

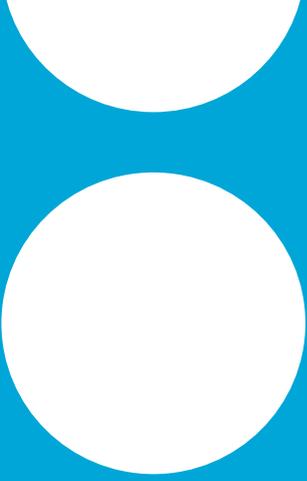


NASA
developed technology

AHMPP™ Technology of BKM

Scientific investigation

IDROBASE®
PASSION FOR WATER



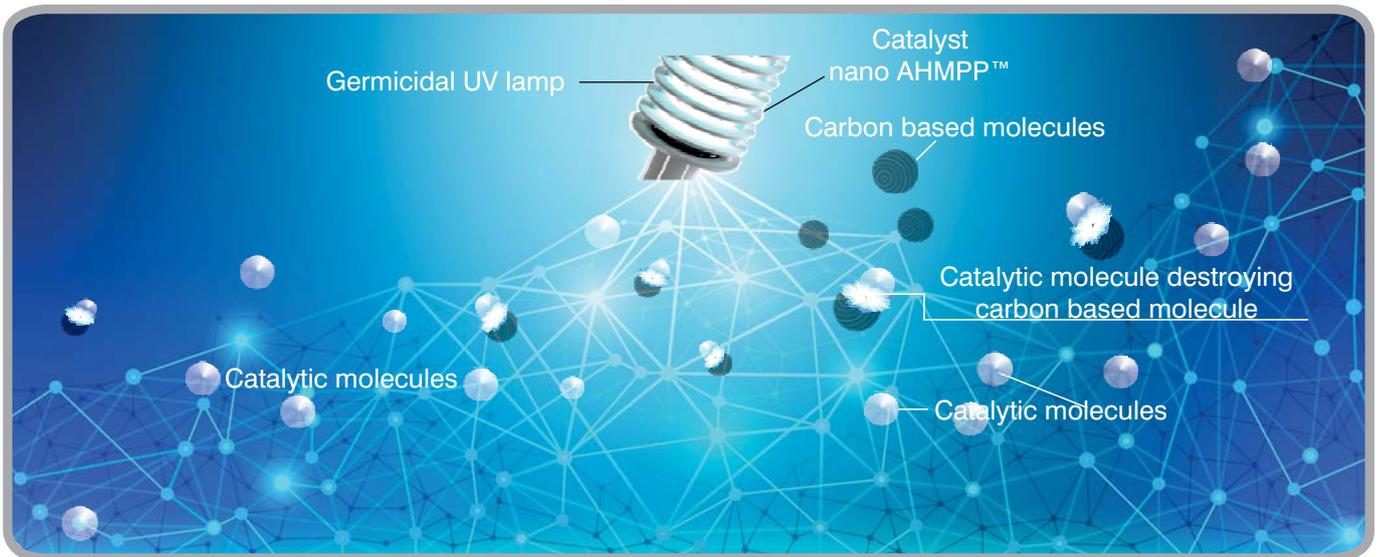
AHMPP technology

BKM and the AHMPP system

With research lasting a decade, Aerobiology and Biotechnology have developed an air purification system that uses an Advanced Hydrate Molecular Photo Promoter. **BKM uses a new generation technology (AHMPP) that essentially is not based on the passage of air through filters or purifiers, but with the production of a layer of oxidants that sanitize the air and also sanitize surfaces and eliminate pollutants.** BKM uses AHMPP technology by doping the surface of TiO_2 with Gold, Silver, Copper, Rhodium and the new molecule nano AHMPP, reducing the size of the metal particles in order to increase the surface area and therefore increase the speed of kinetic reaction.

