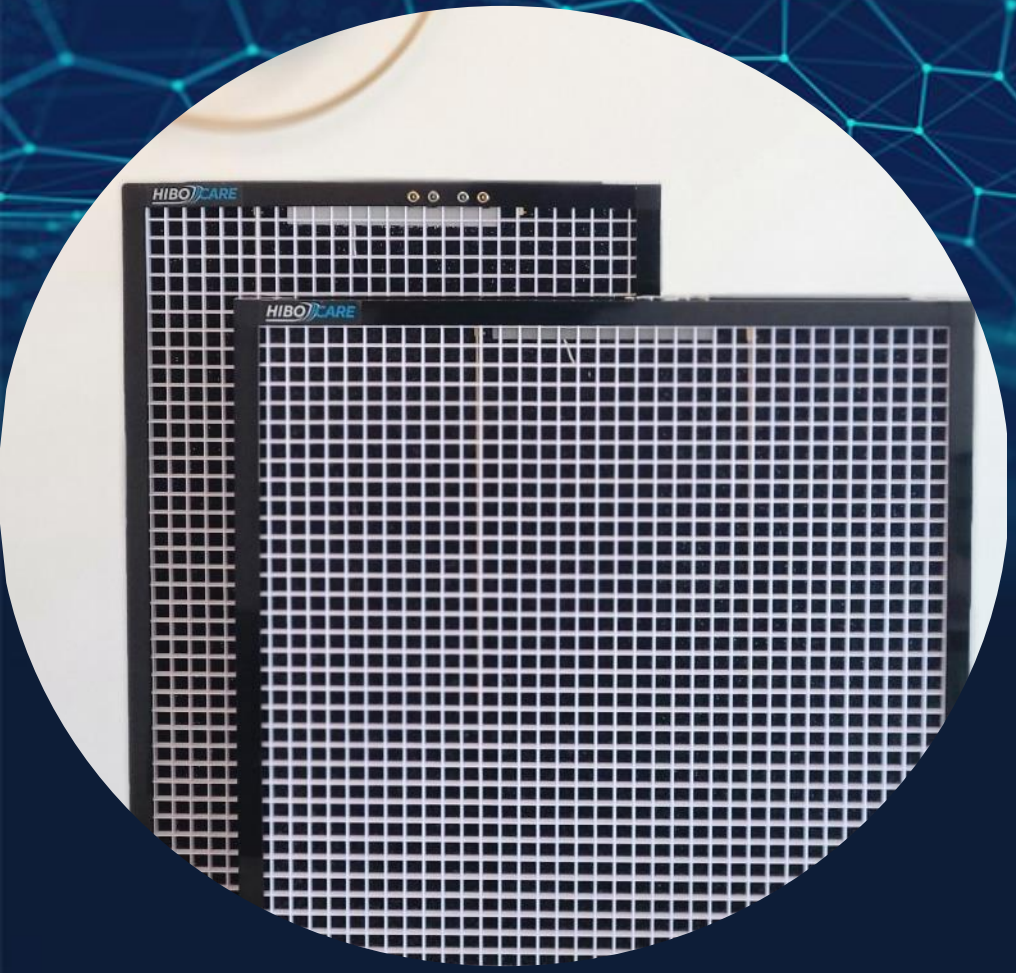

REVOLUTIONISING LABORATORY AIR

LABORATORY CASE STUDY

Long Term Findings

8 Feb 2025

Background: The customer needed protection against biological contamination

The facility requires pharma grade cleanroom environment.
As a botanical laboratory,
it is prone to bacterial and fungal contamination.

HiboScreen was included in the filtration setup as an antimicrobial solution to keep the facility contamination free.

Mid 2023: Commissioning
Mar 2024: Cleanroom validation
Dec 2024: HiboScreen review

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Solution: HiboScreen

The customer selected Hibocare's HiboScreen due to its high efficiency against biological contaminants.

