



N•A•N•O HUB

Innovative solutions for the **Fruit & Vegetable**
sector and the **Conservation of Products**

An Exclusive Partnership and Collaboration

N•A•N•O HUB

NanoHub is a R&D startup specialized in nano-technologies for treatment of indoor air based Nano Photocatalytic Oxidation with the use of an innovative solutions.



Fuel is an Italian a company specialized in design and production of Air Sanitation systems for civil, industrial and commercial use. It is also the controller company of Ellamp Spa leader in design and production of interior systems for passenger transport vehicles bus and trains.

Together we develop solutions for Indoor Air treatment in confined spaces by sharing and enhancing our respective skills and know-how and recourses.

Patents:

- | | | |
|--------------|--|---------------------|
| - NANO HUB | n. 102020000013921 Filter for air treatment (and water). Photocatalytic tissue reactor with copper nanocluster | (Trade name "KtV") |
| - ELLAMP SPA | n. 102019000023847 photocatalytic air sanitizer for vehicle compartments" | (Trade name "ETRA") |
| - FUEL Srl | n. 102020000009604 Personal protection equipment with photocatalytic reactor | (Trade name "ARIA") |

Innovative Solutions for Conservation of Fresh Fruits and Vegetables

In developed countries, the traditional distribution and retail sector Fresh Fruits and Vegetables (FF&V) produces about 10% of waste.

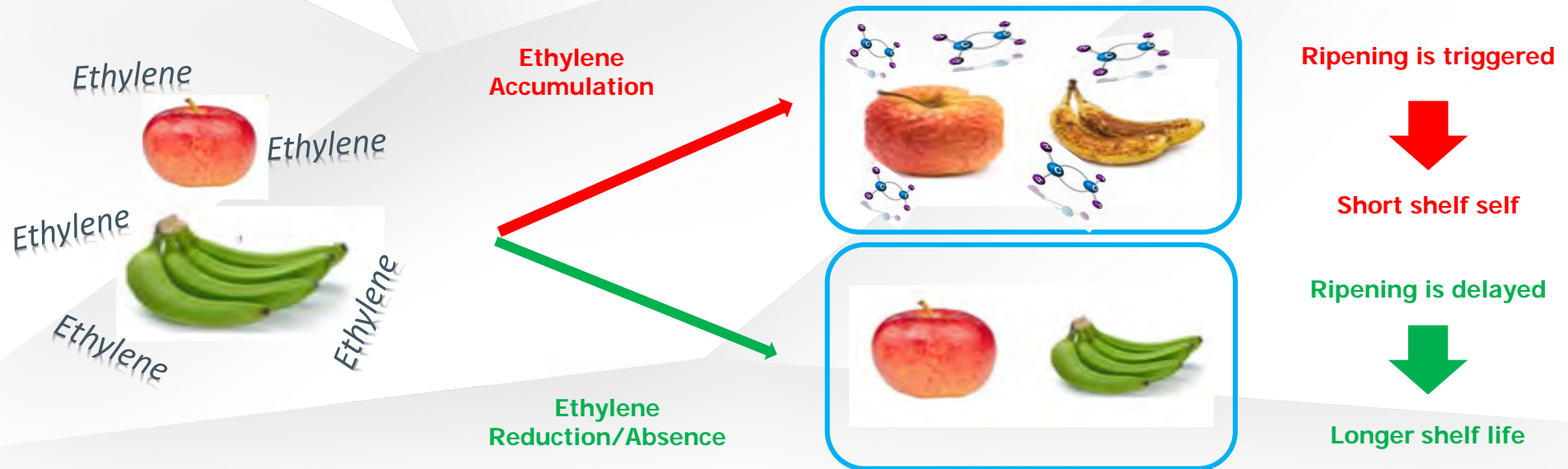
A significant portion of these losses are represented by alterations caused by microorganisms and bacterial species that are capable of growing also at lower refrigeration temperatures

Controlling the microbial load during refrigerated storage and ethylene production is one of the key factors for obtaining food of good microbiological quality and with a better and longer shelf-life.