The effect of the dopants on the surface of TiO_2 has increased the lifetime of hydroxyl radicals generated when it is subjected to UV radiation. The metallic copper works as a centre of accumulation of electrons, thus disfavours the recombination of these radicals. The two hydrophilic gels have the function of hydrating the coating and react in combination with all the metal catalysts to decompose ozone (donating hydrogen to ozone) and to form hydroxide ions and radicals, as well as hydroperoxides such as hydrogen peroxide and HO_2 radicals, which are desirable reaction products for the decomposition of ozone due to their strong oxidizing properties, which together with the UVC radiation increases the germicidal effect. This technology simply produces a mist of catalytic molecules that clean not only the air, but sanitize surfaces. The hydrated cell catalytic coated with nano AHMPP Xtreme™ 360 degrees, provides maximum exposure to the catalysts. The lamp is HE / UV Broad Spectrum with a broad spectrum, heavy-duty filament and a long-lasting coating that uses the short wavelength UV light (254 nm) that is harmful to life forms on a micro-biological level, being effective in destroying the nucleic acids in these organisms. As a microorganism passes over the UV lamp, the UVC light penetrates the membrane and alters its genetic material (DNA). With altered DNA, the microorganism will no longer be able to reproduce, being microbiologically devitalized. The permissible dose of ultraviolet light is 6.0 mW-sec / cm^2 , which is the maximum exposure time allowed (PET, test performance evaluation), BKM is considerably below this value. Ozone levels are between 0.01 and 0.02 ppm.





HOW BKM WORKS

The germicidal UV lamp destroys germs that pass through the UVC light rays. The rays of light from the UV lamp react with the nano AHMPP™ catalyst producing catalytic molecules. The catalytic molecules detect and destroy the carbon-based molecules by converting them into harmless carbon dioxide and water.



Titanium dioxide: a valuable ally

Titanium dioxide is the natural titanium oxide, whose chemical formula is TiO_2 . It is considered a safe substance and harmless to human health and is commonly used in the production of paint, printing inks, plastics, paper, synthetic fibres, rubber, condensers, colours for painting and pastels, ceramics, electronics, food and cosmetics. Titanium dioxide, in the form of anatase, one of three different crystal structures of TiO_2 : **the photocatalyst is the most common and has the following advantages: low cost, high photocatalytic efficiency and non-toxicity.** The product has biocidal features and, following the regulations and laws that govern its application areas, can be considered as a guarantee for a final sanitization.

Photocatalytic oxidation

Photocatalysis is a natural phenomenon whereby a substance, called a photocatalyst (TiO_2) through the action of light (natural or artificial) changes the speed of a chemical reaction; its function mimics photosynthesis. The chemical process that lies at its base is in fact an oxidation that is started by the combined action of light (solar or industrial / artificial) and air humidity. The two elements (light and air), in contact with the coating of the surfaces, favour the activation of the reaction and the subsequent decomposition of organic and inorganic substances.

UVC light

Regarding the light, it is very important for it to be at very high energy level; in particular, a radiation with a wavelength of 254nm has been proved very effective for disinfection. Over 90% of the total UVC radiation emitted is actually of 254nm.





The wavelength of 200-280nm is called UVC. Therefore disinfection using 254nm wavelength is called UVC disinfection; this destroys microorganisms by changing the genetic information contained in their DNA and / or RNA.

By simply switching on fluorescent lamps at full solar spectrum (UVC) the photocatalysis process is activated, allowing the titanium dioxide to exploit its photocatalytic characteristic, generating ROS (Reactive Oxygen Species), chemically reactive molecules generated by the synergistic titanium dioxide system- light that reacts with organic substances produces inorganic non-toxic substances.

Today the most powerful advanced oxidation systems are based on the generation of hydroxyl radicals: most of the studies have led to the same conclusion, namely that the hydroxyl radical $\text{HO}\bullet$ is the main species involved in bactericidal action and virucidal photocatalysis.