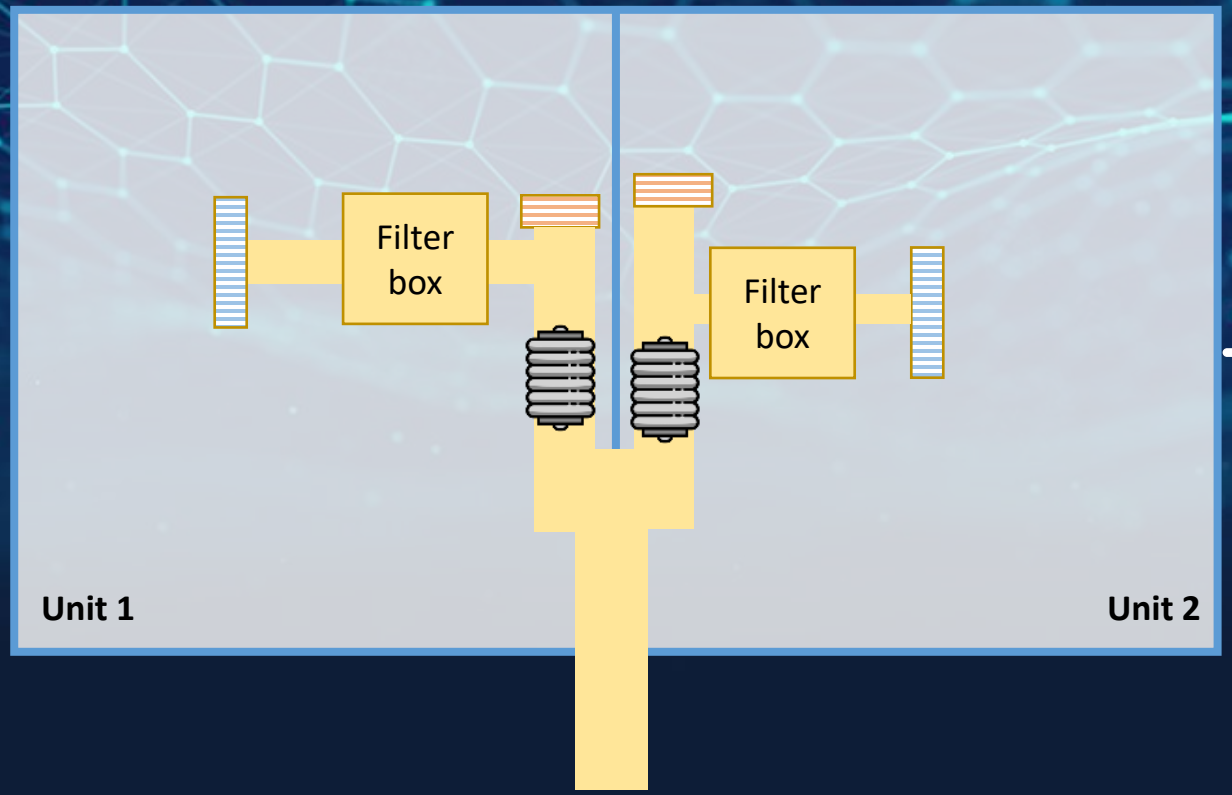
Due to low pressure drop, low footprint of a standard filter and easy electrical connectivity, HiboScreen was easy to include despite being introduced in the latter stages of design.

HiboScreen also aids in filtration, improving cleanroom rating performance and the effectiveness of secondary filters.

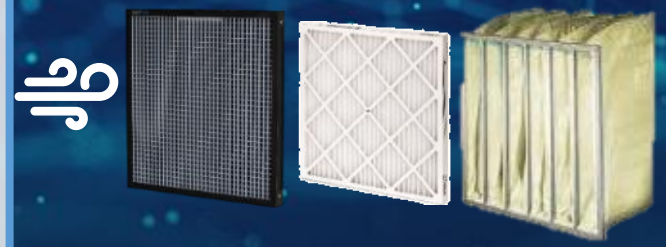
Setup: The three filter boxes offered opportunity to test multiple setups

Unit 1 filter box has only a G4 filter and an F9 filter installed in that order.

