

Advancing the Utilization of Germicidal UVC in Food Processing
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Air Treatment in Food Processing Facilities

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JenAct
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- Director of JenAct - design and manufacture of UV disinfection systems
- 13 years of experience in UV applications in food, pharmaceutical and HVAC industries
- Member of BSI (British Standard Institute) committee for development of UV disinfection standard
- Postgraduate degree from School of Engineering Sciences, University of Southampton, United Kingdom
- UVC sizing software for estimating disinfection rates in air streams and on surfaces



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Air Treatment in Food Processing Facilities

- Why air?
- Food industry specifics
- UV in food industry
- UV air disinfection systems
- Monitoring performance
- Safety



UV – germicidal radiation

- **200nm – 300nm**
- **non-ionising**
- **not a chemical substance**
- **contact-free disinfection**

wavelength
radiation
bacteria
moulds
viruses
RNA
D90 dose
DNA
log kill
log reduction
photoreactivation
mJ/cm²
mW/cm²
μW/cm²
enzymes
proteins
disinfection
sterilisation
decontamination
purification
fungi
neutralisation
thymine dimers
inactivation
UVC
irradiance
fluence rate
fluence
transmissivity
energy
intensity
power
UV-C
UVGI
UVV
VUV
LP lamp
MP lamp
UVC LED
UV dose
HO lamp
99.99%
shoulder curve
viewing angle
cosine response
photokeratitis
far UV

UV in food industry – WHY AIR?

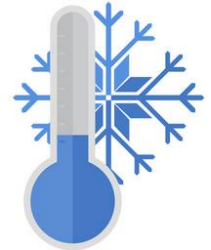
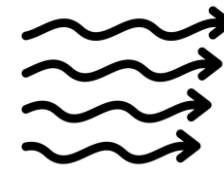
- air is everywhere all the time
- if air is contaminated, it is practically impossible to produce food, which is not contaminated
- air is the easiest 'thing' to **clean** with UV



What is CLEAN AIR ?

Food industry specifics

- Large production halls with many workers
- Very high air flow rates
 - Typically 40 ACH, low fresh air intake
- Very cold environment*
 - Typically 5-8°C
 - Output from a chiller might be below 0°C in extreme cases
- Glass fragments **MUST** be prevented
 - All lamps **MUST** be either glass-free or shatterproof
- Systems and controls suitable for washing down
- Performance monitored for validation, maintenance and audits



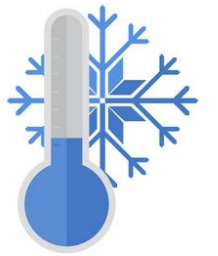
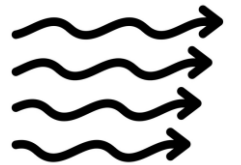
UV in food industry – WHY?

- **protect staff**
- **reduce waste**
- **increase product shelf life**
- **reduce use of chemicals**
- **increase nutritional value**



UV - Protect staff

- COVID-19 pandemic – lessons learnt?
 - Transmission path (surfaces or aerosols?)
 - Dozens of outbreaks in UK food factories reported in 2020 despite high hygiene standards
 - Staff shortages due to isolation rules



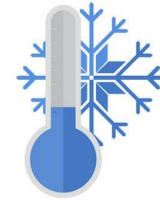
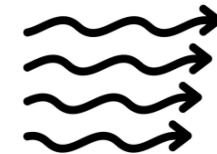
UV - Protect staff



(reducing sick leave)

