

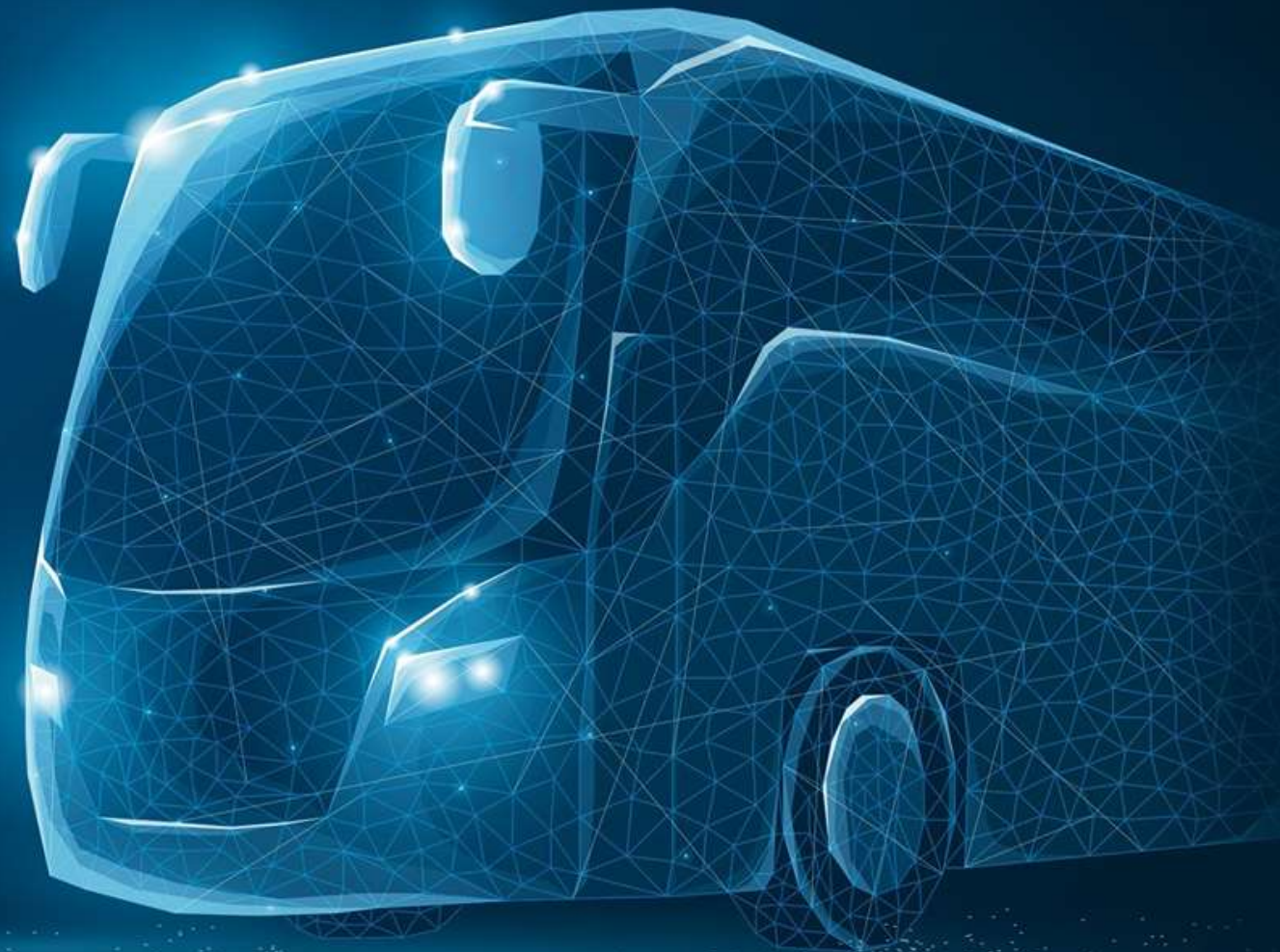


We make mobility

cleaner and safer

UV PURIFIER

Busworld North America Conference
January 9th and 10th, 2022



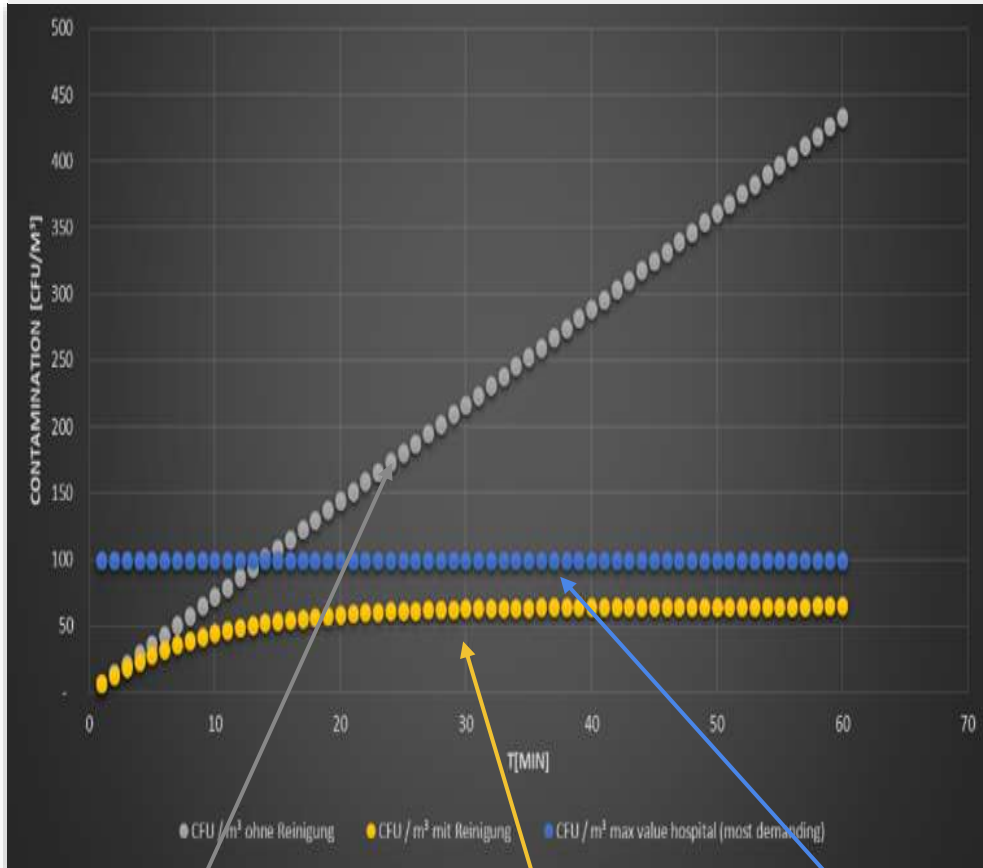
SMART TECHNOLOGY FOR SMARTER MOBILITY

Assumption

Passengers:

40 of which 5 infected or 1 superspreader

Bus volume: 60m³ (Conventional 40ft Bus)



Virus load with fresh air

Virus load without cleaning measures

Limit value "Hospital"

What we know

- Viruses are transported in **aerosols**, which can **spread very quickly** indoors and **transmit viruses**.
- Even when we ingest viruses via aerosols, a **critical dose** is required to **cause an infection**. From a medical point of view there is still uncertainty about the required dose.
- Flushing a bus interior by **fresh air** according to VDV 236* can keep the concentration of CFU below the limit of 100 CFU/m³.
- **Does this mean that fresh air supply as a measure is sufficient enough to prevent the spread of infection inside buses and coaches?**

*)Requirements for the air conditioning of public buses according to Association of German Transport Companies

No!!

Fresh air supply is not enough!

- In Europe for **comfort purposes** there is in most cases a **fresh air flap** integrated into the air conditioning system.

However: Beside a temperature range of +46°F to +73°F the proportion of recirculated air increases significantly. The proportion of **fresh air is then no longer sufficient to dilute the virus load inside the bus.**

>> Conclusion: **We do not always get as much fresh air into the bus as we need!**

- **Worldwide** there are still **many vehicles that use air conditioning without a fresh air flap**
- In many countries there is **still a large number of buses that are not air conditioned at all**
- **Besides the supply of fresh air, a further measure against viruses is urgently needed.**

Valeo UV purifier Vent

UV purifier reduces the concentration of viruses in the air inside passenger compartments just as effectively as fresh air supply

- ➔ Flexibly applicable in all bus types and for all AC options worldwide
- ➔ Scientifically proven more than 95% inactivation rate per circuit
- ➔ Continuously working while passengers on board
- ➔ Safety package (shaker tested, stray light destroyers, UV-impermeable box, no ozone)
- ➔ “Plug and play”-retrofit or OE solution, autonomous operating box or HVAC integrated device
- ➔ Maintenance-free longlife operation