The effectiveness of photocatalytic oxidation

Because of its strong oxidative capability, photocatalytic oxidation can effectively sanitize, deodorize and purify the air, water and other surfaces. Photocatalysis not only kills the bacteria cells, but it causes decomposition. It was verified that titanium dioxide is more effective than any other antibacterial agent, because the photocatalytic reaction occurs even when there are cells that cover the surface and the multiplication of bacteria is active: activating and bypassing the biofilm on the surface created by bacteria is effective where conventional chemical sanitizers are less efficient.

Furthermore also endotoxin, resulting from the death of the cell, is decomposed by the photocatalytic action. The titanium dioxide does not deteriorate and displays a long term antibacterial and virucidal effect, in general the disinfection by means of titanium dioxide, is 3 times more effective than that obtained with chlorine and 1.5 times ozone.

In a similar way to bacteria, viruses are also destroyed.

Viruses such as HIV are generally susceptible to the devastating effects of photosensitivity. Photocatalytic oxidation, in essence, can be summarized as an intense light that is reflected on a metal surface and that, in turn, oxidizes toxins; it is defined as the acceleration of a photoreaction in the presence of a catalyst. This type of technology converts harmful particles and toxic gases into safer compounds such as carbon dioxide and water.

PCO and UV light

PCO uses broad-spectrum UV light that reacts with a thin film of titanium dioxide which, in the presence of water, generates hydroxyl radicals and superoxide ions that “burn” the microorganisms accumulated on the catalyst surface.

Photocatalytic efficiency depends on several parameters: the number and the stability over time of the photogenerated charge carriers, the balance of absorption / dispersion, the type of reaction, the distance with the surface of TO_2 , extremely short duration of the hydroxyl radical, by flows of air and water or dust that may decrease the effectiveness of irradiation.

Many brands of air purifiers are starting to use cheap imitations of PCO technology. Titanium dioxide is not always the catalyst, but other materials such as ZnO - Zinc oxide, CeO₂ - Cerium oxide, ZnS - Zinc Sulfide, etc,



using common UV lamp equipment which is presented as an air purifier. These assemblies, very approximate, may cause an incomplete decomposition of VOC in the air stream with a production of formaldehyde, acetaldehyde, formic acid and acetic acid. The concentrations of the output of formaldehyde and acetaldehyde, according to some researchers, may be from 3.4 to 4.6 times the concentrations of input. Both formaldehyde that acetaldehyde are recognized as significantly toxic agents in a closed environment. Formaldehyde is classified as a human carcinogen.

BKM eliminates in real time...

Salmonella enterica

Staphylococcus aureus

**Resistant strains of Staphylococcus aureus:
Methicillin resistant (MRSA) and CA-MRSA /
PVL-MRSA**

Vancomycin resistant Enterococcus (VRE)

Listeria monocytogenes

Escherichia coli (E. coli O157: H7)

Campylobacter jejuni

Acinetobacter baumannii

HIV 1

Influenza A

Avian Influenza

H1N1 (Human and Swine)

Herpes Simplex Type 1

Polio Type 2

Norovirus and Murine Norovirus

Rhinovirus

Human Coronavirus (SARS Surrogate)