Without HiboScreen

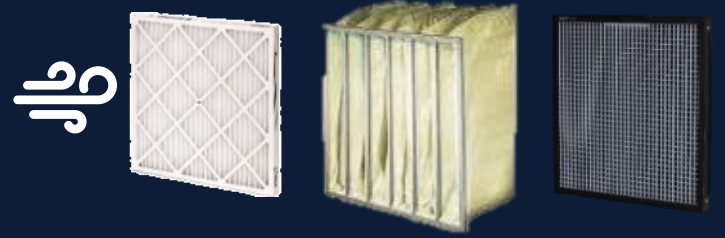


Unit 2 filter box has HiboScreen, G4 filter and F9 filter installed in that order



With HiboScreen

Outside air filter box has G4 filter, F9 filter and HiboScreen installed in that order



Return air vent

Supply air vent

Coils

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Cleanroom Validation Finding: ISO 7 without HEPA filter

Unit 1: Without HiboScreen

PARTICLE COUNT TEST RESULTS

GROW ROOM 1

Target ISO Class : 8				
Cumulative Particle Count = >	0,3	0,5	1,0	5,0
Maximum permissible Counts	N/A	3520000	N/A	29300

Sampling Locations	$x_i \geq 0.5\mu m$ (counts per 28.3l)	Location sample average (counts per 28.3l)	Location concentration average (counts per m^3 = location average x 35.3147)	ISO Class 8 limit for 0.5µm particle size	ISO CLASS	Pass/Fail
1	6938	6938	245013,4	3520000	8	PASS
2	5808	5808	205107,8	3520000	8	PASS
3	5439	5439	192076,7	3520000	8	PASS
4	6798	6798	240069,3	3520000	8	PASS
5	6322	6322	223259,5	3520000	8	PASS
6	6327	6327	223436,1	3520000	8	PASS
7	5766	5766	203624,6	3520000	8	PASS
8	5199	5199	183601,1	3520000	8	PASS
9	5145	5145	181694,1	3520000	8	PASS

Sampling Locations	$x_i \geq 5.0\mu m$ (counts per 28.3l)	Location sample average (counts per 28.3l)	Location concentration average (counts per m^3 = location average x 35.3147)	ISO Class 8 limit for 5.0µm particle size	ISO CLASS	Pass/Fail
1	106	106	3743,4	29300	8	PASS
2	102	102			8	PASS
3	64	64			8	PASS
4	142	142			8	PASS
5	99	99			8	PASS
6	121	121			8	PASS
7	75	75			8	PASS
8	73	73			8	PASS
9	75	75			8	PASS

ISO 8

Unit 2: With HiboScreen

Target ISO Class : 7				
Cumulative Particle Count = >	0,3	0,5	1,0	5,0
Maximum permissible Counts	N/A	352000	N/A	2930

Sampling Locations	$x_i \geq 0.5\mu m$ (counts per 28.3l)	Location sample average (counts per 28.3l)	Location concentration average (counts per m^3 = location average x 35.3147)	ISO Class 7 limit for 0.5µm particle size	ISO CLASS	Pass/Fail
1	4589	4589	162059,2	352000	7	PASS
2	4744	4744	167532,9	352000	7	PASS
3	4602	4602	162518,2	352000	7	PASS
4	4941	4941	174489,9	352000	7	PASS
5	4965	4965	175337,5	352000	7	PASS
6	4965	4965	175337,5	352000	7	PASS
7	5163	5163	182329,8	352000	7	PASS
8	4980	4980	175867,2	352000	7	PASS

