



Industrial



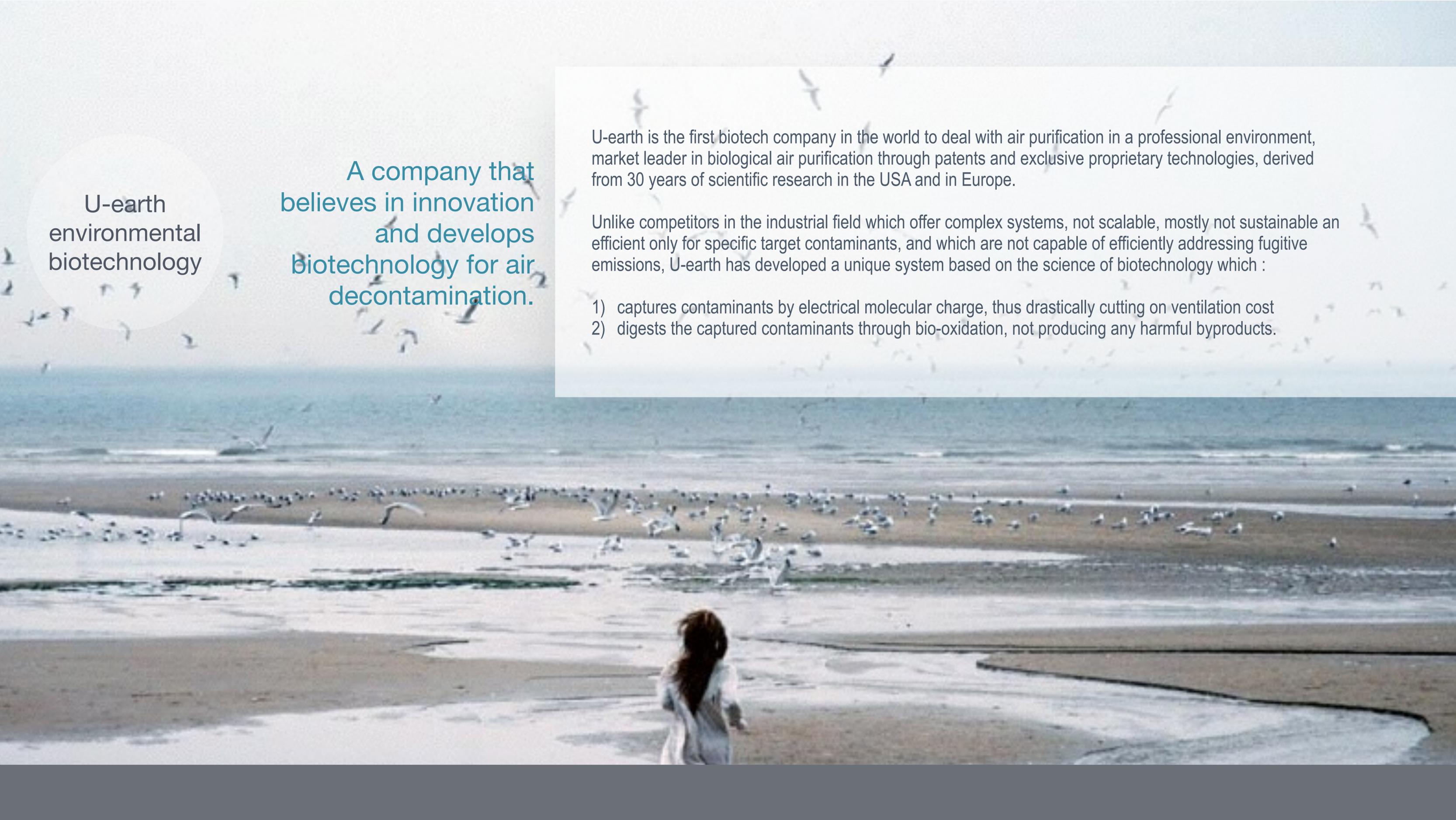
Bio-oxidation systems for air purification

Energy efficiency through air quality management in industrial facilities.

AIRcel70 85 600-5000 Biological Air Purifiers.

Solve the unsolvable
Clean the unclean-able
Breathe the unbreathable





U-earth
environmental
biotechnology

A company that
believes in innovation
and develops
biotechnology for air
decontamination.

U-earth is the first biotech company in the world to deal with air purification in a professional environment, market leader in biological air purification through patents and exclusive proprietary technologies, derived from 30 years of scientific research in the USA and in Europe.

Unlike competitors in the industrial field which offer complex systems, not scalable, mostly not sustainable and efficient only for specific target contaminants, and which are not capable of efficiently addressing fugitive emissions, U-earth has developed a unique system based on the science of biotechnology which :

- 1) captures contaminants by electrical molecular charge, thus drastically cutting on ventilation cost
- 2) digests the captured contaminants through bio-oxidation, not producing any harmful byproducts.

