



AIROCIDIE

PHOTO CATALYSIS & UV LIGHT AIR PURIFYING SYSTEM.

Design and equipment for fresh produce storage have improved greatly during these last few years. The purpose has been to reach a higher level of optimum environmental conditions that improve stored produce preservation, avoiding shrinkage and premature ageing.

These advances have been especially important in the case of cold stores, where most perishable produce is kept. Our study case refers to the company named Ebrocork dedicated to the manufacturing of cork for bottles. Cork is an inert material and it's very little or almost non-biodegradable. However, cork has a considerable capacity of absorbing volatile organic compounds (VOC's) from the air, fact that makes this product vulnerable to environmental contamination.

Controlled temperature and relative humidity conditions are provided inside the cork store rooms at Ebrocork's facilities. This way, the total humidity of the cork can then be stabilized between 5.5 to 6%. We also make sure that the cork has a water activity value, a_w , of approx. 0,7. This figure guarantees that the microbial activity is stopped or highly slowed down and simultaneously with it the metabolic ability of creating odoriferous substances, particularly Volatile Organic Compounds (VOC's).

Under such conditions of temperature, relative humidity, hygiene, VOC's differentiation (especially chloroanisoles) within the stored corks, Key Point control, etc., it would be easy to think that we are already obtaining a top safe/quality product. Furthermore, the corks, after packaging, are once more sterilized through electron acceleration.

But Ebrocork wished to persevere on its search for a prevention system to definitely eradicate the risk of chemical contamination as well as the microbial one, since microorganisms were still present in the store room air, more specifically filamentous fungi, eager to spread over all the surfaces and the stored product. It is also true that the developing conditions for fungi were not at its best but its enzymes deposits that generate unwanted volatile compounds were still intact, such as 2,4,6-trichloroanisole or TCA, a highly volatile chlorated organic molecule, mainly generated by filamentous fungi set off from an airborne forerunner and easily absorbed by the stored corks.

These airborne fungi turn a molecule, the TCP, slightly volatile, into a molecule, TCA, highly volatile. It is non-toxic, but at very low concentrations, around Parts per trillion, it can affect a product organoleptically, such as wine, producing a serious flaw called TCA taste, or mold, or more widely known as "corky" taste.

Ebrocork found in the UV photo catalysis the newest, most original, but at the same time the most uncomplicated system to eliminate airborne microorganisms, along with the surprise that this system did not only kill all sort of microbes (bacteria, fungi filamentous fungi, yeasts, pollen, virus and other resistant forms as spores, conidia, etc) but also, and this was the most interesting fact, it would also eliminate the volatile organic compounds present.

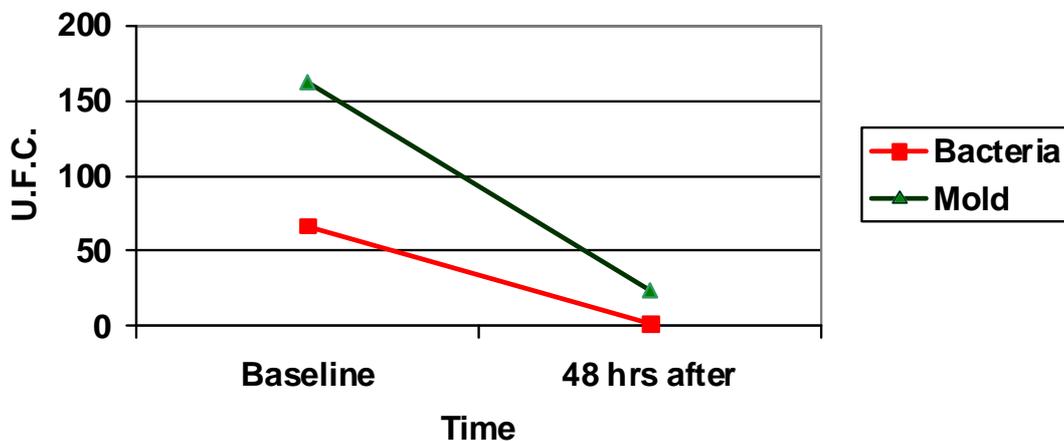


Therefore, with the use of one single device we could finally face the two big potential risks in the cork industry.

Once we learnt about the working mechanism of AiroCide and about its technical details, we arranged to have one unit brought to us to conduct our first trial test in order to study the Airocide's efficiency under certain conditions. To encounter the worse possible storing conditions, we filled the store room with untreated cork, packed in nets, and well exposed to the indoor air, providing humidity conditions of 6.5% and a higher presence of microbes than the one usually found in finish cork. Temperature inside the room was of 15 °C and the relative humidity of 70%. Previously initiating our test, we counted the existing filamentous fungi and bacteria in order to have a baseline, and right after, the AiroCide is then turned on and allowed to function during 48 hrs inside the airtight store room.

The test result was spectacular, particularly in the case of bacteria kill (97% reduction in the second count).

Test



The stored cork inside the room still kept its own load of microbes, mainly fungi, however almost all microorganisms that became airborne were destroyed. (85 %).

Keeping these test results in mind, we were ready to plan the project of implementing the system and applying it to the whole facility itself, considering the distribution of the different storing areas, the direction of indoor air flows and the total volume of indoor air to treat, in order to locate the optimum place to install the needed devices.



Five AiroCide units were then accordingly placed within the facility (approx. 6.000 m3 in volume).

Air samples are taken in seven different sampling points at the Ebrocork facility every 21 days, knowing that:

- The different sampling points represent working places with different activity.
- The store room is an open area, that is, it is not an airtight room.
- The arrival of raw material which is afterwards classified creates a sudden rise pike of microorganisms in the indoor air.
- The laboring staff is a certain source of microorganisms.

Taking all these factors into account, and also considering that the AiroCide devices are working 24/7 during 365 days a year, then the killing of pathogens and reduction of VOC's from the air is therefore, constant. Despite any punctual increase of microorganisms in the air, we will never start from scratch or go back to the environmental conditions studied at baseline, as we have a cleaner and microbe free air already.

Regarding fungi, the kind that prevails is Green Mold (Penicillium), commonly present and dominant in our environment at mild temperature and a relative humidity of 40-70 %. Surprisingly, the more specific fungi found in cork, such as *Chrisonilia sitophila* now is vanished from the counts in the sample plates and this is a great indicator of the efficient performance of these devices inside our facility.

