

JOY TRADING CO.

TESTING OF HEPA FILTERS (DOP/PAO/HEPA FILTR INTEGRITY TEST)

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

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