- Air disinfection in food production halls

- UV systems built into HVAC
- independent UV systems



- Air disinfection in areas, where people gather

- canteens
- changing rooms
- meeting rooms
- open-plan offices

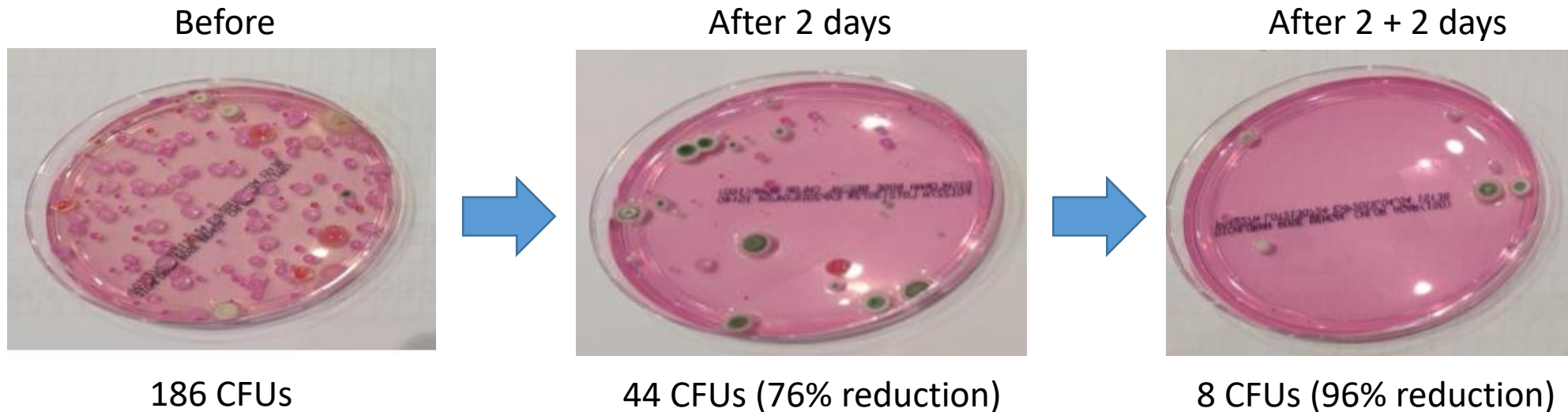


UV - Reduce waste

UV - Increase product shelf life



- Air disinfection in areas where food items or packaging are exposed to surrounding air
- Very little can achieve a lot

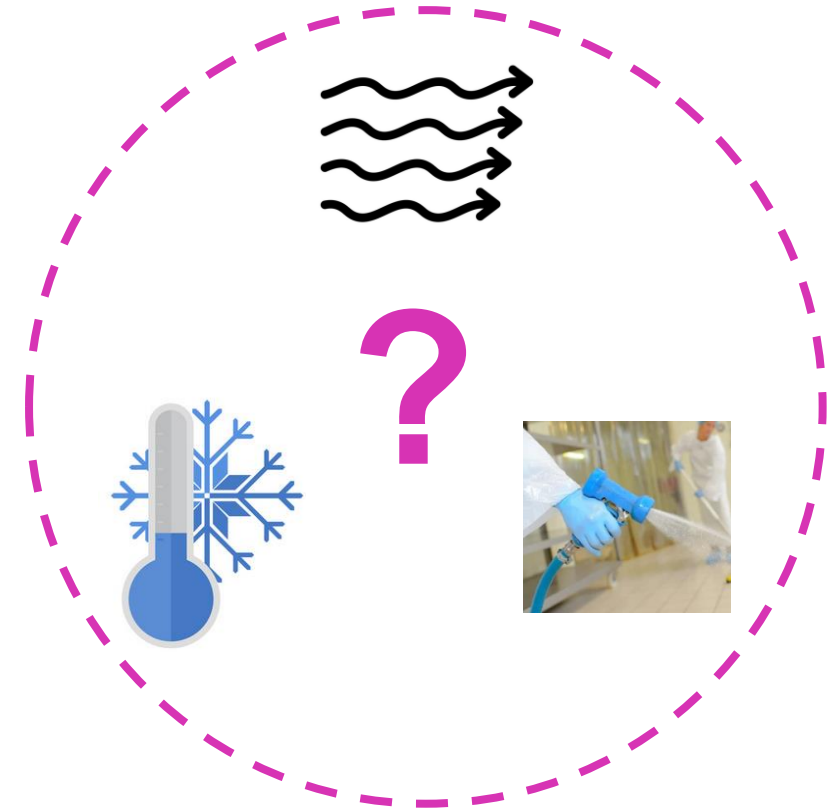


UV - Reduce waste

UV - Increase product shelf life



- Food production halls
- Cooling rooms/towers (baked products)
- Storage rooms/halls
- Areas/Rooms where food is matured (cheese, steaks, beef jerky, etc.)



