



**cyclonic**

**First air purifier for livestock farming**

## Farms: a problem in the air

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Contamination from farming due to the feed, excrement and other waste, affect directly to animals health. This make significantly decrease the productivity of livestock farms.

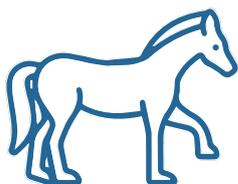
Among the principal pollutants that may affect production and livestock health, **Spanish Ministry of Agriculture, Fisheries and Food (MAPA)** highlights the following:

- **Carbon dioxide:** it is recommended not to exceed concentrations between 3.500 y 4.000 ppm.
- **Ammonia:** it is recommended not to exceed 20-45 ppm. Higher concentrations can cause respiratory and eye diseases and loss of appetite. It is also a harmful gas for the personnel working on the farm.
- **Hydrogen sulphide:** it is recommended not exceed 10 ppm. Exceeding this figure may cause serious digestive disorders in animals.
- **Carbon monoxide:** concentration should not exceed 25 ppm.
- **Dust:** its presence causes respiratory diseases. The following concentrations are recommended: total dust (2,5 mg/m3) and breathable dust (2,0 mg/m3).

Until now, the way to clean the air that animals breathe in the livestock industry was by installing filtration systems with passive technology or mechanical ventilation with outside air renewal.

## Farm Types: applications

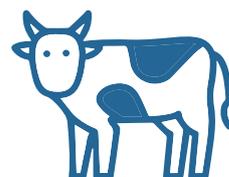
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**Equine**  
(horses, donkeys and mules)



**Porcine**  
(pigs)



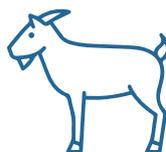
**Bovine**  
(cattle, cows...)



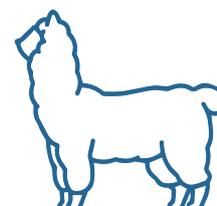
**Avian**  
(chickens, turkeys, ducks...)



**Ovine**  
(sheep and lambs)



**Goat**  
(goats)



**Exotic**  
(camels, alpacas, ostriches...)

## The solution: Cyclohnic

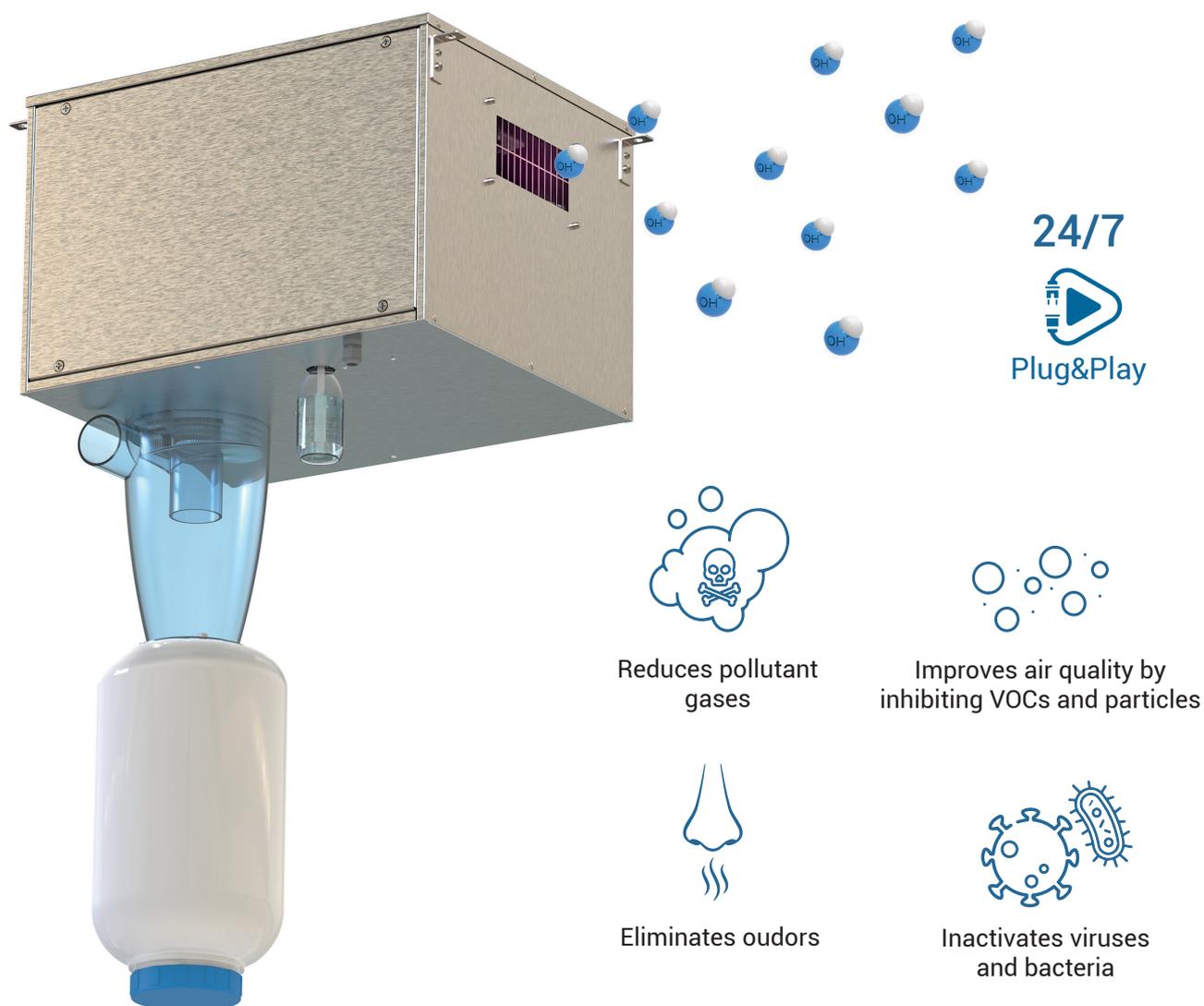
Airtècnics has developed a revolutionary device for environmental hygiene in farms and livestock establishments, where contaminating particles are very large and standard air purifiers are not an efficient or recommended option.

