CARBELIM

Redefining Green Engineering

CARBELIM

AirForest™

Carbelim AirForest™

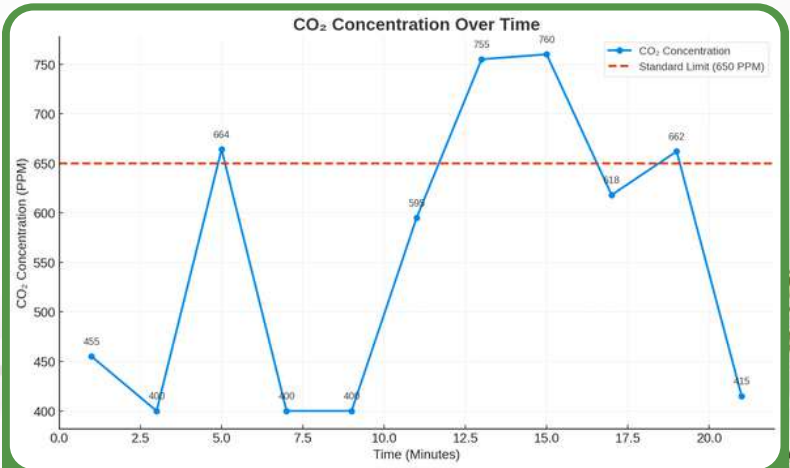
World's first commercial microalgae-based living wall air purifier that goes beyond filtering pollutants. It actively generates oxygen equivalent to 15 mature trees and captures CO_2, improving air quality and promoting better respiratory health

Sick building Syndrome

Invisible pollutants like CO_2 and VOCs build up inside modern buildings, causing sick building syndrome, a condition linked to headaches, fatigue, and respiratory issues. Though unseen, these pollutants can seriously affect your health.

Indoor Sources

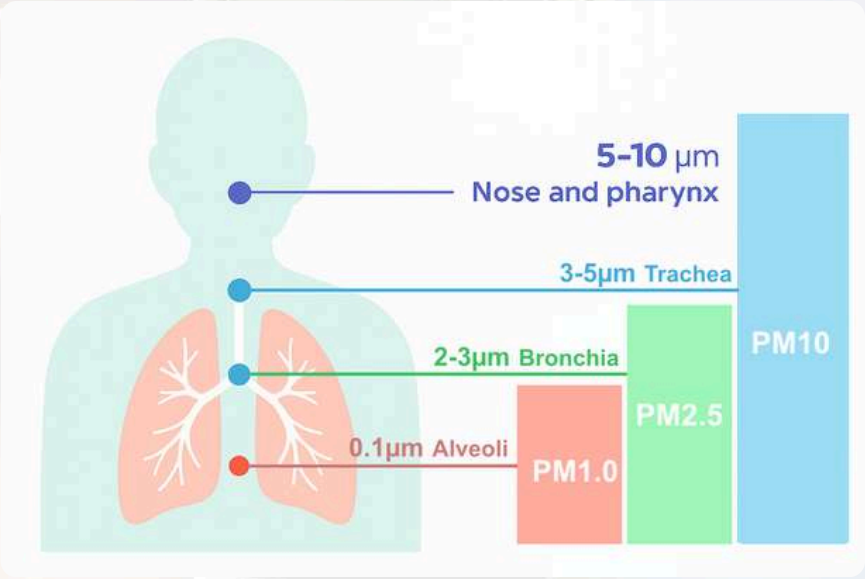
- Human or animal activity
- Cigarette smoke Dust
- Bacteria Mold
- Volatile Organic Compounds (VOCs- carbon-basedcompounds that can easily evaporate)



The graph shows CO_2 levels peaking above safe limits, indicating poor ventilation and potential health risks.

Harmful Effects of Poor Air Quality

Pollution consists of several types of airborne elements which pose serious threats to your health. Exposure to a high concentration of particulate matter (PM1/2.5/10) can lead to health complications such as eye, nose, throat, and lung irritation, coughing, sneezing, runny nose and shortness of breath. Also, exposure to fine particles can affect lung function and worsen medical conditions like asthma and heart disease.