/ Rotavirus / RSV / Adenovirus

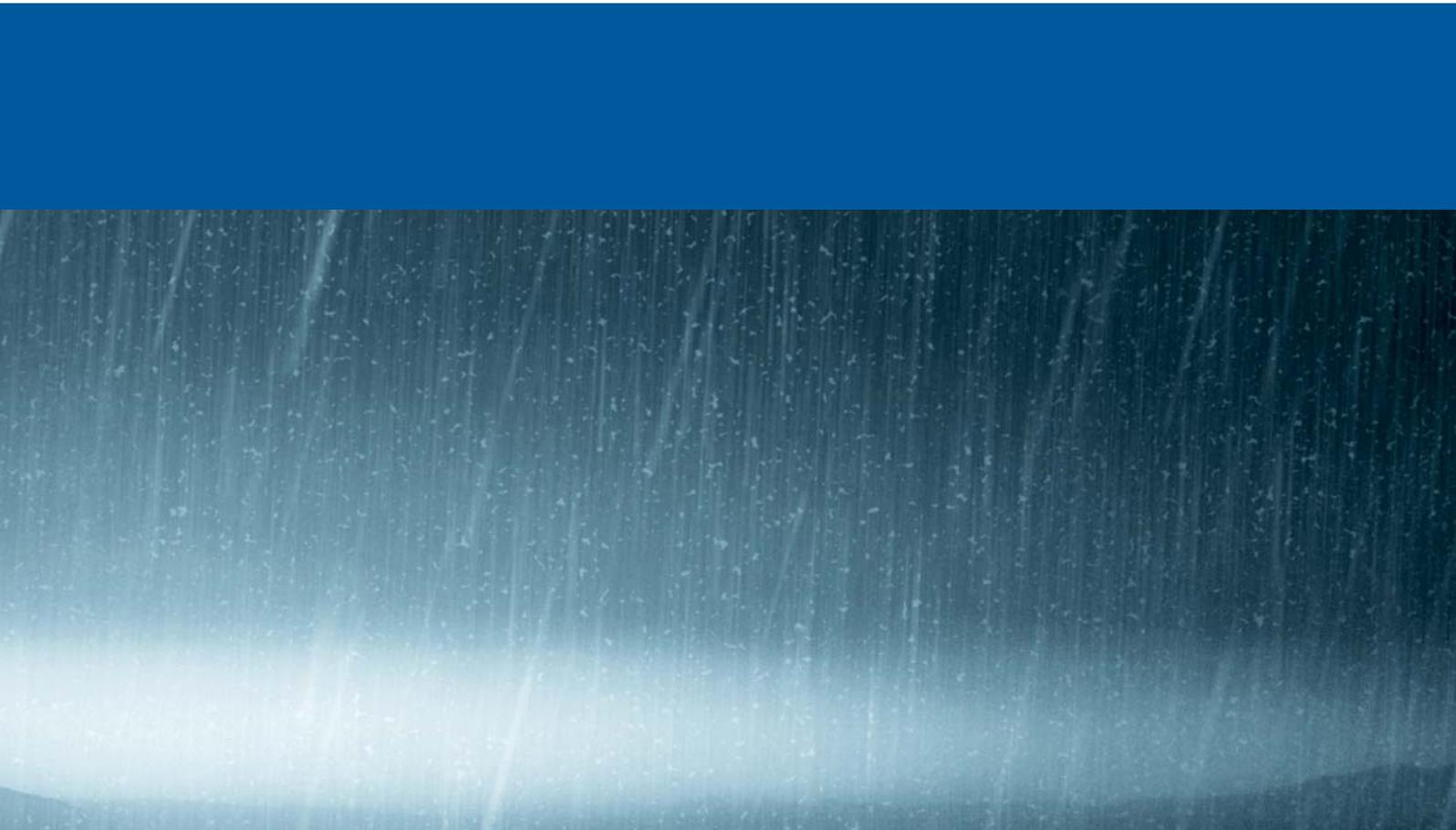


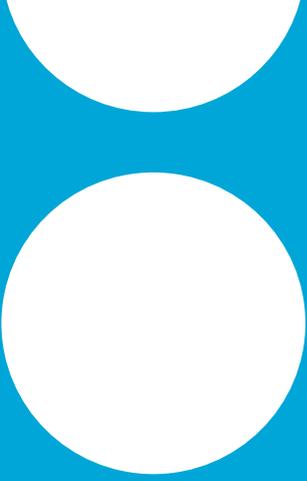
The AHMPP Technology: like a thunderstorm

AHMPP technology (Advanced Hydrated Molecular Photo Promoter) can be defined as a broad spectrum of high intensity UV light projected on a catalyst that uses Nano technology, all wrapped in a damp environment. The photocatalytic activity and thus also the biocidal activity have been greatly improved by reducing the particle size of TiO_2 , from micro to nano.