UV - Reduce use of chemicals

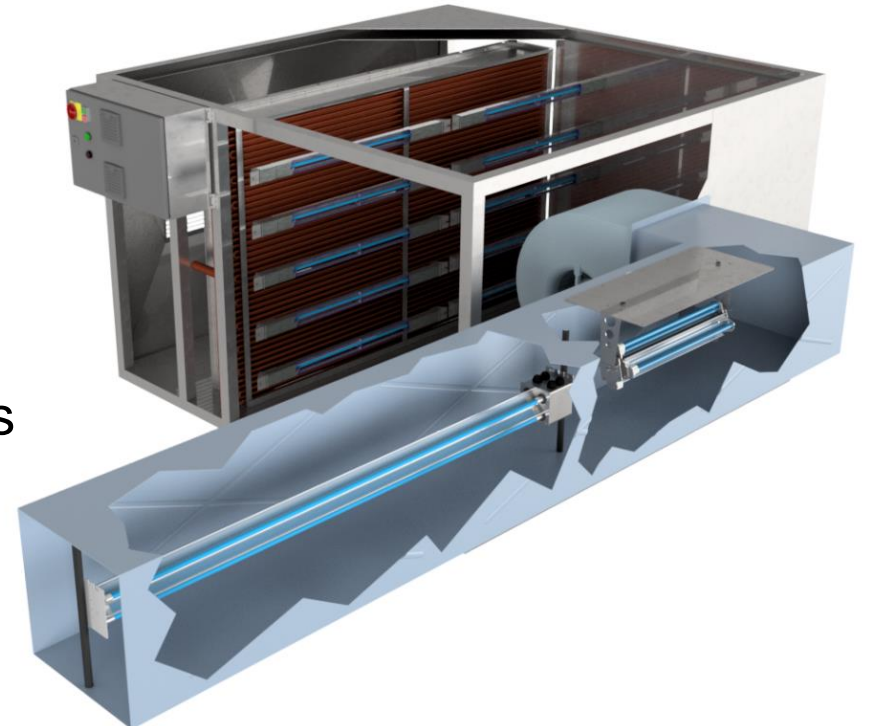
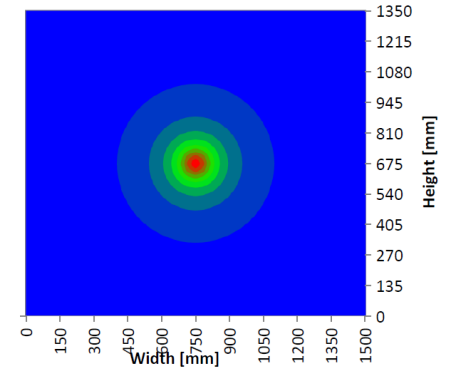


- Ready-to-eat and baking industry
 - Lowering bioburden in air allows using less or no chemical additives
- Food production environment
 - Reducing usage of cleaning chemicals
 - Simplifying maintenance/cleaning