Why Indoor Air Quality Matters: A Global Health Concern

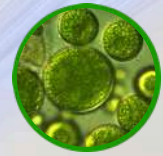
The World Health Organization estimates that 3.8 million people worldwide die every year from illnesses attributable to harmful indoor air pollution.

Indoor air quality (IAQ) is crucial due to the significant amount of time humans spend indoors, as poor IAQ can negatively affect health, causing both immediate and long-term effects.

Feel the Freshness in Every Breath

Release Oxygen
Releases fresh O_2 like 15 Trees

Quiet Operation
Runs under 50 dB—peaceful environment



Microalgae Filtration
Removes fine allergens & pollutants

UV Sterilization
kills germs, viruses, bacteria

Pre-filter
Traps dust & large particles

Active CO_2 Capture
Actively reduces indoor carbon dioxide

Aesthetic Design
Natural, living wall integration

Real-Time Monitoring
Advanced sensors for air quality

Why Carbelim AirForest™?

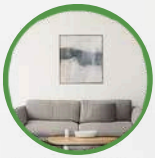
Carbelim systems go beyond aesthetics by purifying indoor air, filtering toxins, and releasing oxygen through microalgae. They help reduce CO_2, support climate goals, and offer customizable designs for offices, homes, or commercial spaces, making them a healthier, more sustainable solution.

- **Captures 330-350 kg Co2/year Equivalent to 15 Trees**
- **Releases 1,500,000 ltr of Oxygen/year**
- **Removes > 90% PM2.5, PM10, and VOCs**
- **Takes up minimal space only 2 m² of wall area and just 0.5 m² of floor space required.**

Air Quality Enhancement

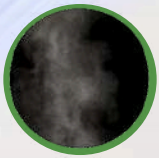
Wide and powerful air sunction in two directions to draw in ultra-fine particles, including co2, dust, impurities, microbacteria

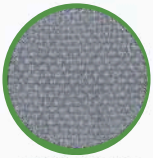

Pollen


Formaldehyde


Air freshener chemicals


Bacteria and airborne viruses


Dust

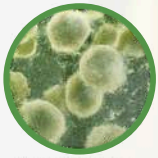

Textile fibers


Outdoor pollutants


Cooking fumes


Cigarette smoke


PM2.5 and PM10


Mold spores


Pet dander

Carbon Mitigation

Our multi-patent-applied AirForest™ biomimitic technology harnesses the power of microalgae to absorb CO_2 and release oxygen through photosynthesis naturally reducing indoor carbon levels, advancing climate action, and transforming everyday spaces into living carbon sinks.

Captures 330 kg Co2/Year Equivalent to 15 mature trees

Releases 1,500,000 ltr of oxygen/year, equivalent to 15 Trees

AirForest™ absorbs up to 330 kg of CO_2 annually, significantly reducing indoor carbon levels and creating cleaner, healthier air for occupants. Powered by advanced microalgae technology, it transforms indoor spaces into active carbon sinks supporting both human well-being and climate action.

Germ-Free Environment

Carbelim AirForest uses biofiltration, UV-C, and microalgae technology to remove up to **99.8%** of airborne germs and bacteria. It continuously purifies indoor air, helping prevent the spread of colds, flu, and infections—ideal for offices, clinics, and public spaces.

FILTER OUT GERMS

LET CLEAN AIR IN

Cleaner air means fewer colds, flu, and respiratory infections, making your home, office, or public area safer and healthier for daily living.

Customizable Design

Carbelim **AirForest™** is available in three elegantly engineered models: **Pro-15**, **T-10**, and **T-01**, each tailored to meet the needs of different indoor environments. These designs offer a perfect balance of performance, adaptability, and visual appeal, making them suitable for both professional and personal spaces without compromising on efficiency or style.