Sampling Locations	$x_i \geq 5.0\mu m$ (counts per 28.3l)	Location sample average (counts per 28.3l)	Location concentration average (counts per m^3 = location average x 35.3147)	ISO Class 7 limit for 5.0µm particle size	ISO CLASS	Pass/Fail
1	4	4	141,3	2930	7	PASS
2	6	6			7	PASS
3	9	9			7	PASS
4	10	10			7	PASS
5	12	12			7	PASS
6	14	14			7	PASS
7	25	25			7	PASS
8	13	13			7	PASS

ISO 7

ISO 7 is normally achieved with HEPA filter

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December 2024 Review

HIBO CARE

State of the HVAC Coils

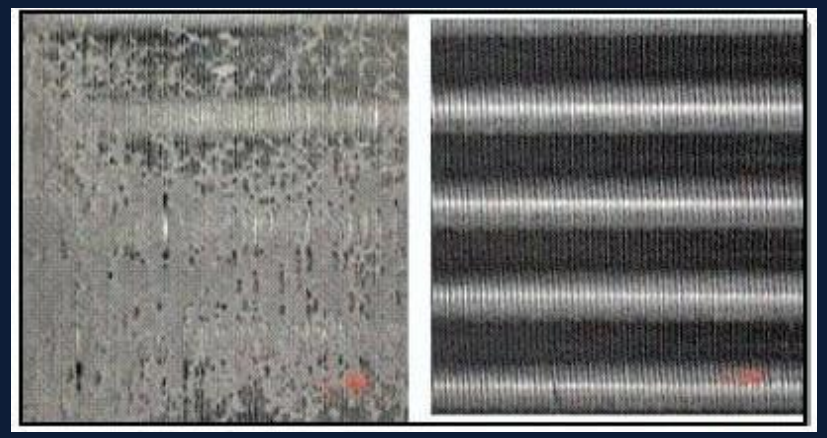
HVAC Coils, 1.5 years after commissioning, never serviced.

"Coils looked clean and like new, no servicing was needed."
- Maintenance Engineer

US$3,400 in annual cost savings due to energy efficient heat transfer and easy airflow through the coils.

Expected state of coils (dirty)
vs
coils when clean

Dirty Coils



Clean Coils

According to US EPA, clean coils are up to 30% energy efficient

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State of the supply air duct

No mould in the duct.

Presence of dust particles indicate that charged fine dust clumped together and settled down.

Mould free ducts mean no cleaning effort needed. Mould in ducts and coils is the main cause of “Sick Building Syndrome”.

HiboScreen was installed after the filters at the Outside Air filter box at the customer facility. The settled dust is avoided when HiboScreen is installed before the filters as the filters trap the clumped particles.

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Like to like comparison, primary filters in Unit 1 & 2

Unit 1 (Without HiboScreen)

Unit 2 (With HiboScreen)

Dust with mould spots on the G4 filter of Unit 1, no mould spots on G4 filter of Unit 2 where HiboScreen is installed.

HiboScreen prevented mould growth on the filter, even in a botanical environment.

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Like to like comparison, secondary filters in Unit 1 & 2

Unit 1 (Without HiboScreen)

Unit 2 (With HiboScreen)

Dust with mould spots on the F9 filter of Unit 1, clean F9 filter of Unit 2 where HiboScreen is installed.

HiboScreen with boosted G4 filter did all the work in Unit 2 and kept the F9 filter clean.

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Conclusions

1. HiboScreen delivered cleaner, better and cheaper air to the laboratory.

2. HiboScreen boosted ISO8 setup to deliver ISO7 cleanliness standard.

3. HiboScreen kept the coils clean and energy efficient.
   Annual energy savings of $3,400 due to energy efficient heat transfer and easy airflow through the coils.

1. The duct was also clean of mould, promoting healthy air.

2. HiboScreen charged the fine particles to clump them together into bigger particles. HiboScreen is best installed as the first line of defence, before the filters.

3. HiboScreen boosts primary filters thus making secondary filters unnecessary, as demonstrated by the clean bag filters, even after a year and half.

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Clean Air, Green Buildings, Healthy Spaces