**HEALTH SHIELD AGAINST VIRUSES
IN THE BUS INTERIOR**

UV purifier Vent - a stand-alone solution



- Use of **short-wave ultraviolet light** (UV-C) at 254nm
- UV-C radiation kills airborne, mold, bacteria and inactivates floating viruses in the air incl. new mutations

- Irradiation **time, dose, blower speed and geometry** of the units are coordinated to **reach a status of almost "virus-free" air** leaving the device
- Unique solution that eliminates **over 95% of viruses** including Covid-19 in one airflow cycle

Virological Laboratory Testing

1. step UVC irradiation test against SARS- CoV-2



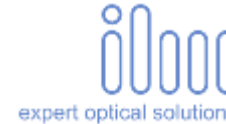
Scientific proof of the effectiveness of the lamps by the **Institute for Medical Virology at the University Hospital Frankfurt.**

The **inactivation rate in the laboratory was 99.99%** (log4). It was also proven that the special Hönle **lamps do not produce ozone.**

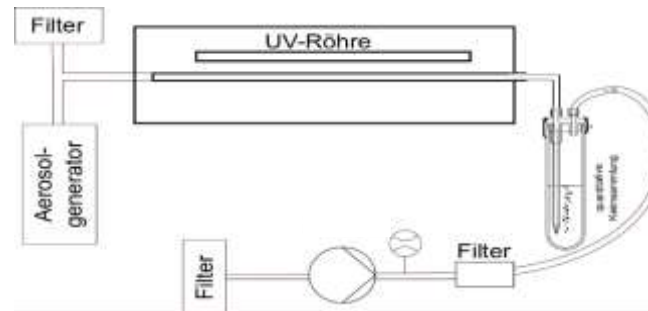
Result:
UVC irradiation characteristic of special UVC lamps against SARS-Cov-2 regarding irradiation power, distance, time, dose

-> **Specifications for the UV purifier**

2. step UV purifier test regarding virus inactivation rate



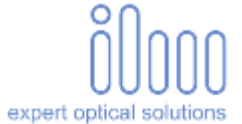
Unique dynamic test series to analyse the inactivation rate of aerosolized microbes



The test corresponds to the Norm ISO 15714:2019

> **Inactivation rate in average of >95% in one loop**

3. step decontamination speed system test of the UV purifier in a real 12m bus



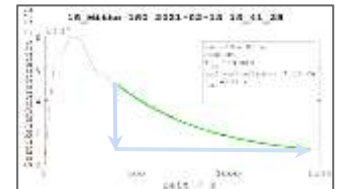
Decontamination performance of cpl. bus compartment



Average reached air exchange rates:
6 per hour

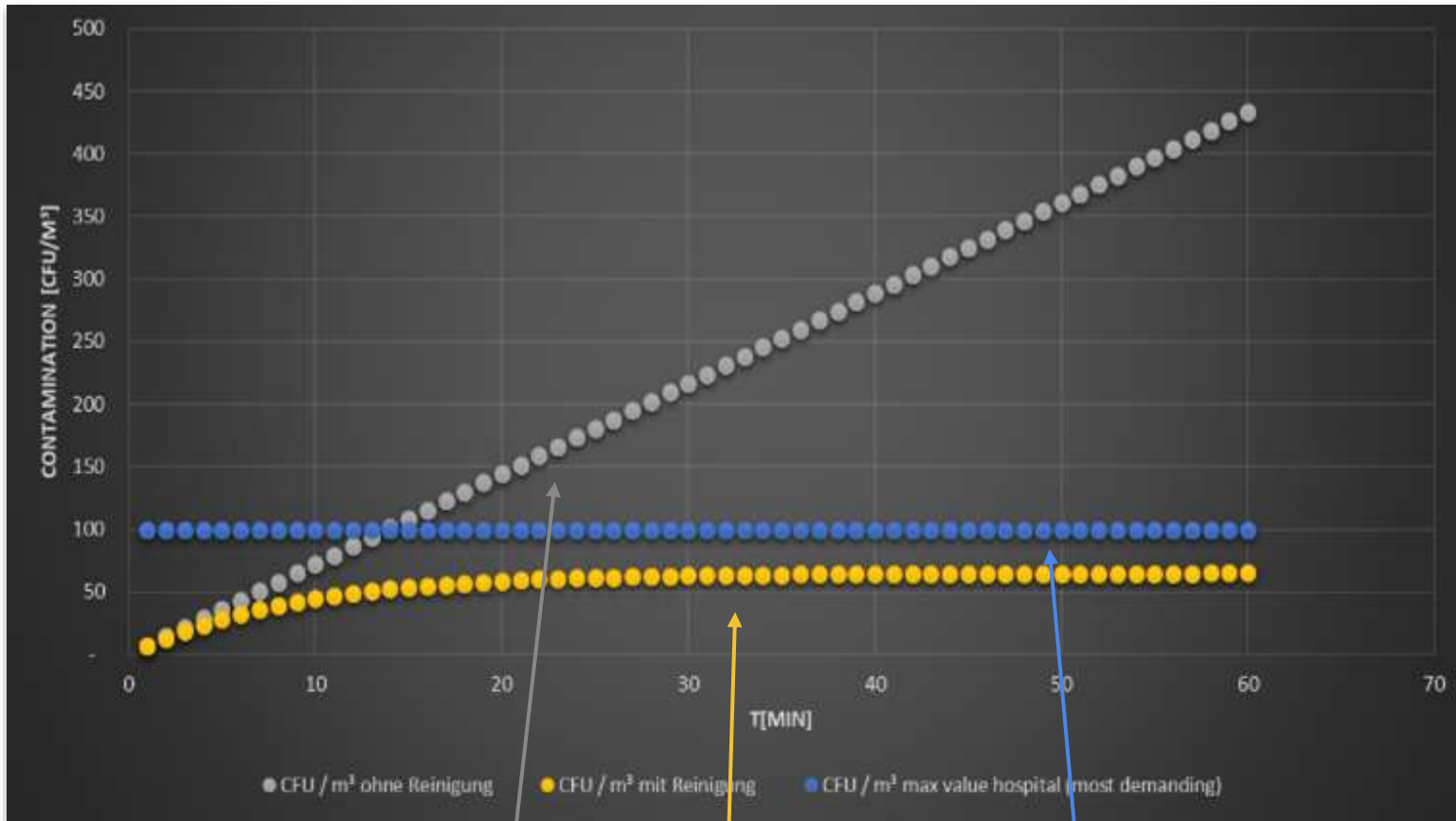
Particle concentration decrease:

