“Clean Air makes the difference”

Introduction

The SARS and flu pandemics during the last decade showed to the entire world that a medical airborne problem can have a significant social and economic impact.

The importance of IAQ (Indoor Air Quality) - or in other words the possibility to transmit pathogenic materials by air, became widely known to the public and the authorities.

Company

Virobuster have been established in 2002 and initially developed successfully the medical market before entering the food production industry.

The Steritubes are produced at the German JK-Group. The JK-Group has its production facility in Germany and is DIN, ISO and TÜV certified.

Virobuster results have set benchmarks and achieved a high level of acceptance as a reference in national and international (research) projects related to IAQ issues.

“Total Hygiene Concept”

Next to hand washing, clean working, clean water, clean equipment and clean materials/products, also clean air gained significance and is the missing link to a “Total Hygiene Concept”.

IAQ

IAQ can be divided into three levels, namely:

- Air safety levels (control of O_2 and CO_2 concentrations).
- Air comfort levels (control of temperature (°C) and humidity (%RH)).
- Air quality levels (control of airborne particles like dust, pollen, tobacco, microorganism and VOC’s).

Air safety levels are often defined by legislation and air comfort levels are common comfort values, but the air quality levels are not well known, because lacking awareness and the effects from bad air quality.

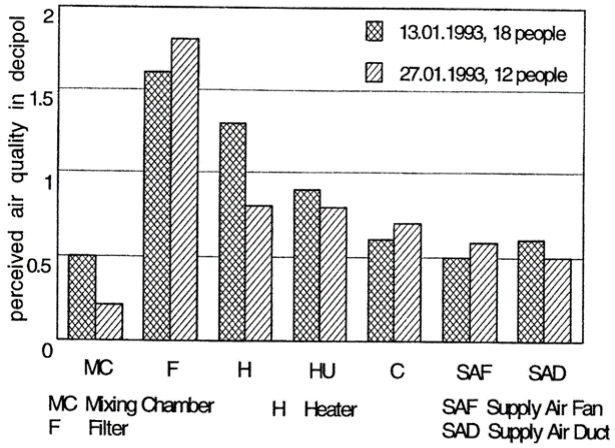
Since the year 2000 studies came available which proved the significant effect of air quality levels in the whole spectrum of air treatments. Beginning by decreased infections & use of antibiotics, reduced sick leave and ending at increased productivity.

PAQ

Due to the introduction of measurements to improve the indoor air quality, the side effects of the HVAC measurements caused unfortunately negative health and comfort issues.

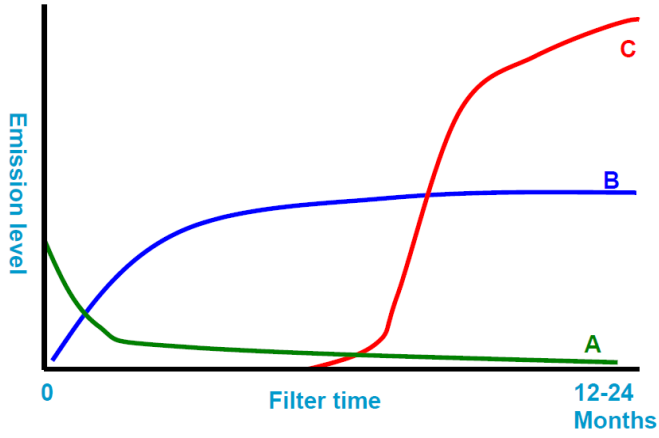
People experience the micro biological contamination of IAQ/HVAC as proven influencing their PAQ (Perceived Air Quality). The PAQ can be seen – next to ergonomics and natural light issues – as a major contributor to SBS (Sick Building Syndrome).

It seems that improving the IAQ by using mechanical filtration contributes significantly to the deterioration of the PAQ.



This sounds not logical because a filter reduces the amount of particles passing through, so how is this possible? There are both biological and chemical hypothesis stating that mechanical filtration is from biological perspective a placebo because it provides a “catch”-guarantee where a “kill”-guarantee is demanded. Consequences are:

A = Chemical emission of filter material.
B = Emission due to chemical reaction on filter bed.
C = Organic (mVOC’s) emission from fungi, bacteria) and viruses passing through.

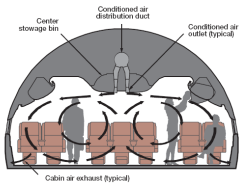


Scientifical research proofed that the introduction of technical measurements for improving IAQ (Indoor Air Quality) caused PAQ (Perceived Air Quality) issues due to emission of VOC’s from caught micro organism on a filter bed. These issues can influence sick leave and productivity significantly.

