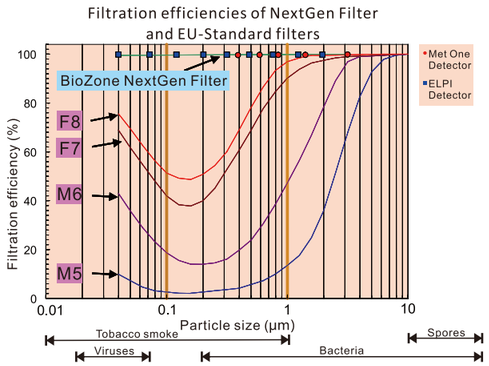
BioZone NEXTGEN Filter System

Competitive features of BioZone NextGen Filter System

- High filtration efficiency
  a) 99.5% for 0.3µm sized particles and 95% for chemical gases, which is comparable to HEPA – H13 and ISO Class 1(10).
  b) Comparison of the Most Penetrating Particle Size (MPPS) among Filter classes of European Standard EN779: Filtration efficiency of NextGen Filter maintain at 100% in the range of 0.1 to 0.3µm, which is the size of particles most difficult for the filter to capture.



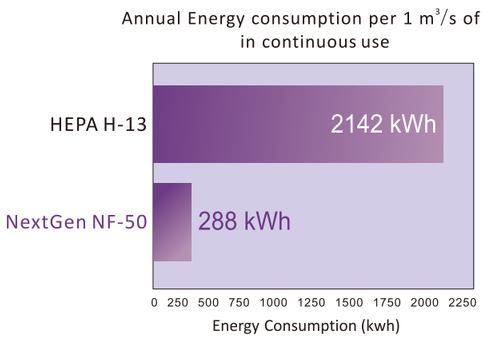
The performances of the filters were assessed by two particle detectors: MetOne optical particle counter and an electrical low pressure impactor (ELPI). The test was performed by an independent laboratory called VTT (Technical Research Centre of Finland).

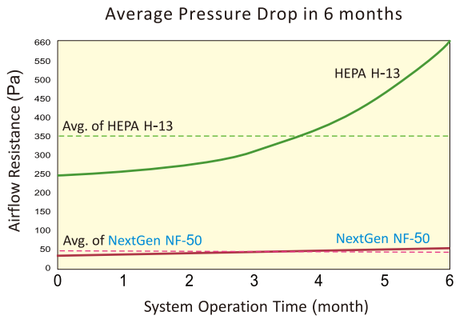
- Capability of removing biological and chemical contaminants
  BioZone NextGen Filter is in the highest MERV/UVGI rating 16/16. Meanwhile, with the aid of PhotoPlasma™ Lamp, a wide range of biological and chemical contaminants can be eliminated effectively.

Filter Rating	MERV 6	MERV 8	MERV 10	MERV 13	MERV 15	MERV 16
Bacillus anthrax spores, %	15.5	36.7	39.2	96.3	99.979	99.981
TB bacilli, %	7.4	18.1	19.5	78.6	98.0	98.1
Smallpox virus, %	3.7	7.4	7.9	39.6	68.0	70.6
Botulinum toxin, %	34.6	69.9	76.3	99.986	100	100
Influenza A virus, %	6.2	11.2	12.0	46.229	71	76
UVGI System Rating	**URV 6**	**URV 8**	**URV 10**	**URV 13**	**URV 15**	**URV 16**
Average intensity, µW/cm²	75	150	500	2,000	4,000	5,000
Dose (t = 0.5 s), µW-s/cm²	37.5	75	250	1,000	2,000	2,500
Bacillus anthrax spores, %	0.4	0.8	1.5	3.1	6.0	8.9
TB bacilli, %	23.4	41.3	65.6	88.1	98.6	99.8
Smallpox virus, %	17.4	31.8	53.4	78.3	95.3	99.0
Botulinum toxin, %	0	0	0	0	0	0
Influenza A virus, %	13.8	25.7	44.8	69.5	90.7	97.2
MERV/URV Rating	**6/6**	**8/8**	**10/10**	**13/13**	**15/15**	**16/16**
Bacillus anthrax spores, %	15.9	37.2	40.2	96.4	99.980	99.983
TB bacilli, %	29.1	52.0	72.3	97.5	99.972	99.997
Smallpox virus, %	20.4	36.8	57.1	86.9	98.5	99.7
Botulinum toxin, %	34.6	69.9	76.3	99.986	100	100
Influenza A virus, %	19.2	34.0	51.4	83.589	97	99

Microorganisms that cause diseases or produce toxins can be used as biological weapons. In weaponized form, they are typically powders consisting of particles in the size range of 0.9µm to 5.8µm. Filters having high minimum efficiency reporting values (MERV) can remove most BW agents.[12]

- Low airflow resistance and power consumption





Face Velocity: 1.0m/s
Air Volume: 450L/s

The average airflow resistance of NextGen NF-50 is 47Pa, while that of HEPA H-13 is 350Pa.

