

ABSTERGE ACME FILTER INDIA PVT LTD

STANDARD OPERATING PROCEDURE

TESTING OF HEPA FILTERS

PURPOSE:

To provide a guideline to ensure that HEPA filters are intact and suitable for operation.

SCOPE:

Applicable to all HEPA filters installed in clean rooms.

RESPONSIBILITY:

Engineering Department.

DEFINITION:-----

1.0 PROCEDURE:

- 1.1 Integrity checking of filters should be carried out by outside party using calibrated photometer.
- 1.2 Following apparatus should be used while integrity testing of filters.
 - 1.2.1 An aerosol photometer having threshold sensitivity below 10 microgram/litre for 0.3 micron particles of aerosolised Di Octyl Phthalate /Poly Alfa Olefin (DOP/PAO) and a sampling rate of 1 Cubic Feet Per Minute(CFM).
 - 1.2.2 A DOP/PAO generator capable of producing a poly dispersed test aerosol having more than 92% of more than 1 micron in accordance with Institute Of Environmental Sciences(IES).
 - 1.2.3 Use vane type calibrated anemometer to measure the velocity of HEPA filter having accuracy of 1FPM.

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1.3 Terminal HEPA filter for clean room (having individual upstream port)

- 1.3.1 Start the AHU of which filter integrity checking is to be checked.
- 1.3.2 Ensure the power supply of photometer.
- 1.3.3 Start the compressed air/Nitrogen gas to generate the test aerosol at minimum pressure 20psi.
- 1.3.4 Direct the test aerosol at the return air point or fresh air intake of the AHU.
- 1.3.5 Put the photometer selector switch on up stream mode.
- 1.3.6 Connect the tube of photometer to the upstream port of HEPA housing.
- 1.3.7 Wait until the photometer displays 100% upstream concentration.
- 1.3.8 Remove the tube of photometer and close the upstream port of HEPA housing and ensure for Zero Leakage.
- 1.3.9 Put the photometer selector switch on down stream mode.
- 1.3.10 Wait until photometer displays '0'(ZERO).
- 1.3.11 Measure the down stream concentration by holding the probe approximately 1 inch away from the face of filter.
- 1.3.12 Scan the entire filter face including perimeters with the probe of photometer in overlapping strokes, traversing at approximately 10 feet per minute (FPM).
- 1.3.13 Observe the percentage of leakage directly on the photometer.
- 1.3.14 If any leakage's observed through the sealing of the filter inform engineering department and get things done, tighten the filter nuts and check again for any leakage.
- 1.3.15 Inform Quality Assurance and concerned department.
- 1.3.16 If the leakage is more than 0.01% of the upstream aerosol concentration then ask engg. department to repair it.

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1.3.17. Repair patches on filters should not exceed maximum of 5% of the total filter face area and the maximum width/length of each patch should not be more than 1.5 inches. Total number of patches should not exceed 5 numbers/filter.

1.3.18 If the above mentioned limit exceeds, then replace the filter and check the integrity of filter as per point no. 1.3.1 to 1.3.13 and 1.7.

1.3.19 A report of filter integrity checking should be obtained from the outside party.

1.4 Terminal HEPA filter for clean room (without individual upstream port).

1.4.1 Start the AHU.

1.4.2 Start the compressed air/Nitrogen gas to DOP/PAO generator to generate the test aerosol, at minimum 20 psi and monitor the pressure .

1.4.3 Direct the test aerosol at the return air point or fresh air intake of AHU.

1.4.4 Ensure the supply of DOP generator.

1.4.5 Put the photometer selector switch on up stream mode.

1.4.6 Check the upstream concentration of DOP/PAO at main duct of AHU, wait until the photometer displays 100% up stream concentration.

1.4.7 Enter the clean room.

1.4.8 Ensure the power supply to DOP photometer.

1.4.9 Put the photometer selector switch on down stream mode.

1.4.10 Wait until photometer displays '0'.(ZERO)

1.4.11 Measure the down stream concentration by holding the probe approximately 1 inch away from the face of filter.

1.4.12 Scan the entire filter face including perimeters with the probe of photometer in overlapping strokes, traversing at approximately 10 feet per minute (FPM)

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- 1.4.13 Observe the percentage of leakage directly on the photometer.
- 1.4.14 If any leakage observed through the sealing of the filter tighten the Filter nuts & check again for any leakage.
- 1.4.15 Inform Quality Assurance and concerned department.
- 1.4.16 If the air leakage is more than 0.01% of the upstream aerosol concentration then repair it.
- 1.4.17 Repair patches on filters should not exceed maximum of 5% of the total filter face area & the maximum width / length of each patch should not be more than 1.5 inches. Total no. of patches should not exceed 5 numbers / filter.
- 1.4.18 If the above mentioned limit exceeds, then replace the filter & check the integrity of filter as per point no.1.4.1 to 1.4.13 and 1.7.
- 1.4.19 A report of filter integrity checking should be obtained from the outside party.