Cyclohnic is a purifier of environmental pollutants, especially indicated for highly polluted places due to the production of farm animals.

In spaces dedicated to the breeding of pigs, poultry, cattle or horses, large particles and polluting gases are generated. Cyclohnic inactivates a large part of pathogenic microorganisms such as viruses and bacteria, and also mineralizes a large part of the gases that are generated by the nature of livestock activity, such as carbon dioxide, ammonia or other formaldehydes, and cleans the air of particles that can cause disease in animals.

Cyclohnic is the alternative for the livestock and agricultural sector thanks to the combination of OH technology and the photocatalysis effect of the patented Kleenfan technology, with different stages of advanced filtering.

Depending on the quality of the air filtering, there are two Cyclohnic models. The standard model with a G4 filter stage, and **Cyclohnic Active** model with three more efficient filter stages, capable of retaining and inhibiting harmful gases.



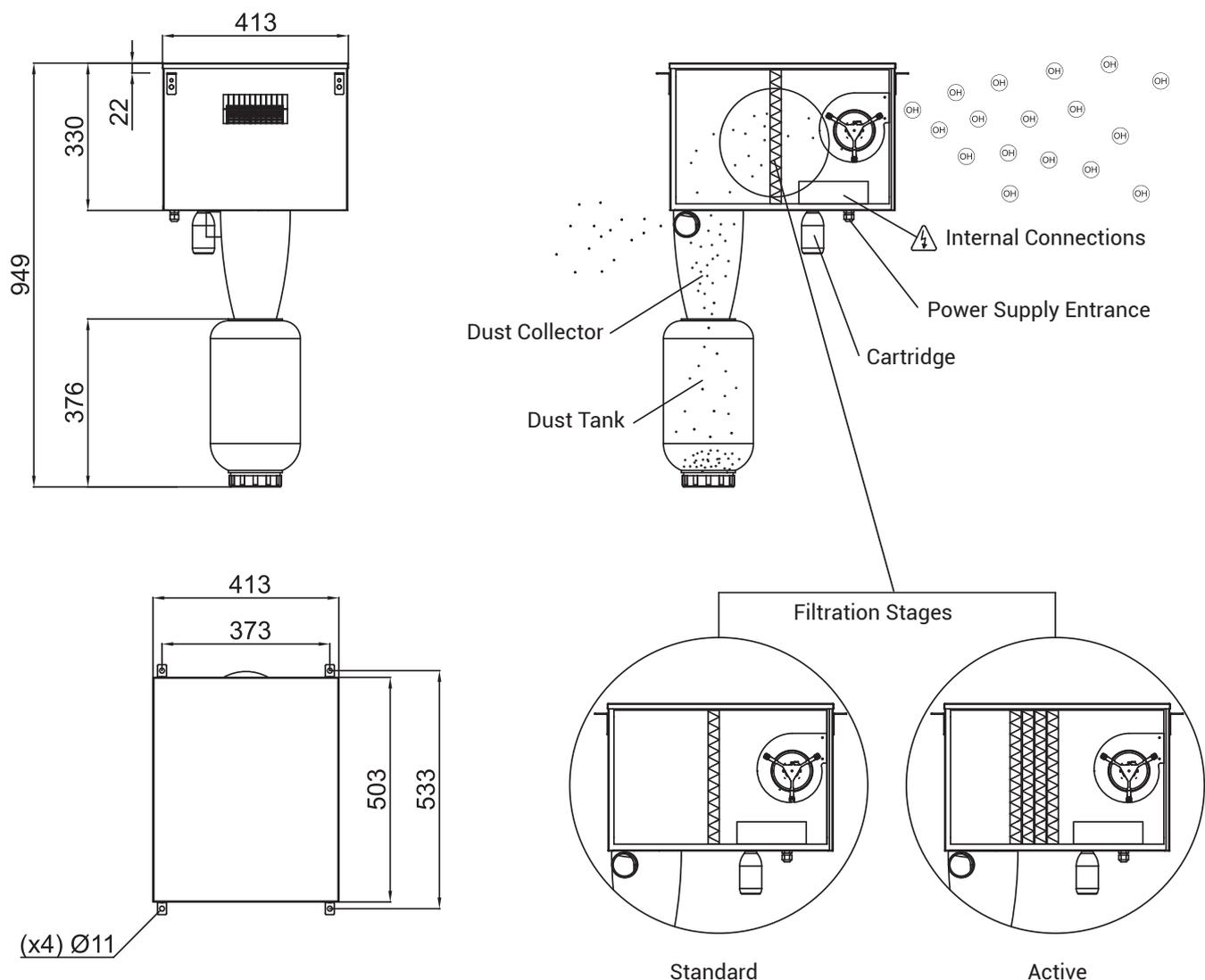
## Technical features

- Self-supporting AISI 304 stainless steel casing, extremely resistant to guarantee a long life in corrosive environments, prepared for installation suspended from the ceiling.
- Double suction centrifugal fan with external rotor motor with very low consumption and noise level.
- Suction through cyclone filter. The filter incorporates a tank with a drain plug for maintenance when it is full.
- Plug&Play equipment without regulation, with active operation 24/7.

					
Air flow (m <sup>3</sup> /h)	Consumption (Wh en 1h)	Current (A a 230V-50Hz)	Range (m <sup>3</sup> )	Noise level (dB a 3m)	Weight (Kg)
110	82	0,36	350	55	14,5

Cyclohnic complies with the exposure limits against chemical agents adopted by the National Institute of Safety and Health INSS (tests in independent laboratories validate ozone emissions <0.05ppm and hydrogen peroxide <1ppm).