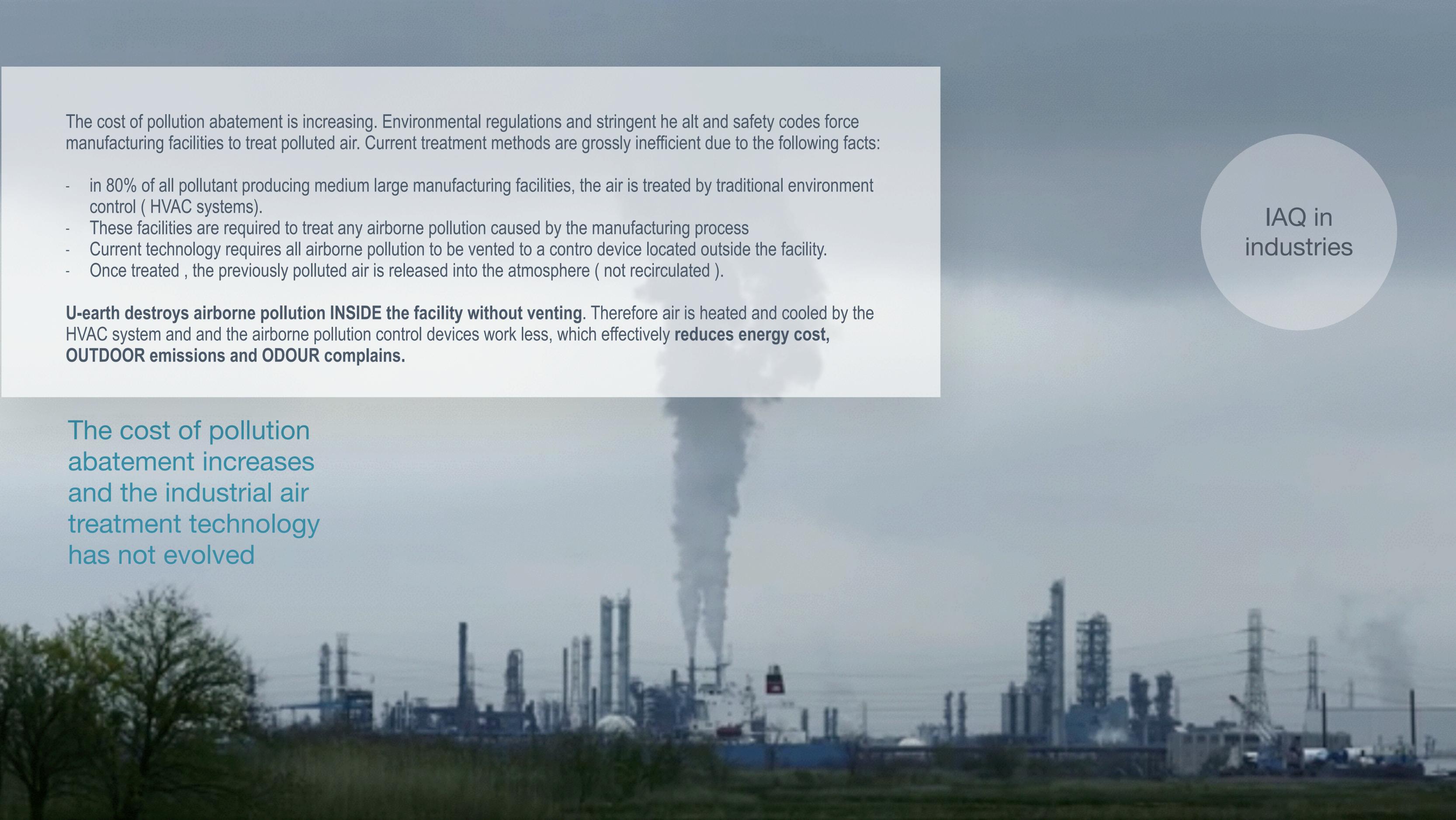
The cost of pollution abatement is increasing. Environmental regulations and stringent health and safety codes force manufacturing facilities to treat polluted air. Current treatment methods are grossly inefficient due to the following facts:

- in 80% of all pollutant producing medium large manufacturing facilities, the air is treated by traditional environment control (HVAC systems).
- These facilities are required to treat any airborne pollution caused by the manufacturing process
- Current technology requires all airborne pollution to be vented to a control device located outside the facility.
- Once treated , the previously polluted air is released into the atmosphere (not recirculated).

U-earth destroys airborne pollution INSIDE the facility without venting. Therefore air is heated and cooled by the HVAC system and the airborne pollution control devices work less, which effectively **reduces energy cost, OUTDOOR emissions and ODOUR complains.**

The cost of pollution abatement increases and the industrial air treatment technology has not evolved

IAQ in industries



IAQ in industries

U-Earth air purifiers are also widely used for the treatment of VOCs (volatile organic compounds), emissions from solvents from industrial processes, both through channelling and in free form, providing a viable and efficient biological alternative to activated carbon filters and post-incineration treatment.

Industrial emissions and odor control.

Odor control is a major problem for industry and the surrounding community. Some processes operate by masking odors, while others reduce them. U-Earth systems destroy odors at the source through the process of bio-oxidation, helping to reduce costs and improve relations with the neighbors.

Superior to thermal oxidation

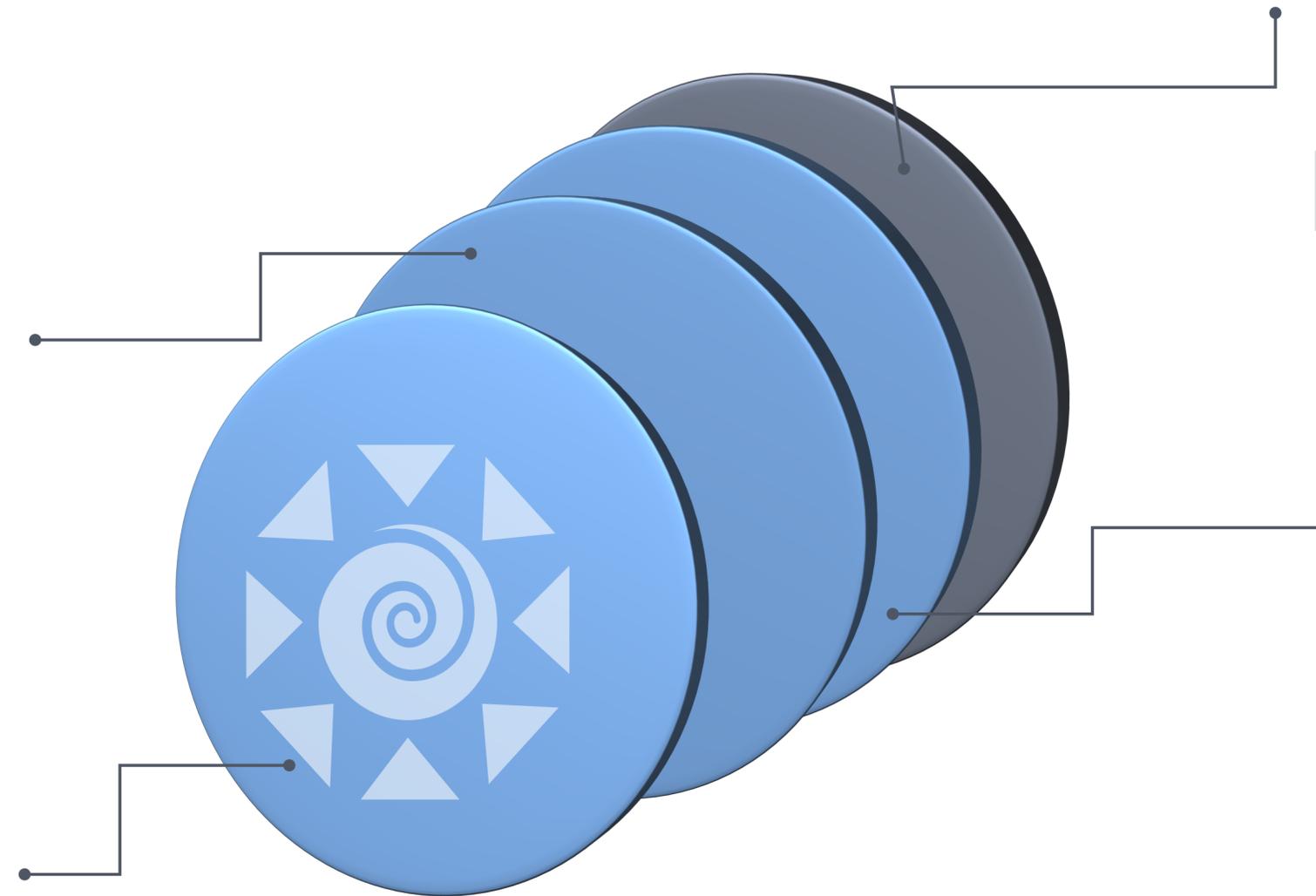
Incinerators often require more space than manufacturing plants. U-Earth air purifiers take up minimal space and are able to fit in very tight spaces. Since U-Earth systems are biological, they do not contribute to additional air pollution as they produce no hazardous waste substances. They work at room temperature and do not increase energy consumption.