1.5 LAF work station, HEPA module, and garment cubical/cupboard

- 1.5.1 Start the LAF of which filter integrity is to be checked.
- 1.5.2 Record the manometer reading.
- 1.5.3 Ensure the power supply of DOP photometer.
- 1.5.4 Start the compressed air / Nitrogen gas to generate the test aerosol
At minimum pressure 20psi.
- 1.5.5 Direct the test aerosol at the return air point or fresh air intake of
The LAF.
- 1.5.6 Put the photometer selector switch on up stream mode.
- 1.5.7 Connect the tube of photometer to the up stream port of HEPA
housing.
- 1.5.8 Wait until the photometer displays 100% up stream concentration.

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- 1.5.9 Put the photometer selector switch on down stream mode.
- 1.5.10 Wait until photometer displays '0'(zero).
- 1.5.11 Measure the down stream concentration by holding the probe approximately 1 inch away from the face of filter.
- 1.5.12 Scan the entire filter face including perimeters with the probe of photometer in overlapping strokes, traversing at approximately 10 feet per minute(FPM).
- 1.5.13 Observe the percentage of leakage directly on photometer.
- 1.5.14 If Any leakage's observe through the sealing of the filter tighten the filter nuts and check again for any leakage
- 1.5.15 If the air leakage is more than 0.01% of the upstream aerosol conc. Then repeat it.
- 1.5.16 Repair patches on filters should not exceed maximum of 5% of total filter face area and the maximum width or height of each patch should not be more than 1.5" Total number of patches should not exceed five number / filters
- 1.5.17 If the above mention limit exceeds then replace the filter and check the integrity of the filter as per point number 1.5.1 to 1.5.13 and 1.7
- 1.5.18 Inform quality assurance and concerned department .
- 1.5.19 Report of filter integrity checking should be obtain from the outside party.
- 1.5.20 Check the air velocity of individual Hepa filter by keeping anemometer probe approximately 6" away from the filter
- 1.5.21 Note down the readings and If the average readings are not within the acceptable limit replace the filter.
- 1.5.22 Cary out steps 1.5.1. to 1.5.13 and 1.7 after replacing the filter
- 1.5.23 Limits for the average velocity 90 fpm + / - 20% , 0.45m/s + / - 20%

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1.6 AHU / PLENUM MOUNTED HEPA FILTERS

- 1.6.1 Start the AHU ,
- 1.6.2 Start the compressed air / nitrogen gas to DOP/PAO generator to generate the test aerosol , at minimum 20 psi and monitor the pressure.
- 1.6.3 Direct the test aerosol at the return air pump or Fresh air intake of AHU
- 1.6.4 Ensure the power supply of DOP photometer
- 1.6.5 Put the photometer selector switch on up stream mode
- 1.6.6 Check the upstream conc.Of DOP/PAO before HEPA at AHU/ Plenum . Wait until photometer displays 100% upstream conc.
- 1.6.7 Remove Tube of photometer and seal AHU / PLENUM port and Ensure for Zero Leakage through port .
- 1.6.8 Person who is carrying out downstream conc. Test should wear the following :
 - 1.6.8.1. Apron, Nose mask and cap.
 - 1.6.8.2. Before entering the AHU/PLENUM he should wear shoe covers
- 1.6.9 Put the photometer selector switch on Downstream mode .
- 1.6.10 Wait until the photometer displays Zero .
- 1.6.11 Open the AHU / PLENUM door and enter inside.
- 1.6.12 Measure the downstream conc. By holding the probe approx. 1 “ away from the filter face
- 1.6.13 Scan the entire filter face including perimeters with the probe of photometer in overlapping strokes , traversing at approximately 10 feet per minute.
- 1.6.14 Observe the percentage of leakage directly on the photometer.

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- 1.6.15 If any leakage observe through he sealing of the filter tighten the filter nuts and check again for any leakage
 - 1.6.16 If the air leakage is more than 0.01% of the upstream aerosol conc. Then repair it
 - 1.6.17 Repair patches on filters should not exceed maximum of 5% of the total filter face area, and the maximum width or height of each patch should not be more than 1.5". Total number of patches should not exceed 5 numbers / filters.
 - 1.6.18 If the above mentioned limit exceeds , then replace the filters and check the integrity of the filters as per 1.6.1 to 1.6.14 and 1.7
 - 1.6.19 Inform quality assurance and concerned departments.
 - 1.6.20 A report of filter integrity checking should be obtained from the third party.
- 1.7 DOP leakage upto 0.01% of the upstream challenge aerosol conc. Is allowed for EU - 12 filter and DOP leakage upto 0.03% of the upstream challenge aerosol conc. Is allowed for EU-13 filter.

1.8 FREQUENCY :

Once In six month or earlier If any change in system for all above.

2.0 ABBREVIATION :

HEPA	High Efficiency particulate Air
FPM	Feet per minute
CFM	Cubic Feet per minute
DOP	Di-octyl pthalate
LAF	Laminar Air flow
AHU	Air Handling unit
IES	Institute of Environmental Science
M/s	Meter per second
%	percentage
psi	Pounds per square inch

3.0 REFERENCES :

Institute of Environmental Sciences.

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