N•A•N•O HUB has developed a specific know-how and expertise in the field of FF&V preservation with the use of nano-photocatalyst technology.



What happens to Fresh Fruits and Vegetables in the Post-Harvest Phase



In the post-harvest phase, all fruit and vegetable products undergo a series of alterations determined by the modification of the initial natural environmental (air properties- storage temperature) and physical-chemical conditions. (natural production of ethylene)

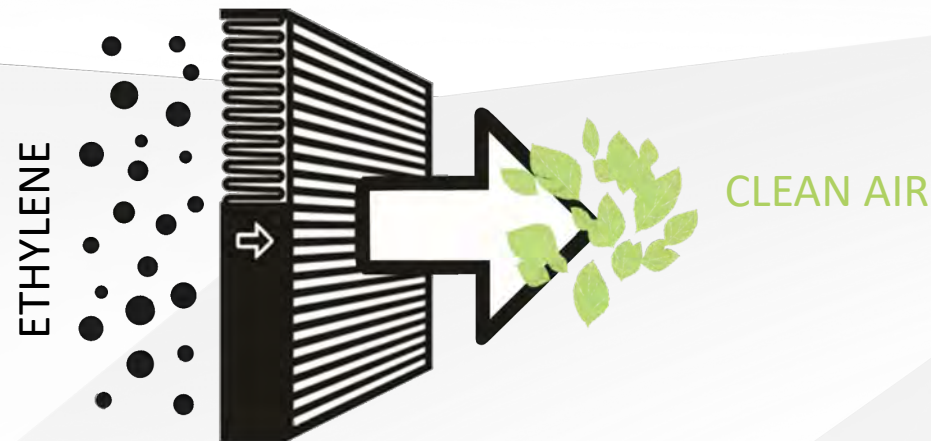
- Alteration of external appearance and taste
- Loss of weight loss, freshness, fragrance and flavor
- Increase of ripeness
- Presence of molds and pathogens

Patented Photocatalytic Filter

The KtV photocatalytic filter is able to eliminate excess of ethylene, which is responsible for the ripening of fruit and vegetables.

The ethylene-saturated air passes through the filter mesh and comes out clean, thanks to the natural phenomena of photocatalysis activated by natural or LED light.

Its characteristics make it **an ideal and unique system for storing fruit and vegetables directly in retail outlets.**



N·A·N·O HUB Patented technology

Key Advantages of KtV[®] filter in preservation of fruit and vegetables

UNIQUE The **unique** filter in the market that can be apply **directly in fruit and vegetable department of supermarkets**

SUSTAINABLE Cutting waste by **30%** and **reducing conservation emissions**

EFFICIENT The KtV filter allows **significant savings in the handling of fruit and vegetables**, prolonging their shelf-life. It is no longer necessary to move the goods to the refrigerated counters at the end of the day.

CHEAP KtV filter requires **little maintenance** and has **negligible power consumption**. Allows fruit and vegetables to be stored at higher temperatures (energy saving).

ECOLOGICAL **No use of chemicals**. Method compatible with "**BIO**" production

SAFE **No UV emissions**. No toxic waste. Only an infinitesimal emission of carbon dioxide and water vapor.



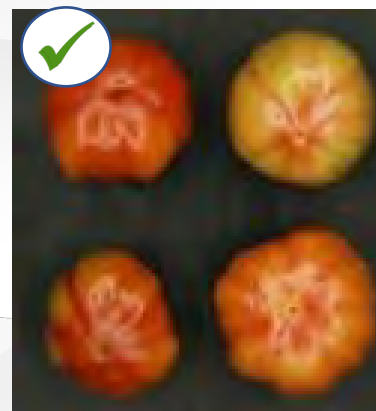
The Scientific Proof at Salento University



UNIVERSITÀ
DEL SALENTO

NANOHUB has an on-going collaboration with the University of Salento for testing the effects of KtV filter on ethylene control for the conservation of fruit and vegetables.