The assembly of nano scale constituents are characterized by large interface areas (large ratio surface / volume) in the order of hundreds or thousands of square meters per cubic centimetre. The reduction of the particle size of TiO_2 results in an increase in its surface area, resulting in improved photo-efficiency and, therefore, of photocatalytic properties. All this involves a cascade of oxidation reactions in which the “broken” molecules attempt to reach a balance by breaking down neighbouring molecules.

The “frenzy of balance” leads to the degradation of harmful particles; microorganisms and all simple carbon-based pollutants are destroyed; also the steam and the decomposition gases are broken down at a molecular level. The balance is satisfied only when, in this environment, the oxygen and hydrogen molecules remain. This phenomenon is quite natural because it is the same to that which occurs during a storm: the air is purified.





Microbiological Testing

BKM: tested by several among the largest and most significant Italian industries

A breath of fresh air with BKM, clean, absolutely healthy, as evidenced by the tests carried out in some of the largest and most important Italian industries. These tests provide the testimony and the evidence of a completely innovative efficacy of sanitizing, with results in terms of healthier environment and highly significant production efficiency.

EFFECT OF TREATMENT WITH BKM ON MICROBIAL COLONIES PRODUCED IN TESTING

Figure 1 shows the number of microbial colonies produced in the control test, before any treatment of indoor air with the air purifier.

Figure 2 shows the Petri dishes after a treatment of 24 hours with the air purifier. Note the reduction in the number of colonies compared to Figure 1. It is to be highlighted that the Petri dishes positioned closer to the air purifier (1ft and 2 ft) report a smaller number of colonies after 24, 48 and 72 hours of treatment of indoor air with the air purifier.

fig. 1

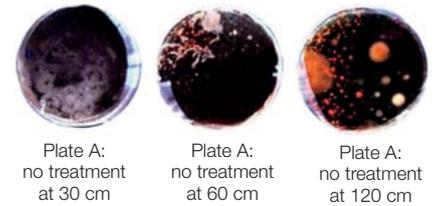
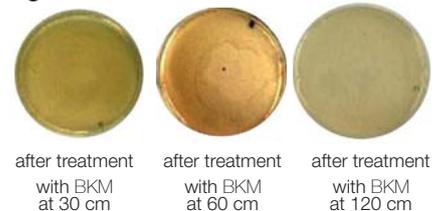
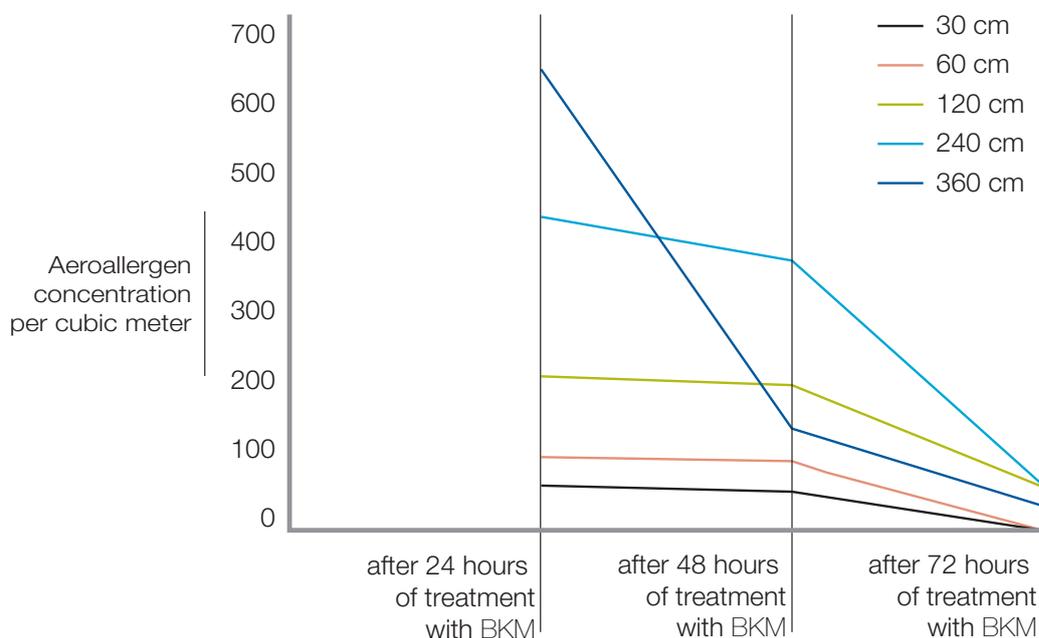