Superior to activated carbon

U-Earth air purification systems incorporate an advanced spiral element design which eliminates the need for channelling and treats contaminants, such as polar compounds, carbon monoxide and formaldehyde, that activated carbon cannot treat. Activated carbon quickly becomes saturated and requires frequent maintenance. U-Earth systems reduce or eliminate the cost of replacing activated carbon filters.

Superior to ventilation

Contaminants and persistent odors travel on particulate matter. These particles are electrically charged. Their motion is controlled by electrical fields, not by air flow because the majority of the particles, to the extent of 98% of all particles, are smaller than 0.5 microns, and therefore have a mass too small to respond to gravity or ventilation. U-Earth systems capture and destroy odors and indoor contaminants in real time, saving energy, improving health and safety, and preventing epidemiological emergencies.





The industrial IAQ market can be separated in two categories:

- 1) pollution control devices (inline solutions) which include various types of incinerators and oxidizers with extremely high installation cost (\$ 1M+ , not including HVAC and operating cost (\$ 1M+ annually).
- 2) pollution abatement (fugitive emission solutions). **U-earth is currently the only solution on the market.**

The superior performance of U-earth in the pollution abatement segment directly effects, and could eventually in smaller facilities, the need for equipment in the pollution control segment.

Compare Technologies

COMPARE TECHNOLOGIES	HEPA	Ionic	Carbon	UV	U-earth
size particle removed	down to 0.3/0.5 microns*	down to 0.1 microns	down to 0.5 microns	N/A	no limits
removes allergens	some	some	some	no	yes
remove bacteria	some	some	some	yes	yes
removes odors	some	some	some	no*	yes
remove viruses & germs	no	some	no	yes	yes
removes chemical fumes	no	no	some	no	yes
	*effectiveness falls down between 0.5 and 0.3 microns	with no ventilation	carbon filters are based on ventilation, so they have the same limits as hepa filters, but they are less effective	*they only kill living organisms, therefore no help on odor issues	contaminats are naturally digested after being captured, with no dangerous byproducts.

Why HEPA says it works

The levels of airborne pollution are so high in factories that the air must be treated for health reasons. Liability on health problems the workers may develop in the future should be taken in careful account,, for which the manufacturing company will be held responsible for.

Unfortunately, current industrial air purification is extremely inefficient.



The filtering technology LIMITATIONS

Filtering is the largest contributor to the air purification industry and is founded primarily on high efficiency particulate air (HEPA) and charcoal filters. **HEPA filters** focus on airborne particulates 0.3 micron and larger. these particulates include many allergens, pollens, textile fibers and mold. **Ultra-HEPA filtering** systems used by high-end distributors can filter particulates as small as 0.1 micron. Charcoal filters are typically used for odor removal.

Filters only capture airborne pollution brought into the system with airflow, but do not destroy it.

Filtering (HEPA) and other IAQ systems like **Ion, UV, Air Washers**, exist on the market with claimed performance (30% - 99%). This raises two very important questions:

- 1) if portable air cleaners are claiming 99% efficiency , how can U-earth produce 900% improved results?
- 2) if current generation portable air cleaners are capturing 99% of all airborne pollution, why are ailments and deaths caused by poor IAQ increasing?

Conventional air purification processes all operate under the fundamental theory of fluid dynamics. Because airborne pollution resides in the air , air must be recirculated to capture it. Consequently **air purifiers have been rated on the volume of air exchanged over a period of time and on inlet versus outlet pollution levels MEASURED AT THE UNIT and not by detecting IAQ the room.** Higher exchange rates of the inlet/ outlet pollution gradients have always meant greater efficiency. this airflow-based theory gave birth to an industry standard “ Clean Air Delivery Rate” (CADR) test. CADR was based on a recorded amount of pollution entering the filtering system , and a recorded amount of pollution exiting the system. Success was historically defined by this test, therefore some companies were able to claim a 99% reduction in airborne pollution.

In December 2003, an article was published in the Journal of Environmental Health that would forever change the principles of air dynamics.

The research shows that more than 98% of particulates in room air are small, less than 2 microns in size and essentially do not settle out of the air by gravity. Air currents in a room entrain and move large particulates, carrying them into the ducts and hence into the filters. Most small particulates are not entrained and moved by air currents because their cross-sectional area is so small. Small particulates motion is primarily determined by the typical electrical fields that exist in all rooms.

Characteristics of Aerosols

particle size in microns	particle percentage by count
10 - 30	<1
6 - 10	<1
3 - 5	<1
1 - 3	1
0.5 - 1	6
< 0,5	92

Particle settling time in still air

particle size in microns	time required to settle 8 feet
100	8 seconds
10	13 minutes
1	19 hours
0.1	79 days
0.01	infinite

*December 2003, Journal of environmental health, "Minimizing pathogenic bacteria, including spores, in indoor air", Linda J.Uthup Ph.D, Kenneth Werner, Allan H. Frey Ph.D.

If 98% of the particulates are too small to respond to gravity and ventilation, current venting systems are capturing around 2% of INDOOR particulates and contaminants.

And even those pollutants are only trapped in the filters, not destroyed.

The science of air particle motion



U-earth system

In order to reach optimal levels of IAQ the system is integrated with a performance tracker, which releases in real time crucial data of contamination levels IN THE ROOM.