Product Specifications

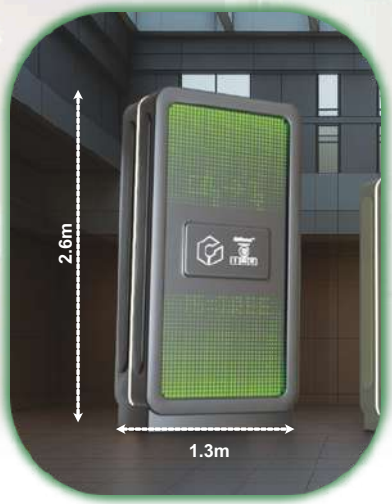
Carbelim AirForest™, offered in Pro-15 (Standard), T-10 (Compact), and T-01 (Wall Mount) models, combines durable construction, silent operation, and optional smart displays for real-time air quality monitoring, making it a versatile solution for a wide range of indoor environments.

AirForest™ Pro-15 | **AirForest™ T-10** | **AirForest™ T -1**

Model	Application Zone	Coverage	Electricty (W)	Size (L × H × D)
AirForest™ Pro-15	Corporate Offices, Lobbies, Cafeterias, Branch Atriums	50–70 m²	180W	1.3 × 2.6 × 0.7 m
AirForest™ T-10	Meeting Rooms, Receptions,Clinics & Health Centers	30–50 m²	160W	0.8 × 1.6 × 0.7 m
AirForest™ T-1	Bank ATMs, Small Cabins, Study Rooms, Retail Counters	10–20 m²	100W	0.6 × 1.1 × 0.11 m

AirForest™ Model Pro-15

The Carbelim Floor Mount series, featuring the AirForest™ Pro-15 model, actively absorbs CO_2 and removes airborne pollutants to enhance indoor air quality. With a sleek design, built-in smart display, and compact footprint, it's ideal for offices, banks, and modern living spaces focused on sustainability.



- Captures up to **330 kg** of CO_2/year equivalent to the impact of **15 mature trees**
- Releases **1.5M** liters of oxygen/year
- Removes > **90**% of PM2.5, PM10, and VOCs
- Requires only **2** m² of wall and **0.5** m² of floor space
- Ideal for corporate, commercial, and public environments
- Real-time AQI monitoring included Smart display with remote monitoring via app support

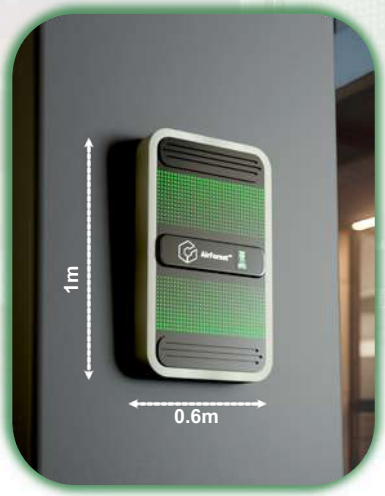
AirForest™ Model T-10

Carbelim Floor mount series, in AirForest™ T-10 models, uses and removes pollutants. Ideal for offices, banks, and homes, with even more compact places, while each unit features a sleek design, built-in display, and minimal footprint for smart, sustainable living.

- Captures up to **220 kg** of CO_2/year comparable to **10 mature trees**
- Releases ~**1M** liters of oxygen/year
- Requires just **2** m² of wall and **0.5** m² of floor space
- Ideal for compact workspaces or premium home use
- Equipped with a miniature display module for air quality insights

AirForest™ Model T-01

Carbelim Wall Mount Series **AirForest™ T-1**, is a compact, lightweight purifier ideal for tight spaces like small offices, clinics, and ATMs. Wall-Mounted and powered with microalgae, it filters air, absorbs CO2, and releases oxygen naturally.