- High loading capacity
- Typical service life is 12 months, which is 4 times longer than HEPA

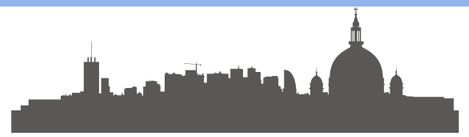
Dealer:

Solution to Indoor Particulates

Cleaner Air Healthier Life

BioZone®
SCIENTIFIC INTERNATIONAL

What is Particulate Matter?



Introduction to Particulate Matter (PM)

Particulate matter is a complex mixture of organic and inorganic particles, and liquid droplets suspended in the air.[1] They are originated from a number of components including dust particles, allergens,organic chemicals, acids, metals and soils.[2] 2 principal groups of particulate matter are classified according to their aerodynamic diameter: **PM_{10}** and **$PM_{2.5}$**. **PM_{10}** are also known as inhalable coarse particles, with size larger than 2.5 µm and smaller than 10µm in diameter. They are common near the roadways and dusty industries. **$PM_{2.5}$** are fine particles which are or less than 2.5µm in diameter. They are found in smoke and haze, or formed by gas emission from power plants.[3]

Indoor air pollution

On average, the human breathes in nearly 16,000 quarts of air each day, while there are almost 70,000 visible and invisible particulate matters in the air. As people spend almost 90% of time indoors in average, the risks to health may increase due to the exposure to indoor air contaminants.[4]

Indoor particle concentration depends on the penetration of outdoor particles into the indoor environment and on the intensity of indoor aerosol sources.[5] It is a complex of substances such as:[6]

- Carbon emitted by combustion sources
- Tiny liquid or solid particles in aerosols
- Mould growth and fungal spores
- Pollen
- Endotoxin (Toxin present in bacteria)
- Cooking fume
- Cigarette smoking
- Non-vented combustion appliances

Factors affecting the behavior of indoor particulate matter:[7]

- Structural system of building
- Material characteristics
- The way of air exchange
- The operating mode of indoor environment and presence of inhabitants

Potential Health Risk

Particulate matter can irritate eyes, nose and throat. There is positive correlation between the size of particles and their health risks. For those particles with 10µm in diameter or smaller, they can cause more serious health effects on respiratory and cardiovascular systems as they can easily pass through the respiratory tract and enter the lungs, or even the bloodstream.[8]

- Long-term exposure: Weakened lung function, development of chronic bronchitis and premature death[9]
- Short-term exposure: Exacerbated lung diseases e.g. causing asthma and acute bronchitis; increased risks to respiratory infections; increased rates of heart attacks and arrhythmias for people with heart disease[10]
- Guideline values of Particulate Matter:[11]

  $PM_{2.5}$: 25µg/m^3 24-hour mean

  PM_{10}: 50µg/m^3 24-hour mean

Air Filtration

Purifying indoor air by filtration is a common way to reduce particulate matters when incorporating with ventilation systems. There are several considerations for selecting suitable filters:

- Filtration efficiency
- Pressure drop
- Loading capacity
- Lifespan
- Additional benefits (e.g. capability to eliminate airborne biological and chemical contaminants)

BioZone NEXTGEN Filter System

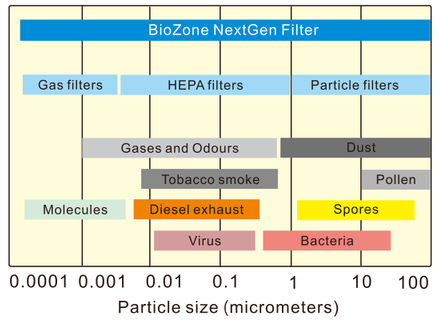
Principle of BioZone NextGen Filter System