U-MONITOR
AIR QUALITY DETECTION



U-MANAGER
DATA HISTORY



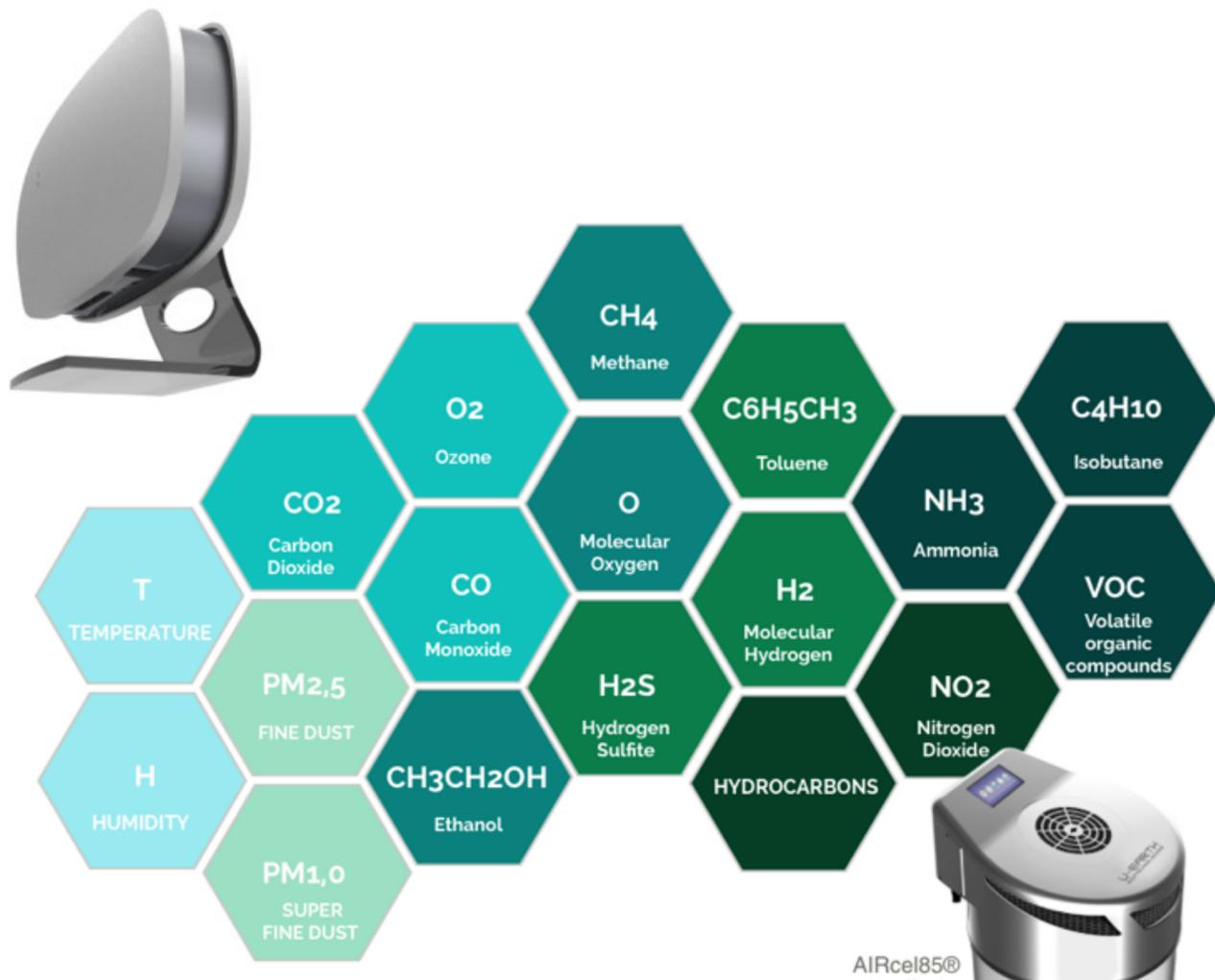
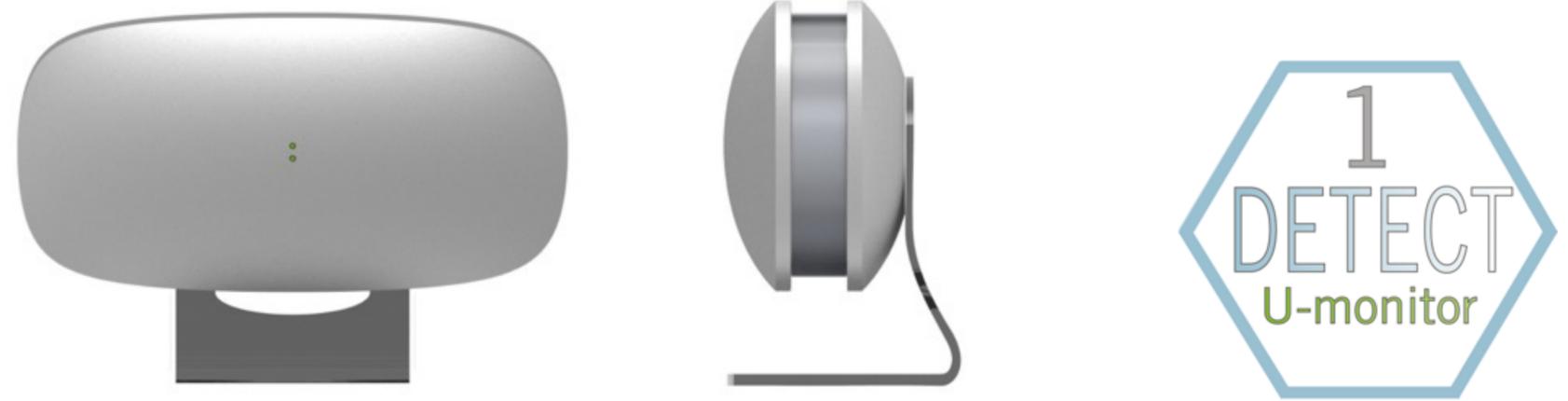
YOU ARE ENTERING A
CERTIFIED
**PURE AIR
ZONE**
PURE-AIR-ZONE.COM

THE CERTIFIED PURE AIR ZONE® SYSTEM



AIRcel
AIR PURIFIER

It is great to be able to control what is happening.
 Every 5 minutes the sensor detect IAQ and send the data to the U-manager Cloud, where they store the history of the site.



U-monitor contaminant detection

U-Monitor is a very powerful tool to detect contamination behavior and history. It can be used to draw baseline data before installing AIRcel air in order to efficiently size the right amount and model of AIRcels needed for the de-contamination purpose.