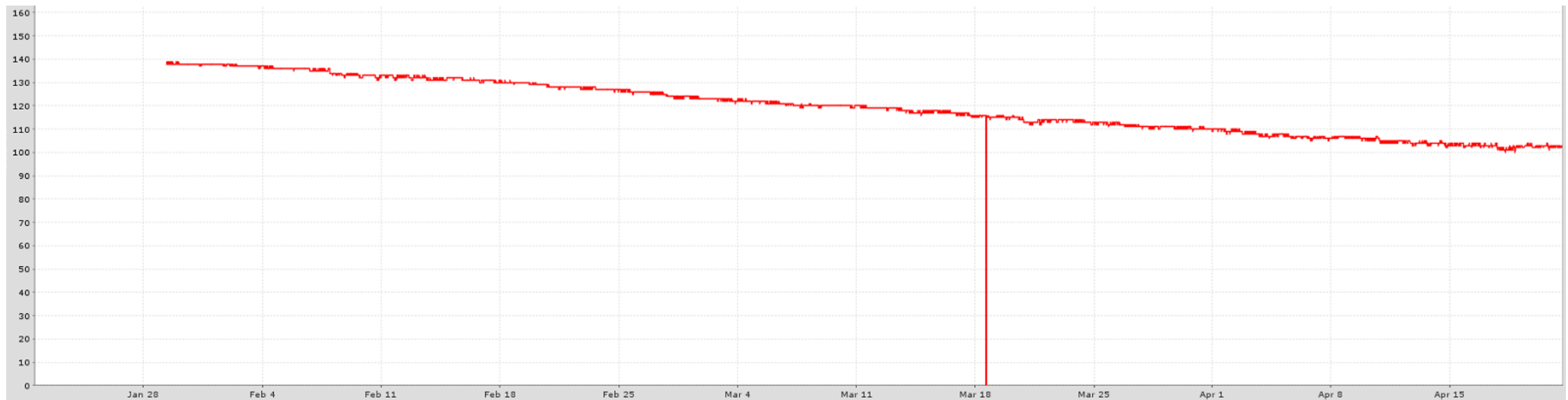
UV air disinfection systems

- Consult experts
 - Contact a reputable UV disinfection company
- Define a problem/target
- Ask for performance data
 - Calculated average inactivation levels
 - Estimated UVC energy distribution / irradiance maps



Monitoring performance

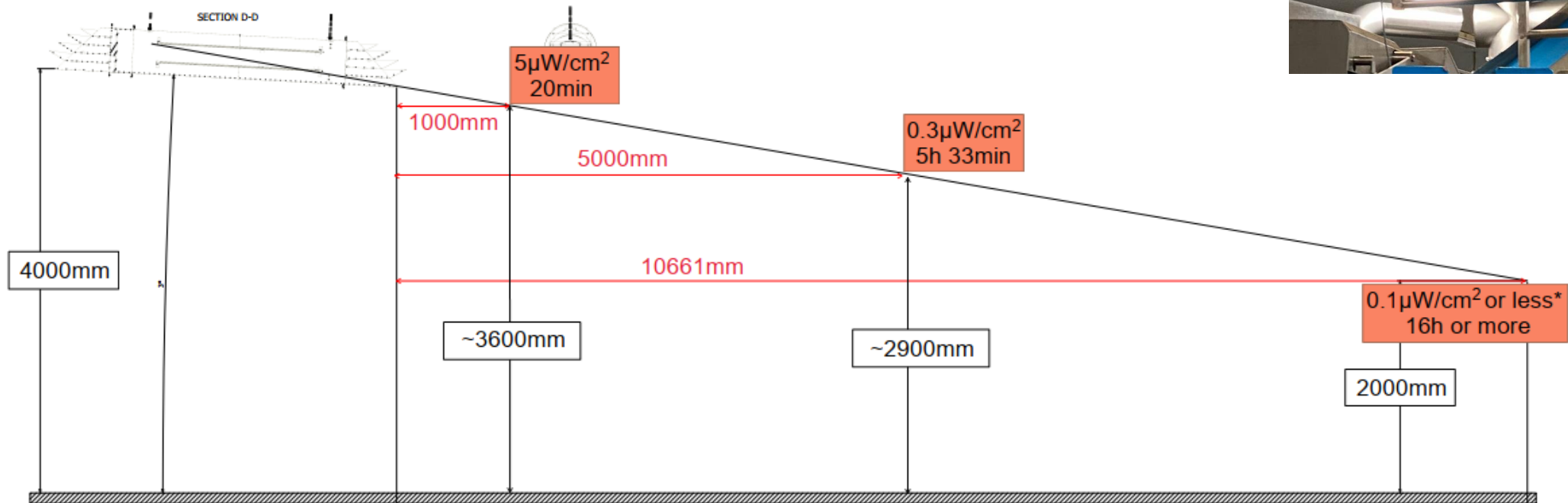
- Key Performance Indicator (KPI) – quantifiable measure of performance
- Built-in UV sensors/radiometers
- Data collection and analysis -> alarms