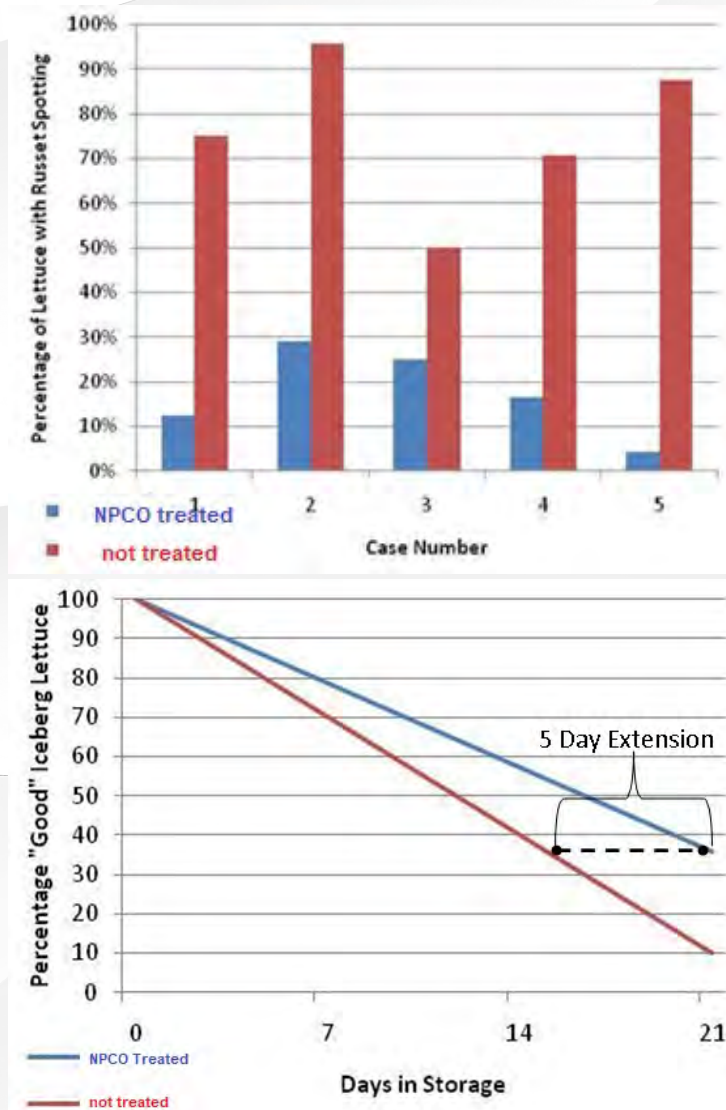
STORAGE RESULT AFTER 3 WEEKS AT 18°C WITH AND WITHOUT
KtV[®] PHOTOCATALYTIC TREATMENT



The ethylene concentration was monitored by measuring the air treated with a gas chromatograph