U-monitor can detect every 5 minutes:

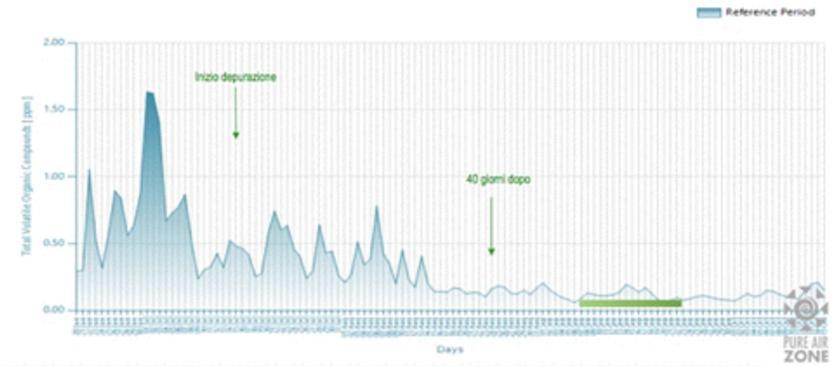
- Volatile Organic Compounds VOC (ppm)
- Odorous Gases (ppm)
- CO2 equivalent (ppm)
- particulate matter PM > 1.0 (pcs/l)
- particulate matter PM > 2.5 (pcs/l)
- Temperature (C°)
- Humidity (%HR)
- Radon*
- Radioactivity*

* on selected models

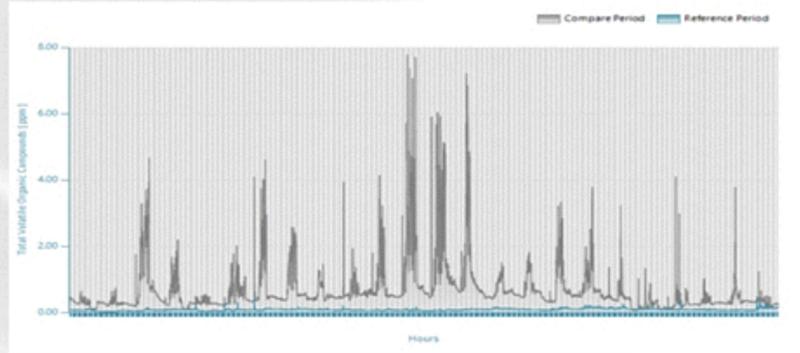
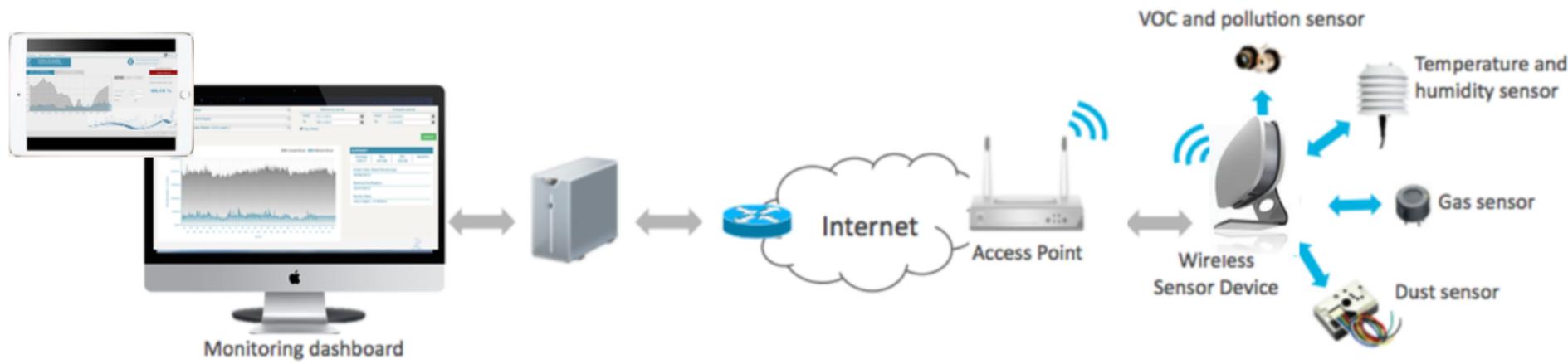
2 ANALYZE U-manager



Compare periods - daily average



Contamination history



Every 5 minutes reading details



A complete range of sizes to fit all industrial needs, from office protection to production decontamination and outdoor odor control.

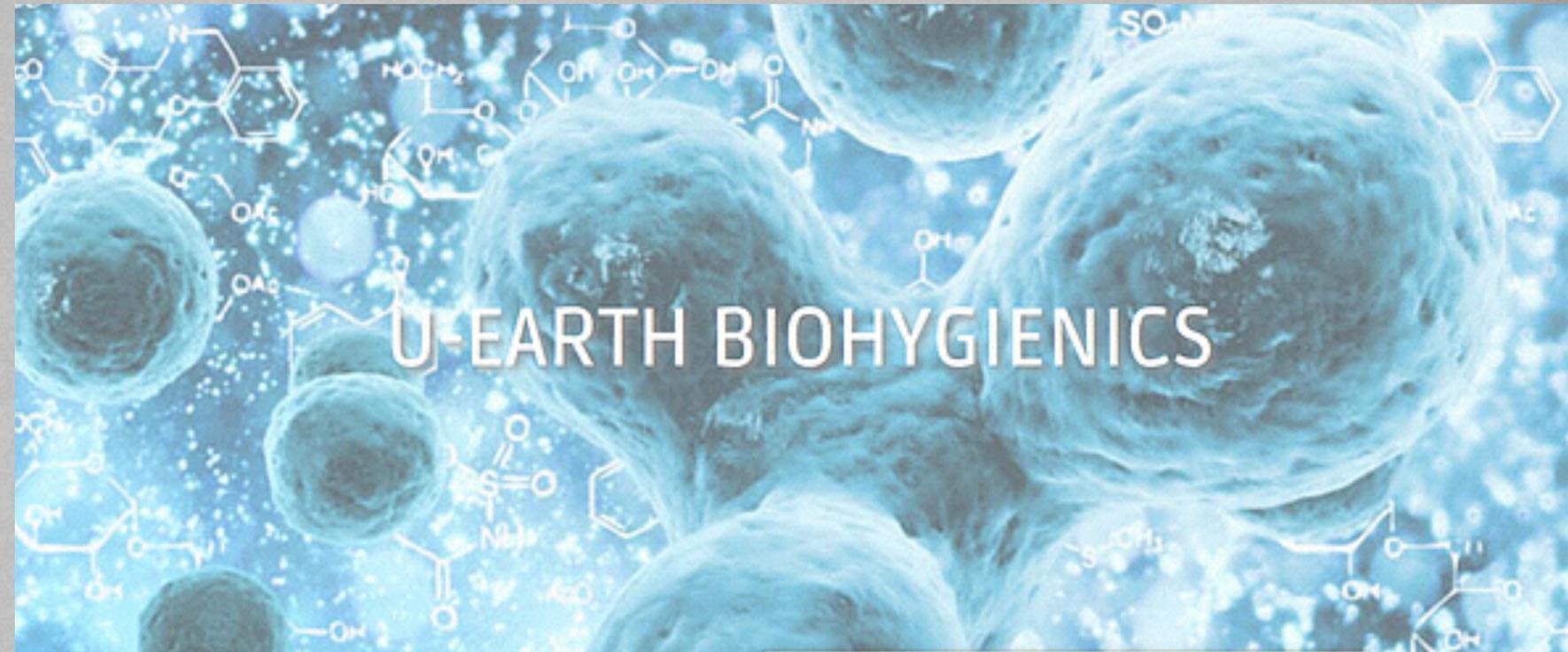


We leave nothing unresolved

Today there is a new technology that allows the capture and destruction of all the contaminants in the air with no limitations on their type or size. U-Earth technology for air purification combines the basic scientific principles of:

- convection
- molecular charge attraction
- natural oxidation

to capture and destroy contaminants in the air with no limitations on their type or size. We call this process BioHygienics.