of 90% within 20 minutes
of 60% within 10 minutes
of 50% in 7 minutes



> **an effective infection prophylaxis can be assumed.**

Virus concentration diluted with UV purifier



Virus load without cleaning measures

Virus load with Valeo UV purifier

Limit value "Hospital"

Assumption

Passengers: 40 of which 5 infected or 1 superspreader
Bus volume: 60m³
No fresh air, with Valeo UV purifier

Conclusion:

Using Valeo UV purifier, the virus concentration in the interior of the bus remains below the limit values, similar / equal to the fresh air supply.

And again:
the **risk of infection** is **significantly reduced**.

IN AN EXPERIMENT, THE **STRONG AIR INTAKE EFFECT**
OF THE **UV PURIFIER** IS VISUALIZED WITH LASER LIGHT

Valeo



UV PURIFIER - A UNIQUE PRODUCT ON THE MARKET THAT HAS BEEN PROVEN TO VERY QUICKLY REDUCE THE VIRUS CONCENTRATION AND THUS THE RISK OF INFECTION IN THE BUS

Valeo

BUS UV Purifier

Most Powerful & Fastest device for Virus Air Purification



Principle

- Contaminated air is drawn in by **high-performing low-noise fans**
- High power **UV-C light eliminates more than 95% of viruses**, including COVID-19, virus variants, bacteria, molds and other pathogens
- **Cleaned and almost virus-free air** is blown out. Virus load in the cabin is significantly reduced within a few minutes

Uniqueness of VALEO solution

- ➔ **Scientifically classified as an effective method in infection prophylaxis**
- ➔ **Flexible application** for **Original Equipment and Aftermarket**
- ➔ Autonomous operation **with or without AC**, continuously, while passengers are on board
- ➔ **Highest safety level:** no chemicals, no ozone, specifically designed to prevent UV-C light leak, thick shatterproof quartz glass

Recognized and awarded

Winner of the International Sustainability Award



Named and awarded as Top Innovation 2021 by the VDA*



*) VDA is the German association of automotive manufacturers and leading automotive suppliers, that sets the standards used in the German automotive industry.

More than 2000 buses successfully equipped



A woman with her hair in a ponytail is seen from behind, looking out of a bus window. The view outside is a blurred city street with cars and buildings, suggesting motion. The overall color palette is a cool, monochromatic blue. A vertical handrail is visible to the right of the woman. A small sign with a hand icon and the word "No Smoking" is visible above the window.

**SAFER COMMUTING AND TRAVELLING BY BUS,
THANKS TO THE UV PURIFIER**

Valeo