Result: Shelf-life can be extended up to 10 -15 days

Significant Tests' Results on lettuce



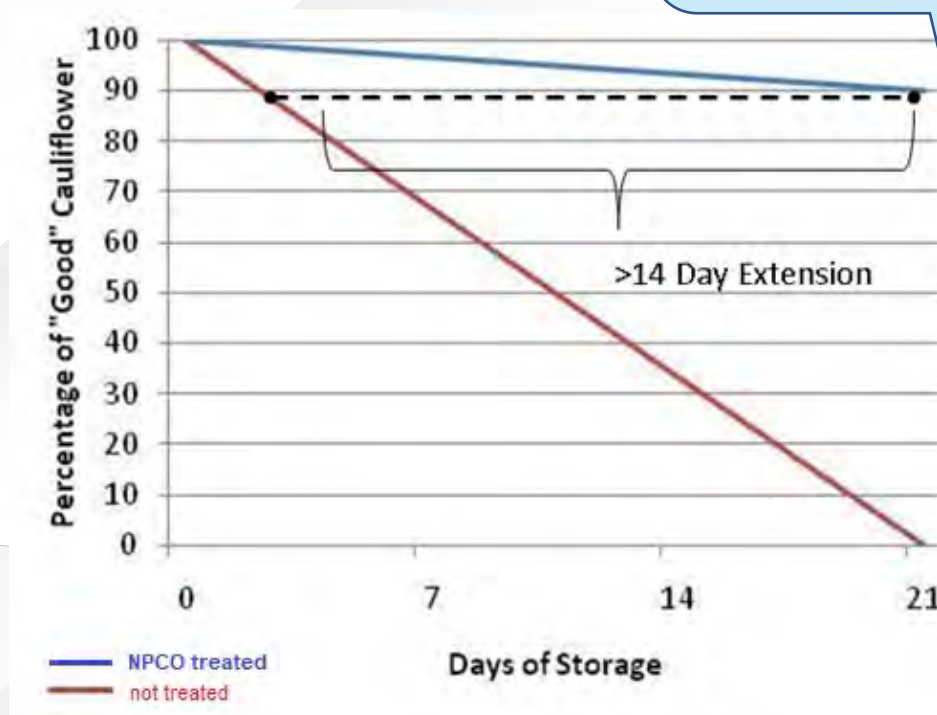
Lettuce treated with KtV filter loses 65% of goodness 5 days after untreated lettuce

The conservation with KtV filter significantly **reduces russet spotting** in wrapped Iceberg Lettuce over the 21 day storage period.

Significant Tests' Results on Cauliflower



Cauliflower treated with KtV filter loses 10% goodness 14 days after untreated cauliflower



Cauliflower experienced total, catastrophic **loss of leaves over the 21-day test without** the treatment with the KtV photocatalytic filter.

Effects of photocatalytic filter treatment after two months



A leader in the commercial refrigeration sector for more than 50 years, chose to test the effectiveness of the KtV photocatalytic filter in a fruit and vegetable counter in its laboratory.

Fruit and vegetables were placed in two refrigerators - one of which was equipped with the KtV photocatalytic filter.

After 2 months the conservation status of the products was compared...

Effects of filter treatment on lemon



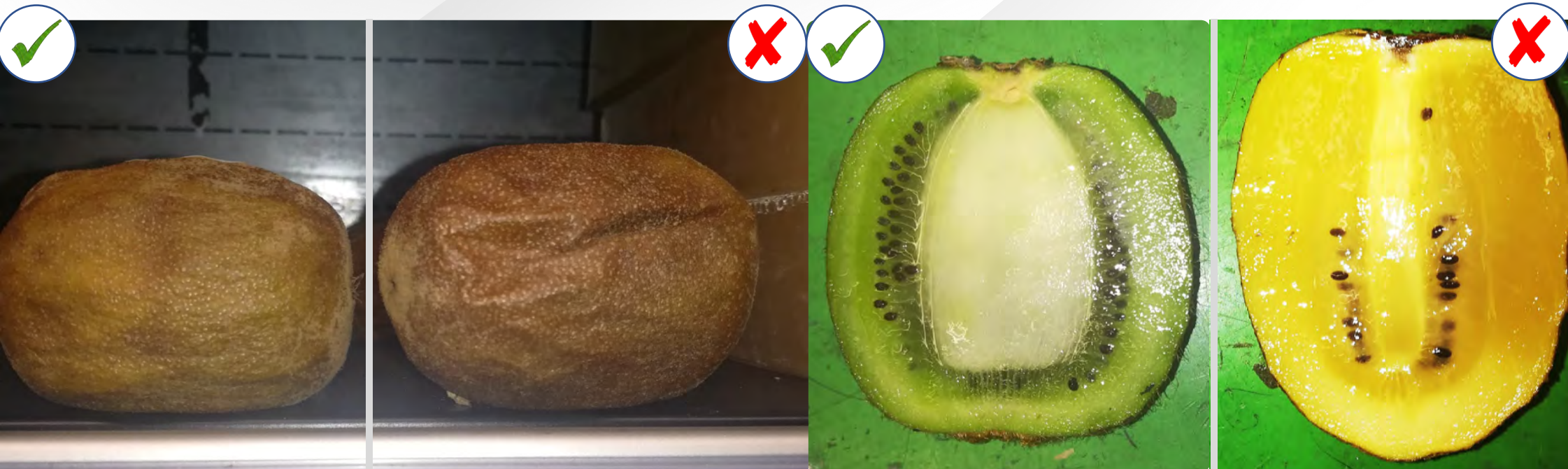
After 2 months, the peel of a lemon stored without the photocatalytic filter is shrivelled and has dark spots, whereas the lemon peel remains in excellent condition with a bright yellow colour after treatment with the photocatalytic filter.