Financial impact

Energy savings forced us to make our buildings more airtight. To save on spending, we have increased the number of workplaces per square metre, subsequently the indoor air quality deteriorates. As discussed IAQ improvement measurements were introduced but ended in PAQ complaints.

Engineering & construction companies should learn from, for example the aviation industry and prevent their concept failure. An airplane is the perfect example of an "airtight building" with high intensity HVAC installation to maintain safety and comfort levels. But we also should learn from the fact that old airplanes come with massive PAQ complaints due the accumulated concentration of caught bacteria and fungi inside the envelop. It is really questionable whether the sky scrapers in for example Dubai will be liveable in fifty years.



Bad air can lead to headaches, respiratory problems, vague complaints, dry eyes, nausea, loss of wellness, and other symptoms, which are often referred to as sick building syndrome (SBS) and can due to influencing sick leave and productivity be translated into Billions of dollars.

The last decade several studies proved:

- "improved air quality increases productivity 1,5 – 6%" *(Fisk et Al, FED 19940405 OSHA Report, IEQ NEMI Study, Cats et Al, Wargocki et Al, Milton et Al, Djukanovic et Al, Menzies et Al)*
- "ROI in improving air quality comes within months" *(Cats et Al, Milton et Al, Djukanovic et Al)*
- "Viruses, which are transported through HVAC systems, cause ARI" *(FED 19940405 OSHA Report, Milton et Al)*

An article in "The Lancet" (Menzis et Al, 2003) stated that office complaints are significantly reduced when the indoor air is treated with UV-C.

The biggest acknowledgment of following studies was not a confirmed improvement in comfort and productivity, but the fact that the improvement was caused by the UV-C installation, preventing the VOC's emissions and - more important - the elimination of viruses causing ARI complaints. This thesis is backed up by the fact that the bacterial & fungi concentrations in the UVGI building did not differ significantly from the reference buildings.

UV-C deactivation of micro organism

The effect of UV-C (254nm) is well known since centuries and already worldwide applied for purifying water. The DNA of a micro-organism is damaged (thymine blocking), preventing future cell division and making the micro-organism harmless (no infections & decay)

The doses needed for sufficient deactivation depends on the type of organism, the intensity - and the residence time in the UV field.

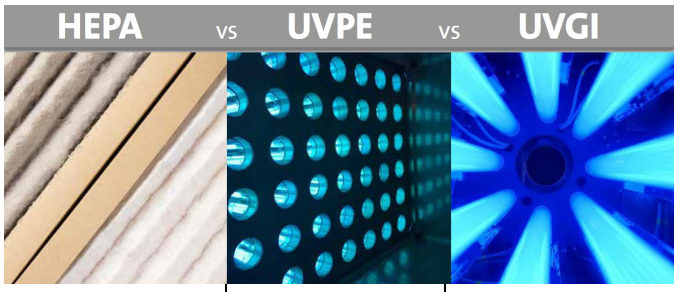
Existing **UVGI** (several UVC lamps in one big space) does have a limited and unpredictable efficiency due to many influencing factors like windchill effect, lamp oldering, shattering and UV interferences. It limits the "kill"-guarantee.

Virobuster **UVPE** Technology (several UV deactivation spaces with special arranged lamps and reflectors) is a step further and comes with much higher doses - even beating fungi, better stability and no pre-engineering. Providing a "kill"-guarantee under all circumstances.

Technology comparison

The industry offers several solutions for purifying the air, but the gross of them should never be allowed due to the hazardous side effects. The use of ionization and worse power ozone generators should never be allowed in public because the accumulation of ozone in a space triggers significant health risk.

For this reason the only accepted and realistic technologies are (HEPA)filtering, classic UVGI and UVPE. Filtering triggers PAQ complaints and does not hold back viruses. UVGI eliminates viruses but cannot handle fungi and their related PAQ influence. UVPE proofed to be the only available technology which is safe and effective enough to coop both challenges of PAQ and virus elimination.



HEPA		UVPE		UVGI	
Virus:	No	Virus:	Yes	Virus:	Yes
Bacteria:	Yes	Bacteria:	Yes	Bacteria:	Yes
Fungi:	Yes	Fungi:	Yes	Fungi:	No

"Born Global Firms" *Prof. P. Englis*

"In less than eight years, Virobuster has eficiently and effectively taken over a global industry that needed help. With a solid line of products all designed to attack air sterilization, Virobuster has become a leader in their industry".

Author: Fahmi Yigit

Fahmi Yigit started in 2002 the development of the UVPE technology in close cooperation with international institutes. Within Virobuster GmbH, he holds a leading positions and is member in several legislation boards. He is also a worldwide respected lecturer on air hygiene issues.

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