Trending chart using data from UVC sensor

Safety

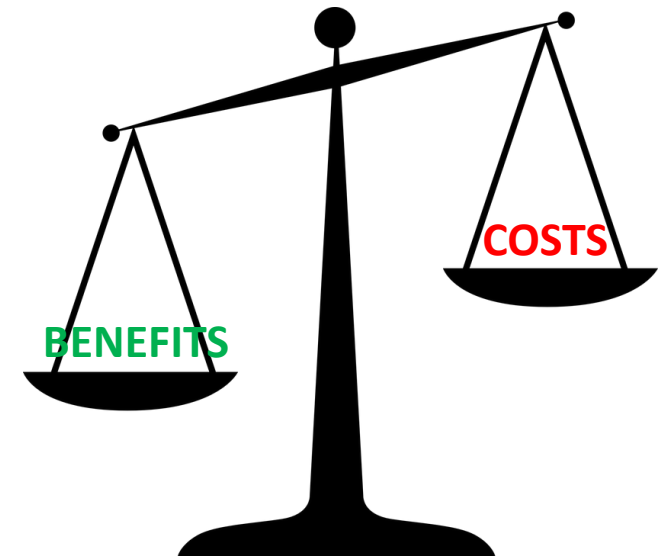
- Carry out risk assessment pre- and post- installation
- Identify critical positions for maximum UVC exposure
- If you can see a UV lamp, check it with **appropriate** radiometer

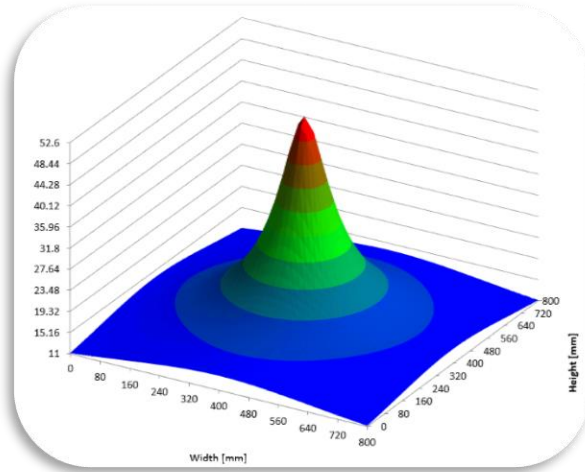
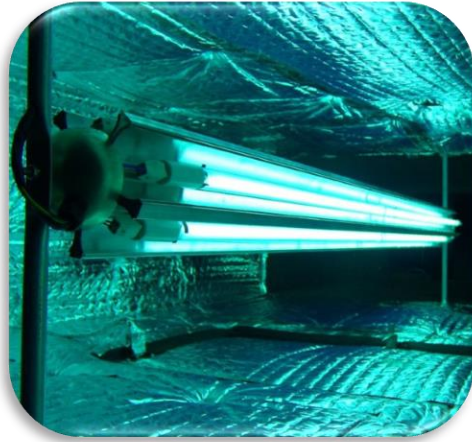


UVC safety analysis for a ceiling mounted system

Air Treatment in Food Processing Facilities

- Always start with air
- Benefits heavily outweigh the costs
- Speak to UV disinfection experts
- Focus on safety and monitoring





Thank you

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