CONVECTION

is the process whereby a ventilation system is used to move large particulate matter, over 0.5 microns in size, which makes up approximately 10% of airborne contaminants in indoor environments. U-Earth systems also use fans to capture the larger particles, causing them to be trapped in the bioreactor.



MOLECULAR CHARGE ATTRACTION

occurs when the air around the bioreactor, electrically charged and rendered neutral by "grounding", is used as a source to attract 90% of the particulate contaminants in the air that do not respond to ventilation.

These contaminants consist of ultrafine particulate matter, volatile organic compounds (VOCs), hazardous air pollutants (HAPs), and more.

We call this the principle of attraction Grounded Air Zone™. It is not an ionic or electrostatic phenomenon and thus produces no harmful by-products. The contaminants captured by the Grounded Air Zone™ remain trapped in the bioreactor.



NATURAL OXIDATION

occurs when the air contaminants that enter the system are destroyed. U-Earth technology incorporates a patented bio-reactor which perfectly controls the combination of water, oxygen, enzymes, and contaminants to obtain an oxidative process 12 times more efficient than the process of natural oxidation.

The contaminants are digested and broken down into

WATER + CARBON DIOXIDE + BASE ELEMENTS

from the compound in the case of inert material. The result is cleaner air without the problem of waste disposal.



Those who have tried it don't change back.

The extraordinary performance of the U-Earth air purification systems is achieved thanks to three fundamental components on which the technology is based:

- 1 AIRcel_bioreactors, produced in various sizes, covered by international patents.
- 2 U-Ox, an additive based on genetically unmodified, non-pathogenic micro-organisms and enzymes in a completely natural proprietary formula.
- 3 the know-how of the U-Earth technicians based on 20 years of research and experience in the field.

For over 30 years the research on the use of bacteria, enzymes and consortia of microorganisms in the field of environment has been pursued and applied to various problems. Among the most well-known are bioremediation for decontamination of land from hydrocarbons and the use of free cell biomass in the purification of wastewater.

U-Earth technology is the evolution of the free cell system in an immobilized cell system where the U-Ox additive of micro-organisms that are selected, acclimatized for contaminants and bottled in dormant conditions in our laboratories in the USA, are in the ideal conditions for triggering the phenomena of capture and digestion of the compounds in extremely efficient, miniaturized freestanding systems.

The system consists of a freestanding patented air purification bioreactor called AIRcel Clean Air Plant®, to be connected to the power socket. The user only needs to add water that evaporates during functioning (every 5-6 days), and an additive enzyme called U-Ox® every 30 days.

Every 4 months it is advisable to completely drain and rinse the bioreactors of any (harmless) waste deposited on the bottom.

BioHygienics™

IMMOBILIZED TECHNOLOGY

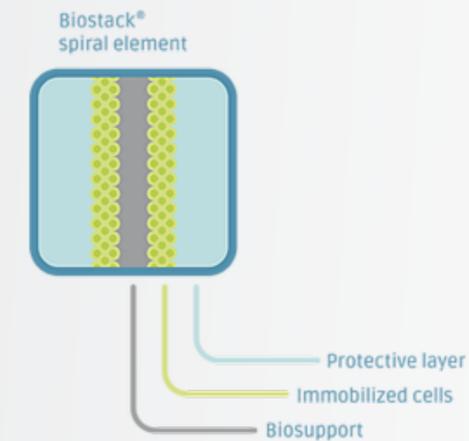


Before the introduction of bio-hygienic technology, the process of bio-oxidation had constraints of space and time. At first, the system used free cell technology, which was a slow process, not applicable to indoor environments and caused disruption in the disposal.

Recent advances in immobilized cell technology have developed the process of bio-oxidation. Combined with the design of the BioStack® Cartridge Element in our bio-system, the immobilization technology is the passage through which the strongpoint of enzymes and micro-organisms is made available to small users.

Immobilized biofilms are a subset of immobilization technology. The immobilized cells are far superior to free cells for the following reasons:

- the cells are arranged back to back and are not exposed to attack by chemicals or microbes
- the cells form a thin protective gel that makes it even more resistant to highly toxic components
- the immobilized cells remain in the biofilm and not in the bottom of the tank as happens with the free cells
- can be used to clean both air and water
- do not wash away when a high flow of liquid is used
- the biofilm is reusable: the water or air can be recycled in the same biofilm thousands of times thus increasing the productivity and efficiency.



Within each AIRcel is a BioStack® Cartridge Element.

The BioStack® element has a spiral configuration which maximizes the surface space, eliminates the "gaps" and does not require replacement. Thanks to the effective coating of the entire element with a bio-organic film, this active surface digests all types of VOC and organic components eliminating odors and the air contaminants that they create.

The configuration of the BioStack® generates an electrically neutral "pure zone" that attracts both the positively and negatively charged particles. Particulate matter, gases and vapors are captured inside the unit, biologically oxidized by the microorganisms and enzymes and finally eliminated. As a result of this process both clean air and water are obtained. This unique solution of the BioStack® Cartridge Element in the unit, which uses biological oxidation to "chop" the contaminants present in the air and water, has proven fast, effective and economic in small, compact treatment installations.

Plug+ add + play.

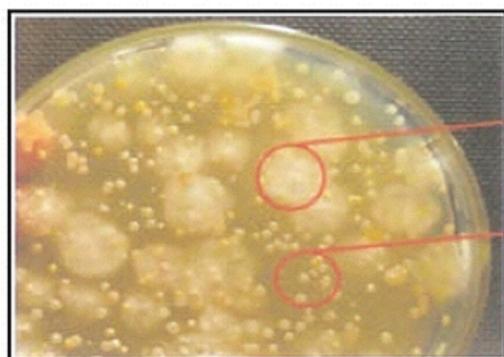
We don't expect you to take our word for it. The comment made most often by our potential customers in all sectors, plagued by unsolvable air problems is:

"If the system works even half as well as you say it does, we'll be happy!"

We focus on results at U-Earth. To us, every customer is unique, given the variety of problems presented, and so we provide a highly personalized service. We have a team of AIR QUALITY SPECIALISTS able to assess your problems and the possible solutions whatever sector or part of the world you are in.

U-Earth provides its customers with 360° solutions and assistance continues throughout the life of the installation through a web-controlled system for remote monitoring of their environmental conditions in real time, and an AFTER SALES service available on call 24H wherever you are.