## Dimensions



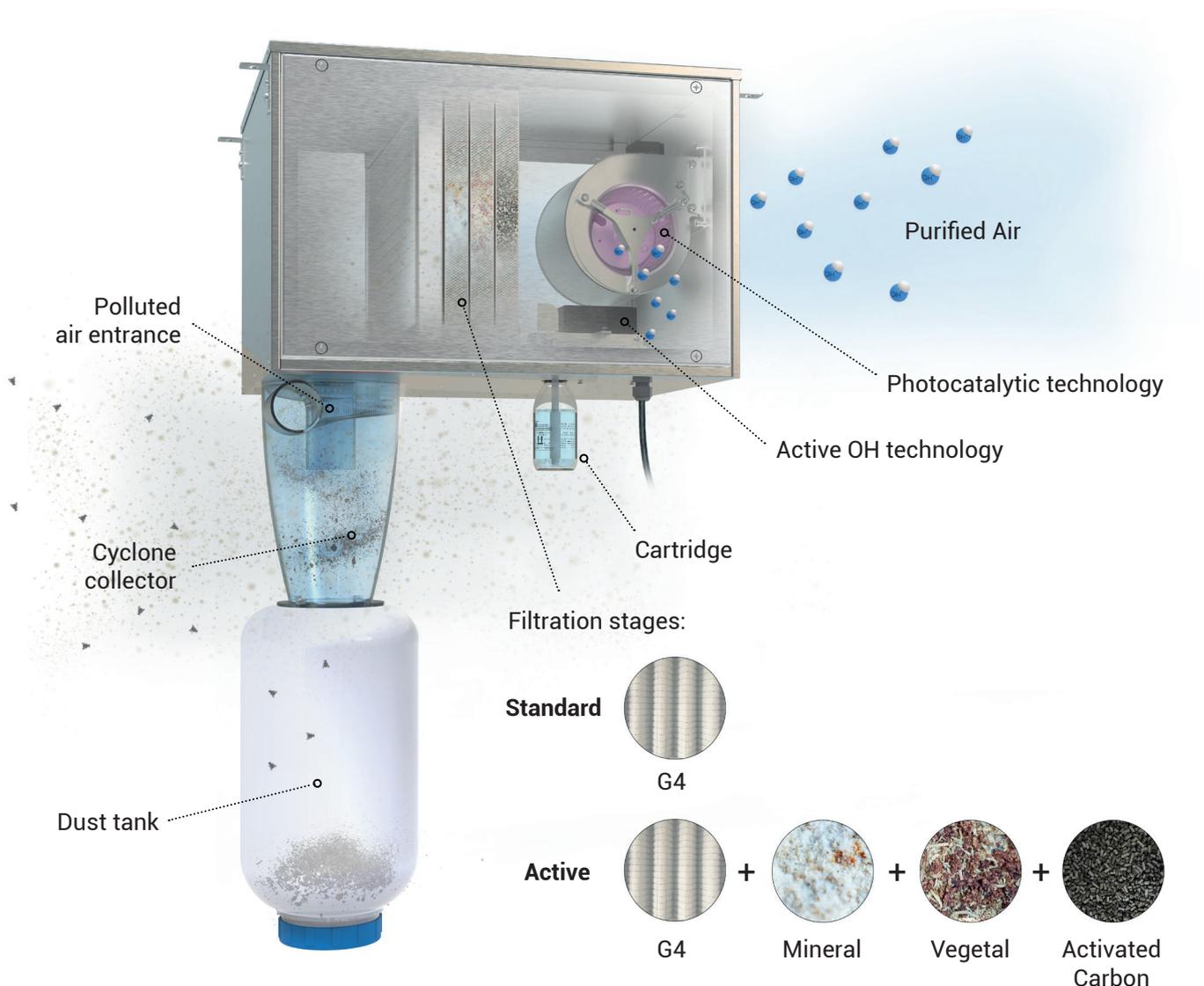
# Functioning

- 1 The contaminated air is first filtered by a **cyclone separator** in which the larger and liquid compounds are precipitated: traces of food, straw or excrement.
- 2 The air passes through a **G4 filter** that retains other smaller particles.

In **Active** model, there are three additional stages of filtering:

- 2.1 In the first stage, a molecular **mineral filter** retains moisture and captures gases, such as CO<sub>2</sub>.
- 2.2 In the second stage, an organic **vegetal filter** retains and decomposes gases (mainly ammonia) through a process of absorption and natural chemical reaction that acts on the ammonia, neutralizing the alkalinity of the ammonia.
- 2.3 The third stage incorporates an **active carbon filter**, which also retains bad odours.