fig. 2



EFFECT OF TREATMENT WITH BKM ON THE CONCENTRATION OF AEROALLERGENS

The illustration below shows the distribution of the aeroallergen count after treatment of the air in the test chamber after 24 hours, 48 hours and 72 hours. The Petri dishes of “24 hour treatment” with the air purifier at the distance of 1ft, 2ft and 4ft showed no significant microbial growth. At a distance of 30, 60 and 120 cm Petri dishes showed very minor traces of inoculums compared with 2.4 m - 3.6 m. After 72 hours of treatment there was hardly a trace of aeroallergen throughout the tested environment.



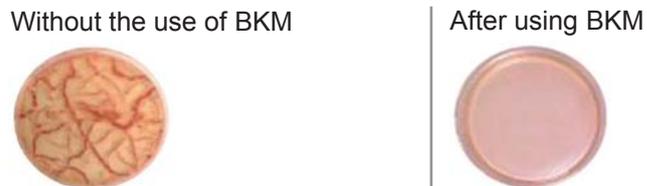
REDUCTION OF BACTERIA AND VIRUSES USING BKM 900

These images show how effective this unit is in reducing the spread of bacteria and viruses in a room.



EFFECT OF TREATMENT OF BKM ON BACTERIA, FUNGI AND YEAST

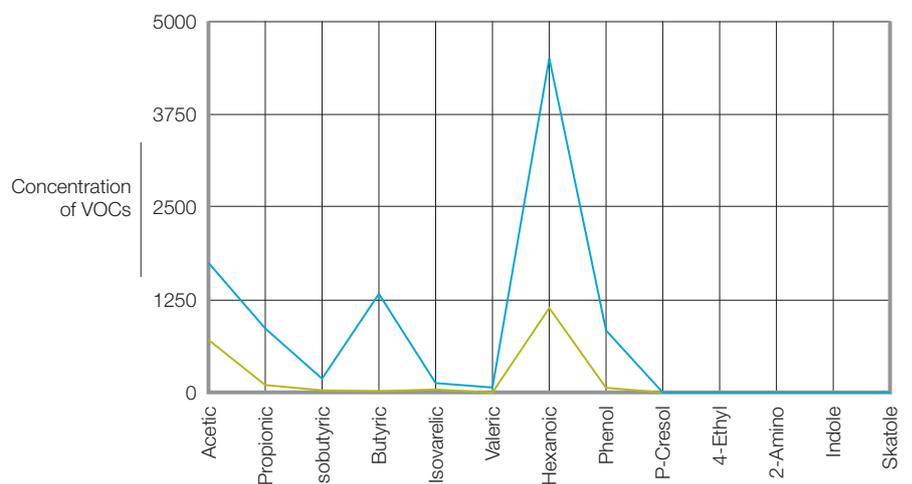
Test results have shown that BKM air units can reduce mould, yeast and bacteria by as much as 98% in a domestic environment.