Effects of filter treatment on bananas



On the outside the banana has turned black in both cases, but the fundamental change lies inside, in the maintenance of its consistency. Without our filter the banana becomes soggy and brown.

Effects of KtV[®] filter treatment on kiwis



The skin of the kiwi fruit stored with the KtV filter is still in excellent condition, whereas where the filter was not present the skin is wrinkled. The difference is also evident inside, as the kiwi stored without the filter is overripe, yellow/brown in colour and no longer edible.

Effects of filter treatment on apples



After **two months** in the refrigerator with the photocatalytic filter, the apple still has a firm, good-looking flesh, unlike apples stored without the filter, which are wormy, soft and deteriorated.

Conclusions

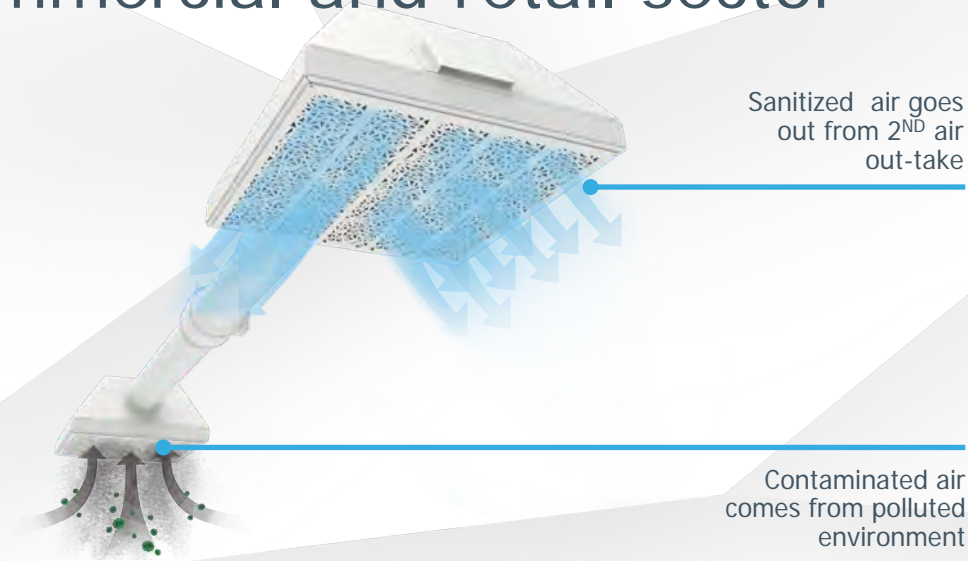
The results are excellent: **fruit treated with the KtV filter remained appealing and kept its consistency** for a long storage period (2 months).

Fruits **preserve their vitamins and** are more **vital**.

The KtV filter **prolongs the shelf-life** of fruit and vegetables **reducing waste**.
The **handling improves**, thanks to the possibility to let the goods on the shelves during closing hours.



Using the photocatalytic filter in the commercial and retail sector



SCIROCCO 250 is ideal for shopping centers, supermarkets and warehouses. It is a ceiling-mounted device that allows the KtV filter to be used in very large environments while ensuring its proven effectiveness against ethylene, which is primarily responsible for the ageing of fruit and vegetables.