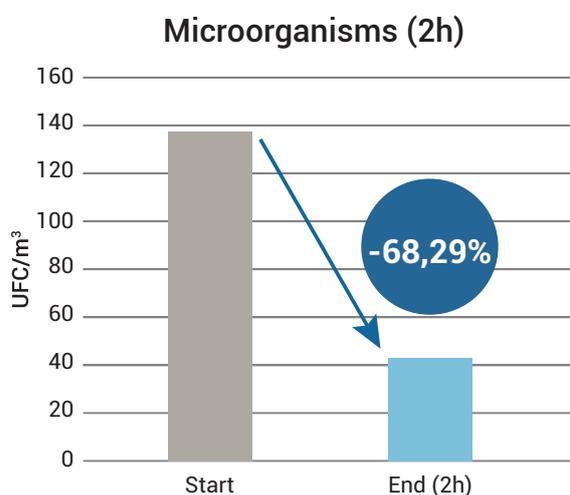
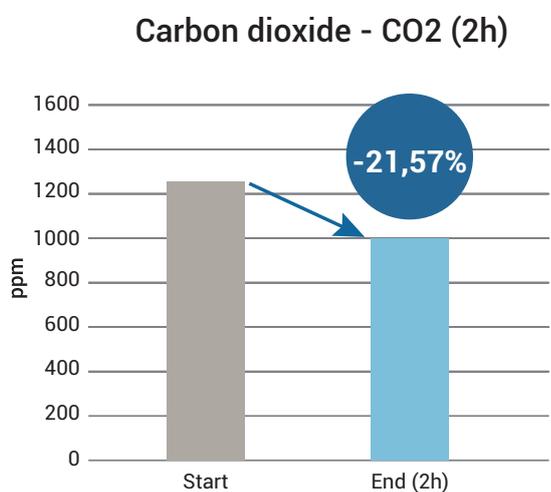
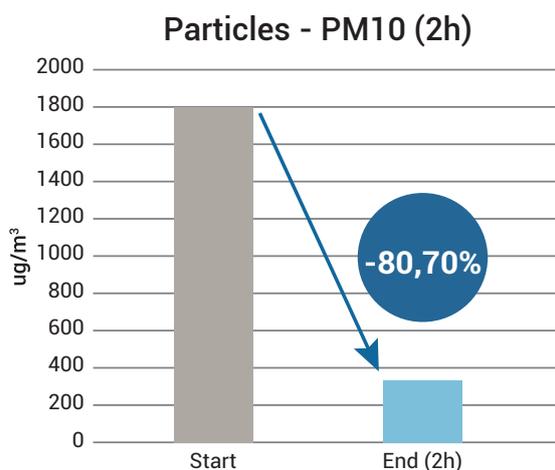
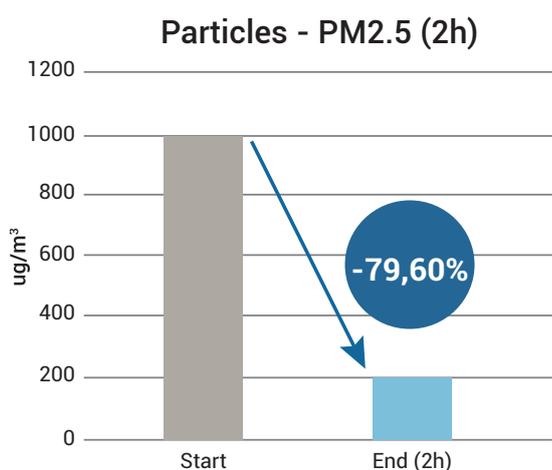
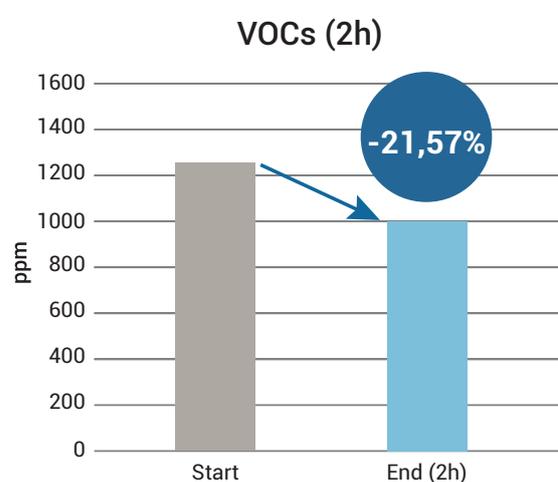
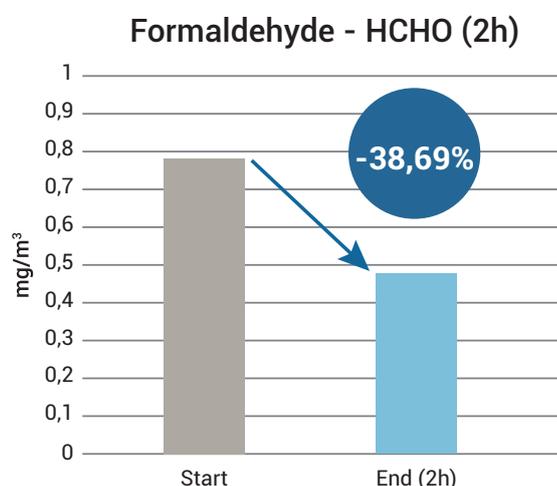
- 3 The action of **photocatalytic technology** activates an Advanced Oxidation Processes.
- 4 Hydroxyls are generated and expanded by chain reaction (**active OH technology**) to purify the air and the surfaces of the facility where the animals stay.