VOC REDUCTION (volatile organic compounds) WITH THE USE OF BKM

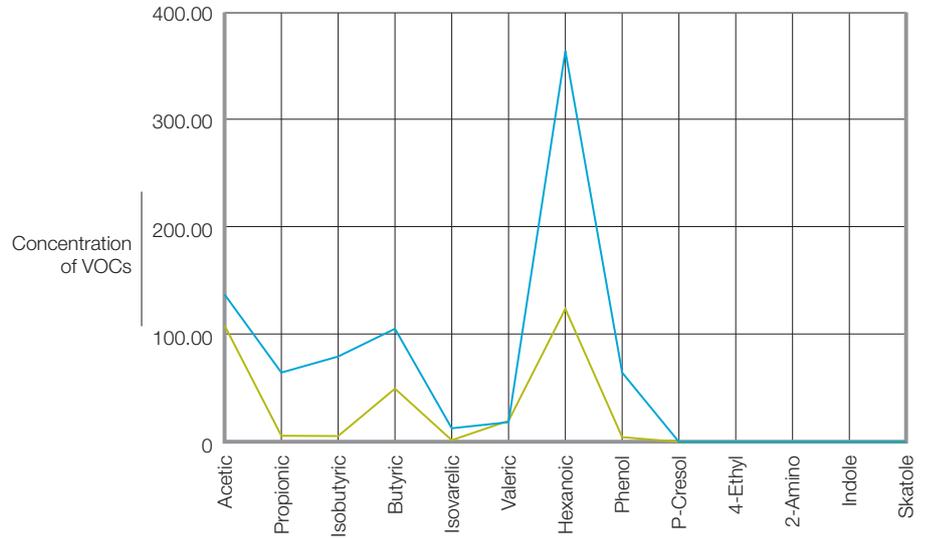
Results of some tests have shown that VOCs can be reduced by as much as 98% in short periods of time. For example, in a test, formaldehyde was reduced by 60% in 4 hours.

— Without the use of BKM
— After using BKM



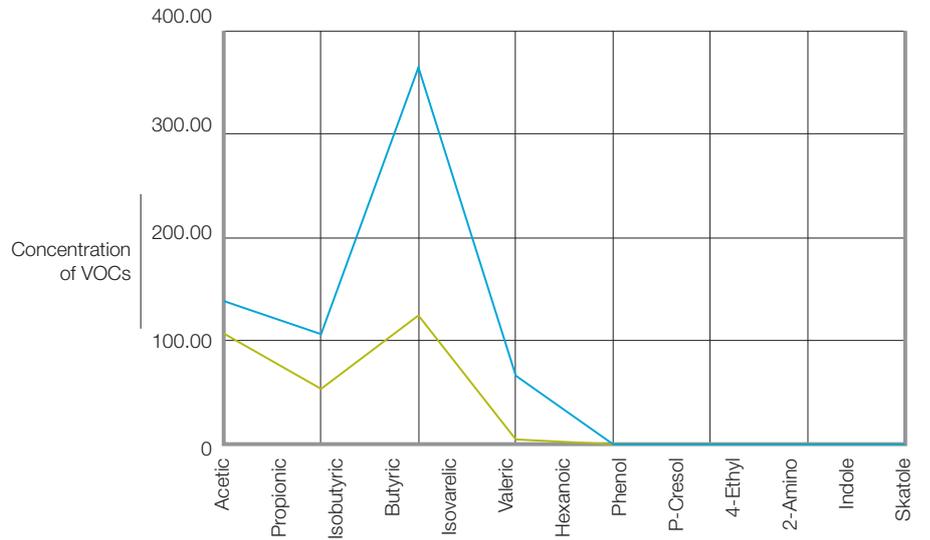
**VOC REDUCTION
(volatile organic compounds) IN
AN HOUR WITH BKM 900X**

— Without the use of BKM
— After using BKM



**VOC REDUCTION OF VOC
(volatile organic compounds) IN
A CLINIC VETERINARY
USING NANO 900**

— Without the use of BKM
— After using BKM



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PASSION FOR WATER

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