees of 99.89% and 99.96% for 0.3 µm and 0.5 µm respectively. The excretory degrees are independent of the varying background strain and the two flow rates.

Germ counts indicate that the air cleaner efficiently remove micro organisms for the air. It is noted that the measurements are carried out with the natural background strain in the room meaning that the naturally existing quantity and structure of micro-organisms in the test room.

Bilag I - Test set-up

The filter unit is taken from the air cleaner cabinet and placed in two separate ventilation tubes ($\text{\O}60\text{cm}$), in a way where the filter unit's inlet takes air from one pipe and the filtered air is exhausted through the other pipe. The two pipes are isolated from each other to ensure that no air change is made outside the filter unit.

The test set-up is 5 m long and illustrated in the below-mentioned figure.



Enclosure II - Used equipment and methods

The used measurement equipment is calibrated according to Eurofins Danmark A/S' quality control system. The following equipment and methods have been applied.

Air velocity: The air velocity in the pipe cross section is measured by means of thermal air velocity sensor typed TESTO 452 for determination of flow.

Uncertainty: estimated at approximately 10%.

Particles, generation of: An aerosol generator typed TOPAS ATM 225 is used to establish a controlled background particle strain.

Particles, measurement of: Two laser particles counters types DEHA and METONE 2400 have been used for particle measurement before and after the filter respectively. Both types register the number of particles per cubic foot as the particles are divided into different size classes ranging from 0.3 μm to 10 μm .

Uncertainty: Estimated at approximately 10%.

Germ: A Biap Slitsampler has been applied for determination of germ. Plate Count Agar was used as collection medium. The exposed media are incubated at 21°C for five days and night after which the number of grown colonies are counted.

Uncertainty: estimated at approximately 15% (sampling and analysis).

For additional information please visit
rensair.com or email contact@rensair.com