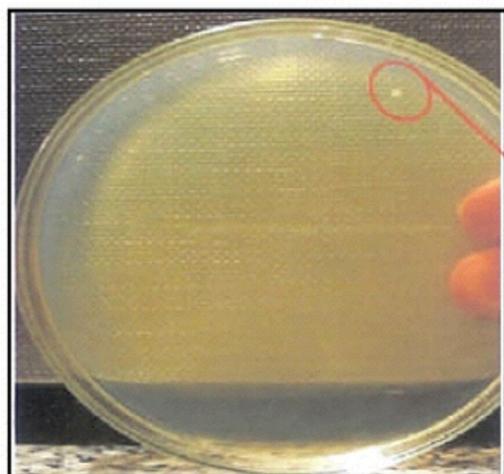
The results



Fungal colony

Other microbial colony

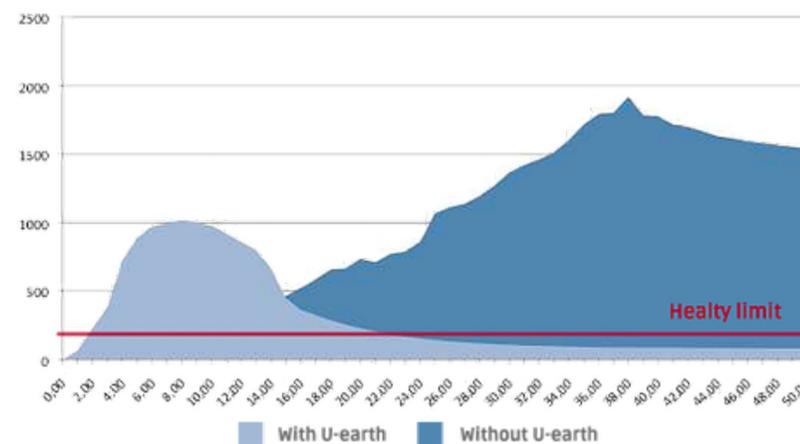
Figure 1A



Single airborne microbial colony

Figure 1B

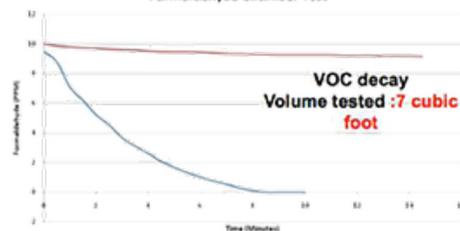
VOC ppm acetone vs time



Particulate count

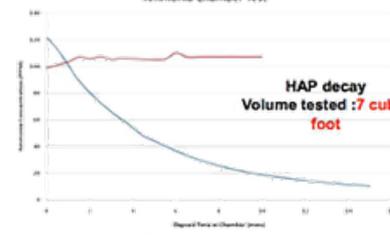
	Initial	Pre	Post
10u	301	272	9
5u	563	362	21
1u	33808	38734	242
.7u	56615	70268	305
.5u	105283	118963	414
.3u	208920	215530	383

Formaldehyde Chamber Test



VOC decay
Volume tested :7 cubic foot

Ammonia Chamber Test



HAP decay
Volume tested :7 cubic foot

Sustainability

The cleanest energy is the one you don't use.
Energy efficiency through air quality management.



The use of U-earth equipment in any professional setting, ranging from office space to industrial process facility, allows to substantially improve indoor air by recycling the air inside the industrial facility. In return, this reduces the need to bring in fresh air from the outside to balance the facility IAQ, while limiting the contaminated or odorous air to be vented outside generating complains from the neighborhood. **By lowering the air turnoff rate in the facility, manufactures and office buildings realize significant improvements in sustainability, workers productivity and welfare and significant reductions in operating cost.**



A 37000 sqm facility in the laminate industry, reduced operating cost \$400,000.00 per year by becoming more efficient through the addition of U-earth technology. The same facility reduced its carbon footprint by 3.267MT (metric tons) per year - the equivalent of 7.442 barrels of oil.