# Effectiveness of Cyclohnic

The efficiency of the standard Cyclohnic device in improving air quality and its ability to reduce airborne microorganisms has been tested and validated in our laboratory in collaboration with CRESCA-UPC.

Results (in 2 hours of operation):



## Case study: pig farm

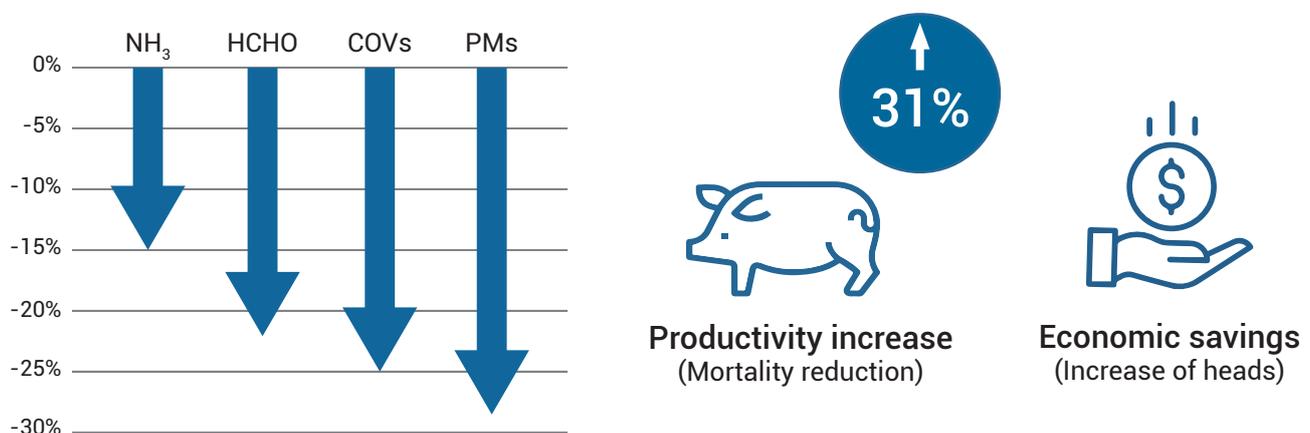
The objective of this preliminary study is to evidence the reduction of the concentration of ammonia (NH<sub>3</sub>), volatile organic compounds (VOCs), formaldehydes (HCHO) and suspended particles (PMs), present inside a pig farm, as well as **evaluate the effect of improving air quality on the production of the farm.**

In order to analyze the performance of the **standard Cyclohnic** equipment, the evolution of the concentration of the named pollutants will be studied in several similar rooms, one of them with the equipment installed and the rest as control rooms (without equipment).

Taking into consideration a preliminary location (subject to change) of the ventilation systems, such that the concentration reduction of the aforementioned pollutants would be optimal, the following aspects will be analyzed in contrast to the control rooms:

- **Ambience temperature of each room.** Temperature is a parameter that directly affects the rate of evaporation of hydrogen peroxide from the purification equipment cartridge.
- **Performance of the ventilation system in each room.** It is essential that the ventilation of each room covers the entire space, in such a way that the hydroxyl radicals are distributed evenly, disinfecting every surface and corner of the interior volume.
- **Pollutants concentration** in the purified room, in contrast to the control room: Ammonia. Formaldehyde, VOCs and PMs

During a period of **73 days**, the reduction of pollutants (NH<sub>3</sub>, HCHO, VOCs, PMs) was assessed in a farrowing room of about 230 m<sup>2</sup> in a sow farm (6 rows of 7 sows), where two standard Cyclohnic equipment were installed. The **productive increase (due to the reduction in mortality)** in the purified room compared to the other rooms in the study has also been studied.



It has been possible to demonstrate the reduction of the concentration of ammonia (NH<sub>3</sub>), volatile organic compounds (VOCs), formaldehydes (HCHO) and suspended particles (PMs), present inside a pig farm, as well as to evaluate the effect of this improvement of the air quality in the farm's production, obtaining as a result an **average reduction in mortality of 30.8%, which is equivalent to 129 heads in 3 months.**

If we extrapolate the results obtained, an increase of around 516 heads per year could be achieved. If the cost associated with the sow stage is €24.22/pig, the incorporation of air purification equipment could lead to savings of up to €12,497.52/year.



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and specifications without prior notice.