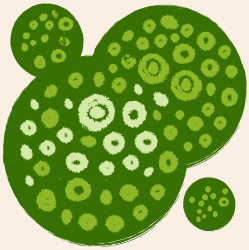
- Captures up to **25 kg** of CO_2/year equivalent to **1** mature trees
- Releases ~**120,000** liters of oxygen/year
- Occupies just **0.6** m² of wall space
- Ideal for compact indoor areas with limited floor availability
- Slim, wall-mounted design with optional air quality display module

Nature-based Air Purification Technology

Carbelim **AirForest™** utilizes high-efficiency microalgae to actively capture carbon dioxide and release oxygen, mimicking and surpassing the natural air-purifying abilities of mature trees in a compact, modern form.

MICROALGAE

Algae captures carbon with an efficiency 400 times greater than trees.



Smart Technology Meets Nature

01 Air purifier running on microalgae based Photobioreactor

02 Capture pollutant gases and particles (CO2, CO, NO2, VOC`s, PM 10 and 2.5)

03 Microalgae: Chlorella vulgaris (high CO_2 capture)

04 UV-C sterilization to eliminate indoor odors & microbes

Annual Environmental Impact

Metrics	Value
CO_2 Captured	~ 330 Kg/year
O_2 Released	~ 1.5M liters/year
Air Purification	› 90% PM/VOC removal
Tree Equivalence	~ 15 Mature Trees

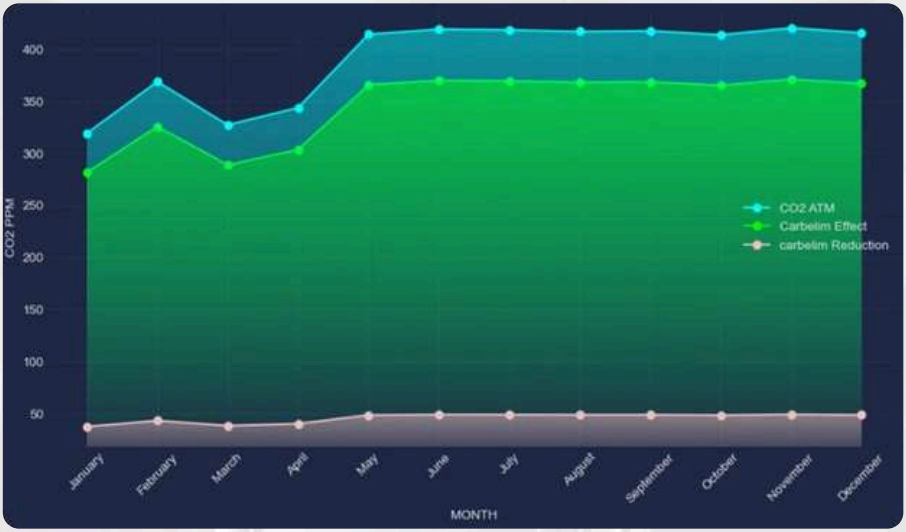
Algae is known for growing its biomass through photosynthesis, producing O2, and fixing CO2 400 times more efficiently than trees ***(Lee et al., 2021)***

Comparison Sheet

Carbelim AirForest™ offers advanced air purification by capturing CO_2, removing pollutants, and releasing oxygen, 400x more efficient than trees. With real-time monitoring, smart controls, and sustainable by-products, it's a modern, eco-friendly alternative to traditional air filters.

Features	Carbelim System	Traditional Air Filters
CO2 Capture Efficiency	400x more efficient than trees	No CO2 capture
Pollutants Removed	Captures CO2, PM 1, PM2.5, VOCs, NOx, and CO	Limited to particulate matter (PM)
Air Purification	Continuous air purification with oxygen release	Removes particles, no oxygen generation
Real-Time Monitoring	Equipped with advanced sensors for AQI reporting and Remote control access	Limited or no real-time monitoring
Sustainability	Biomimetic, eco-friendly, produces useful biomass	Filters need frequent replacement and disposal
Aesthetic Design with multi use	Customizable, fit in walls, floors adds greenery	The company's built-in designs are limited to only a few models.
Useful By-products	Generates biomass for bioplastics, biofuel, feed, and pharmaceuticals.	Generate landfill waste with used filters and cleaning debris

Transformative Effects of Carbelim AirForest™



Simulation Data on Monthly CO2 Level Reduction Using a Single Carbelim System in indoor Areas: The impact is expected to double in the high-traffic lobby/ offcies due to higher CO2 concentrations, which boost micro-algae absorption, accelerating growth and improving air purification efficiency.

