It’s time to breathe healthier air

Philips UV-C disinfection technology is the fast and effective way to reduce the risk of coming into contact with harmful micro-organisms.

Protect against viruses and bacteria with UV-C lighting

The quality of the air we breathe has a profound effect on our health and well-being. Improving indoor air quality (IAQ) should therefore be given our highest priority. Because bacteria and viruses that are transported by the air can cause a wide range of common infections.

Indoors, especially when there are a lot of people present, the likelihood that there are micro-organisms in the air is high. The risk of acquiring an infection from those micro-organisms increases according to a number of factors: the amount of time a person spends in a room, the number of infected people, the nature of their activity (singing, talking, exercising etc.), and the infectiousness of the organism (e.g. Delta vs Omicron variants of COVID-19).

But there is a simple way to reduce the risks – by treating the air with UV-C radiation.

What are micro-organisms?
Micro-organisms are living organisms and can be either bacteria, yeasts, fungi, viruses or single-celled parasites. They are too small to see with the naked eye, but are present everywhere - in the air, in (natural) water, in our food and in and on animals. Some of these micro-organisms can cause diseases and can be transmitted via the air, such as SARS-CoV-2, tuberculosis and measles.

What is UV lighting?
Ultra-Violet (UV) radiation is invisible to the human eye and is divided into UV-A, UV-B and UV-C. UV-C radiation has been shown to effectively break down the DNA of micro-organisms, which renders them unable to replicate and cause disease.

The importance of treating indoor air
Indoor air needs to be treated to enhance the comfort of the people who live or work there. Not only should temperature and humidity be in their comfort zone, indoor air quality should also be at an acceptable level. No bad odors, harmful substances or dust should be present in the air. This includes nanoparticles, chemical substances and micro-organisms that are transferred from the air outside, or are generated inside the building.

Figure 1: The Electromagnetic spectrum
Micro-organisms in the air can be generated by construction materials (mold) but typically come from infected people in the building. When an infected person is present in the room, the concentration of micro-organisms suspended in the air (aerosolized) will increase until the number of micro-organisms generated per minute is equal to the number of micro-organisms removed per minute. Once the infected person leaves the room, the concentration will decrease exponentially. This will also depend on the room being ventilated with fresh, uncontaminated air, or other contaminant removal systems.

Air changes per hour
The ventilation in a room can be expressed in air changes per hour (ACH). This is the amount of clean air that is brought into the room per hour, compared to the total air volume of the room. The graph below demonstrates that a higher ACH - based on perfectly mixed air - results in less exposure to the contaminant.

The speed of contaminant removal will depend on:
- the number of contaminating micro-organisms present in the room, the concentration of micro-organisms suspended in the air
- how contagious the virus is.

The number of contaminating micro-organisms and their concentration can be directly influenced by air treatment. Some of the micro-organisms will settle on the ground, while others will stay in the air for a longer period (so-called aerosols). These aerosols can be removed with air treatment. Ideally, this should remove micro-organisms as quickly as possible, since this will reduce the total dose inhaled by people in the room.

The speed of contaminant removal will depend on:
- the amount of clean air brought into the room per hour compared to the total air volume of the room
- how efficiently the air is mixed
- how efficiently the air treatment device deactivates micro-organisms in the air of the room.

How long does it take to remove contaminants?
The clean air used to dilute the contaminated air can come from outside, or from recirculated air that has been disinfected prior to re-entering the room. The table below shows the time required to remove the contamination, when there are no infected people present in the room.

<table>
<thead>
<tr>
<th>Air changes per hour (ACH)</th>
<th>Time required to remove percentage of contaminants (minutes)</th>
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<tbody>
<tr>
<td></td>
<td>90%</td>
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<tr>
<td>2</td>
<td>60</td>
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<td>35</td>
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<td>7</td>
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<td>50</td>
<td>3</td>
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The performance of UV-C deactivation is expressed in equivalent air changes per hour (eACH). This is the number of air changes with fresh (not contaminated) air that would be required to have the same reduction in micro-organisms as UV-C deactivation. In the case of in-room air treatment, these eACH work in tandem with the ACH from ventilation air treatment. The result is that air in the room is cleaned much faster than by ventilation alone.

One of the most efficient ways to use UV-C is to disinfect the upper air in rooms. This has a proven track record of drastically reducing infections in tuberculosis patient rooms. It can deliver equivalent air exchanges of 15 eACH or more, which is very cost effective compared to using air ventilation for the same purpose.

To find out more about the benefits of using Philips UV-C technology to improve your air quality, contact your Signify representative, or go to www.lighting.philips.com/main/products/uv-disinfection/uvc-lamps