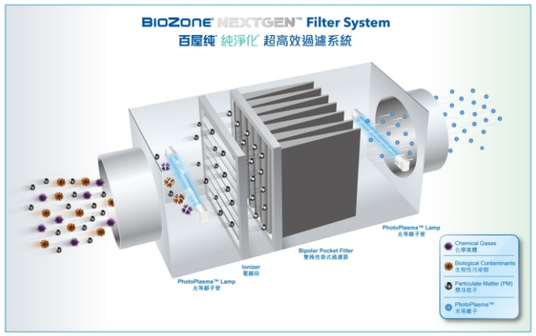
BioZone NextGen Filter system is to protect not only against varied contaminants originating outdoors but also against indoor pollution. It improves indoor air quality by removing a wide range of airborne pollutants including particulate matter, biological and chemical contaminants.

Components of BioZone NextGen Filter System

- Bipolar Filter bag: It contains filter media for particles and gases, which is made up of activated carbon. Activated carbon has highly porous structure that ensures large surface area for absorbing odour. The filter media is electrostatically enhanced, thus it is very efficient at capturing submicron particles. The extended surface area of filter bag also reduces media velocity and improves the capability to capture particles from the airstream.
- Charger: Airborne particles are electrostatically charged when air passes through the system. They are strongly attracted to and captured by the fibre of the filter bag. It demonstrates better initial filtration efficiency compared to those fine filters without chargers.
- PhotoPlasma™ Lamp: PhotoPlasma™ are generated by our patented UV lamp, which are reactive free radicals that actively destroy and break down the biological and chemical structures of airborne contaminants, and quickly convert them into harmless end-products such as carbon dioxide and water.

Effective ranges of Filters against airborne contaminants



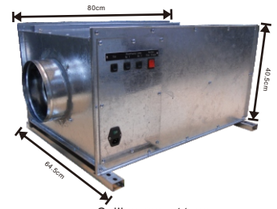


Installation and Technical Specification

BioZone NextGen models are designed to be connected to AHU, HVAC ducts as supply or exhaust air filters. They can be installed in the supply air ductwork or used as stand-alone units with self-contained fans, to be attached to the HVAC system.

Model No.	NF-10	NF-20	NF-30	NF-40	NF-50
Bag size (mm) w x h x l	305 x 305 x 285	550 x 305 x 375	450 x 450 x 293	550 x 450 x 375	592 x 592 x 600
PhotoPlasma Lamp	< 15 W				
Charger	7 W / 8 kV	9 W / 8 kV	10 W / 8 kV	10 W / 8 kV	12 W / 8 kV
Pressure drop	70 Pa	66 Pa	51 Pa	40 Pa	36 Pa
Airflow	100 L/s	165 L/s	205 L/s	250 L/s	352 L/s
With face velocity of 1.0 m/s	360 m^3/h 212 CFM	594 m^3/h 350 CFM	738 m^3/h 434 CFM	900 m^3/h 530 CFM	1267 m^3/h 745 CFM
Efficiency for particles	99.5% (< 123 L/s) 95% (123-190 L/s) 90% (190-250 L/s)	99.5% (< 240 L/s) 95% (240-380 L/s) 90% (380-500 L/s)	99.5% (< 325 L/s) 95% (325-525 L/s) 90% (525-760 L/s)	99.5% (< 400 L/s) 95% (400-625 L/s) 90% (625-950 L/s)	99.5% (< 445 L/s) 95% (445-700 L/s) 90% (700-1200 L/s)
Efficiency for gases	95% (< 123 L/s)	95% (< 240 L/s)	95% (< 325 L/s)	95% (< 400 L/s)	95% (< 445 L/s)

Stand-alone type



Ceiling-mount type

References:
[1] World Health Organization
[2] United States Environmental Protection Agency
[3] World Health Organization, United States Environmental Protection Agency
[4] United States Environmental Protection Agency
[5] A. Estokova et al. (2010). Particulate matter investigation in indoor environment. Global NEST.
[6] Health Canada
[7] A. Estokova et al. (2010). Particulate matter investigation in indoor environment. Global NEST.
[8] World Health Organization
[9] United States Environmental Protection Agency
[10] United States Environmental Protection Agency
[11] World Health Organization
[12] W.J. Kowalski (2003). Immune-building technology and bioterrorism defense. HPAC Engineering.