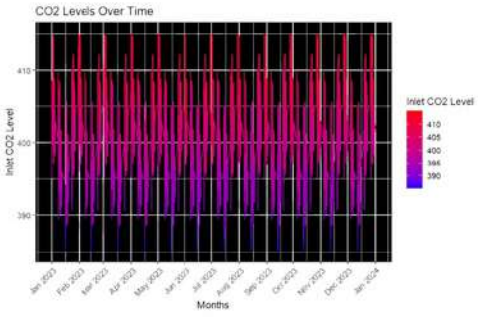
- A single Carbelim AirForest™ unit can reduce indoor CO_2 levels by at least **30.5**%.
- Reduces NOx levels by up to **75**%, improving overall air quality.
- Uses biosorption to capture **PM1.0**, **PM2.5**, and **PM10** particles.
- In high-traffic indoor spaces, it can lower CO_2 emissions by **60-70**%.
- Eliminates **99.8**% of airborne pollutants and microbes, ensuring a cleaner, germ-free environment.
- Also releases oxygen, enhancing indoor freshness and circulation.
- Features real-time air quality monitoring with remote access for smart control.

Impact of Algae Purification

Before (Pre-Installation)

High levels of pollutants, CO2 and odors in the surroundings.

Limited fresh air circulation in high-traffic indoor areas like lounges and walkways.

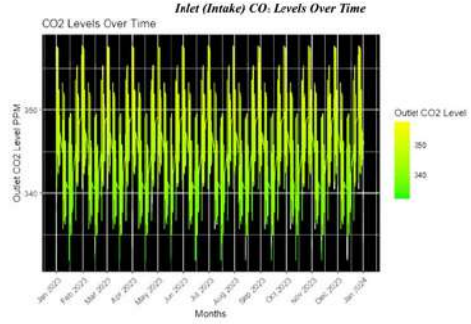


Inlet (Intake) CO_2 Levels Over Time

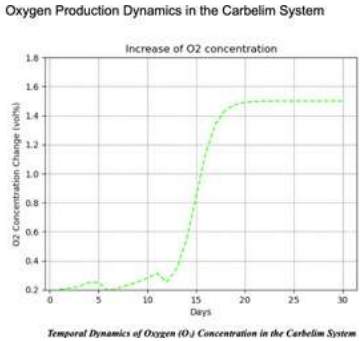
After (Post-Installation)

Drastic reduction in CO2 and airborne pollutants.

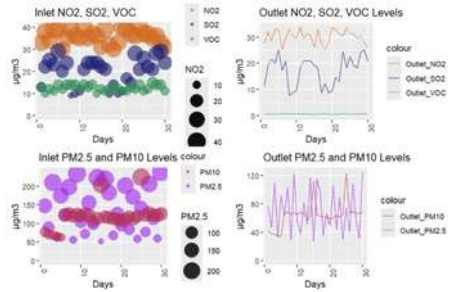
Fresh oxygen and improved air quality and enhanced passenger experience.



Outlet (Exhaust) CO_2 Levels Over Time



Temporal Dynamics of Oxygen (O_2) Concentration in the Carbelim System



Reduction of Various Air Pollutants in Carbelim Workshop Experiments

Following installation, the system delivers a bio-optimized indoor environment with up to 95% reduction in airborne pollutants and a 25–35% drop in CO_2 levels, significantly improving air quality and cognitive comfort. Continuous oxygen generation (~230,000 L/year) and odor neutralization enhance both user experience and well-being, while aligning the space with leading green building standards like WELL and IGBC.

Who Must Own One?

- Allergy & Asthma Sufferers
- Health-Conscious Professionals
- Homes with Children or Elderly
- Gyms & Yoga Studios
- Small Medical Offices
- Clinics & Wellness Centers

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