Air Flow: 250 m3/h
Input power: 60W
Power supply: 220/240 V/ac
Technology: KtV
Light Source: LED visible white light
Dimensions: (L x W x h) 5400 x 600 x 295 mm
Weight: 14,5 kg



NANOHUB patented Photocatalysis filter, FuEI designed product





Air Flow: custom
Input power: 12W
Power supply: 24V/cc
Technology: KtV
Light Source: LED visible white light
Dimensions: (L x W x h) 550 x 550 x 37mm or custom
Weight: 4 kg custom

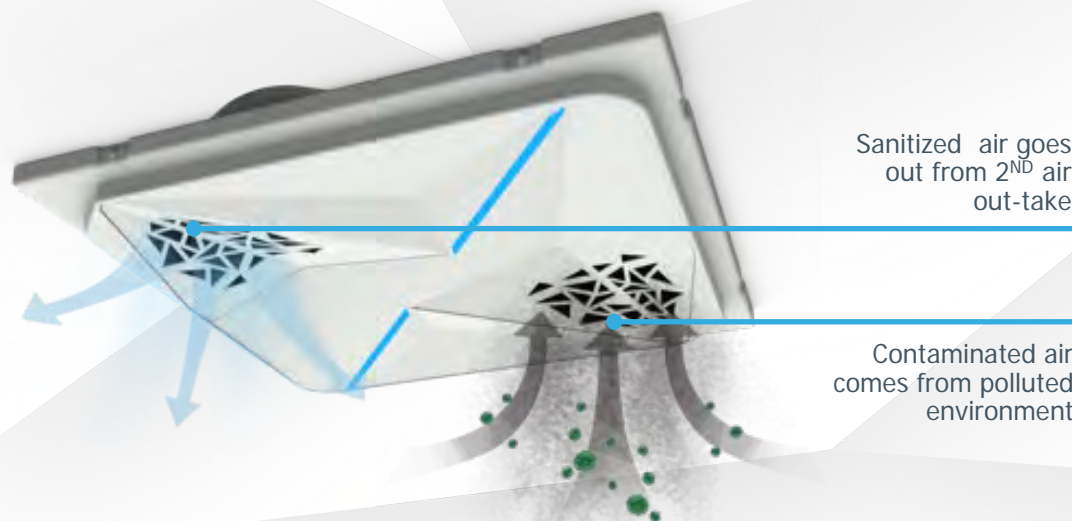


PONENTE 1000 is a KtV filter system that can be integrated in ATU - Centralized Air Treatment Units or in UFAD (underfloor air distribution). It can be installed in air channels of ATUs to keep under control the air quality and eliminate all airborne impurities ensuring a high degree of air sanitification. Common applications are in Hospitals, Shopping Malls, Restaurants and the Cold Chain sector. Special note for installations in supermarkets/fresh food stores were VOCs responsible for rapid aging of perishable such vegetables, fruits are very effectively eliminated thus prolonging the shelf-life products.

NANO HUB patented product



Home, Business, Construction, Epc Sector



Sanitized air goes out from 2ND air out-take

Contaminated air comes from polluted environment

SCIROCCO 150 is a light weight 60 x 60 cm active ceiling panel that sanitizes air efficiently and safely in the presence of humans. It can be installed in any ceiling tile system being 100% integrable with existing standard panels or light panels. It is suitable for continuous air sanitation of large open office environments and restricted spaces such as elevators.

Air Flow: 150 m³/h (increasable on demand)
Input power: 40W
Power supply: 80/264 V/ac
Technology: KtV
Light Source: LED visible white light
Dimensions: (L x W x h) 600 x 600 x 310 mm
Weight: 6,5 kg



NANOHUB patented Photocatalysis filter, FuEI designed product



N•A•N•O HUB

i n n o v a t i o n i s i n t h e a i r

Thank You for the attention

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By



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Images are provided for demonstration purposes only and may differ from the final product.
NANOHUB reserves the right to change or update the look, features and accessories list of the device at any time without notice.