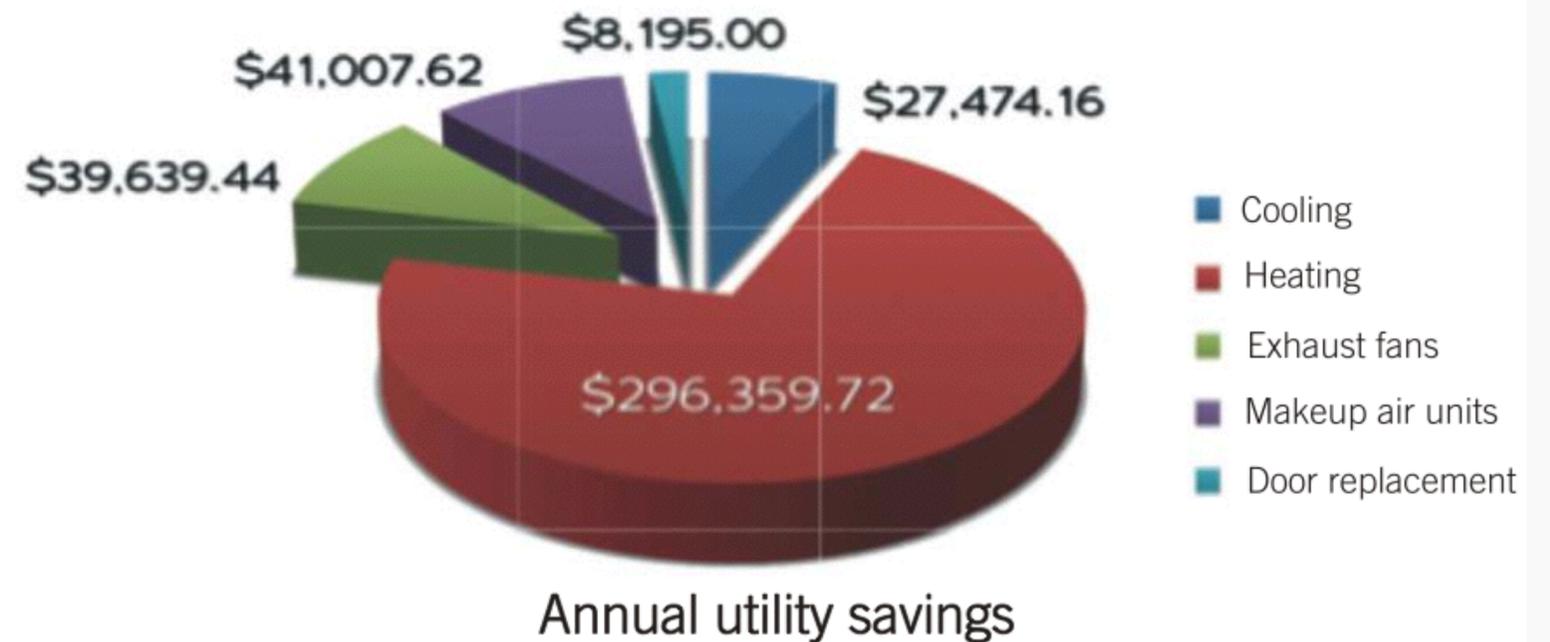


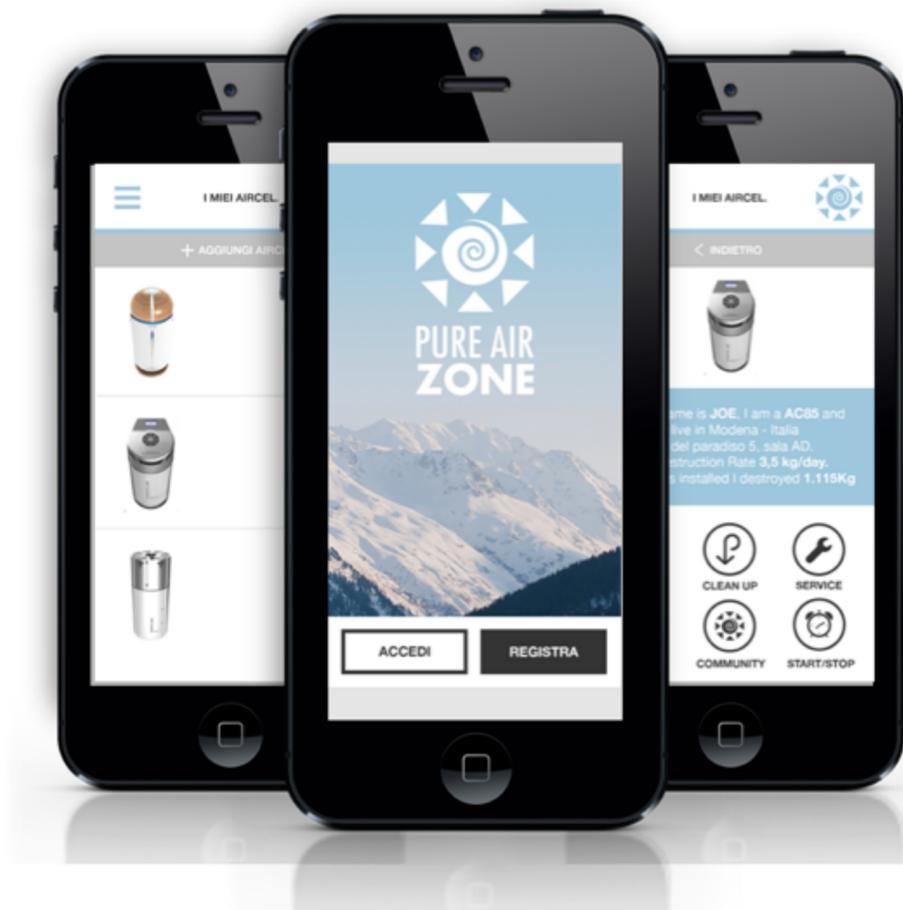
Within days from installation, employees noticed a difference in airborne particulates and odors from VOCs. Within 2 months the facility began turning off exhaust fans and lowering their utilities bills.

Leading industries and companies around the world are solving their air purification challenges by using U-earth air purification systems. to explore how you can achieve energy efficiency through air quality management, e mail us at

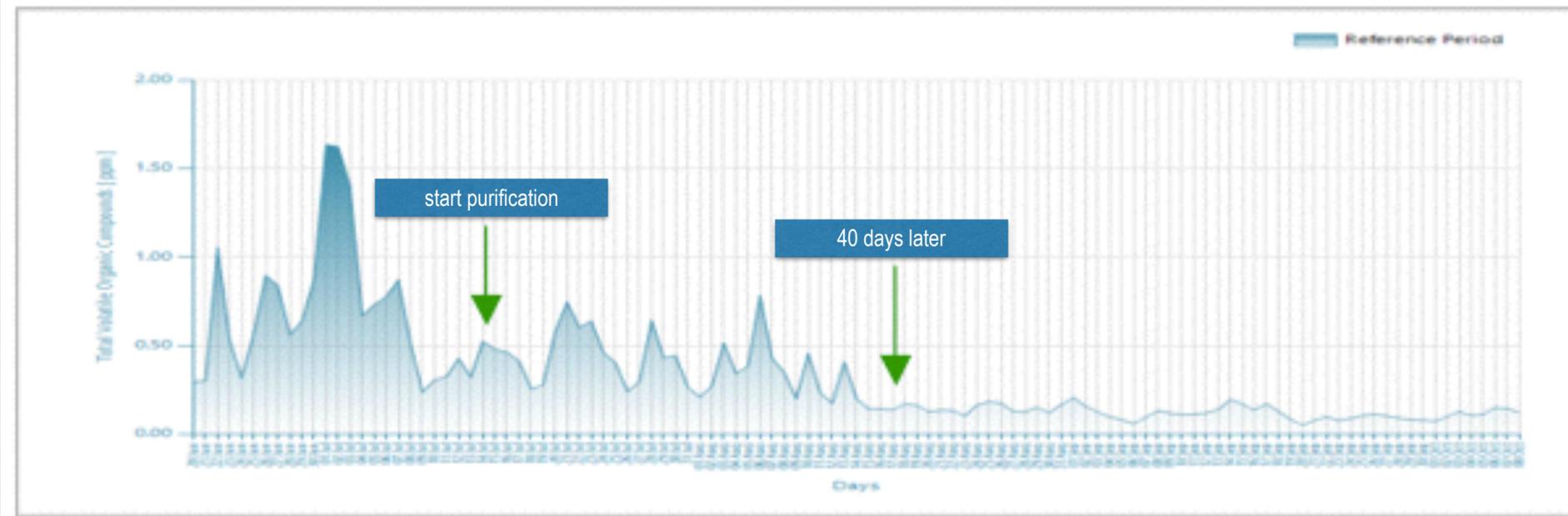
info@u-earth.com

and we will be happy to come and assess your AIR quality with U-monitor and find together a sustainable solution to your environmental responsibility concerns.





Keep every data securely saved in the cloud, accessible from every device and well managed. Now you really have everything under control.





We are not afraid
of getting
our hands dirty

The “electrical charge attraction “
principle on which U-earth technology is
based, is suitable for the most extreme
conditions such a huge loads of
contamination to process, like odor and
bacteria in trash transfers, and outdoor
urban settings where a bubble of pure
mountain air is created.

learn more on
www.u-earth.eu
www.pure-air-zone.com

Extreme
conditions



And work in
outdoor settings



U-earth Biotechnologies
www.u-earth.eu

