

# PULSED LIGHT PACKAGING DECONTAMINATION

# CLEAN ZONE TRANSFER SYSTEMS





#### PULSED LIGHT TECHNOLOGY

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HISTORY

decontamination date back to the 80's in Japan. A first patent was taken out in 1984 by Hiramoto, for the use of xenon lamps for this purpose. The literature from the 1990-2000 period describes reaching the industrial market. The first industrial many trials carried out on a wide range of products, food items, medical devices etc., on the laboratory

The first trials using intense light flashes for surface level. Most of these articles failed to specify the physical parameters of the trials.

> Hence the results reported could not be linked to cost elements, which has held back the technology from applications of the technology for online packaging treatment began in the early 2000's.

#### **ACTION ON MICROORGANIMS**

The performance of the technology in destroying microorganisms on surfaces has been demonstrated. It is explained by:

• the effect of UV rays, which have a denaturation effect on biomolecules (DNA, proteins, enzymes ...)

 the effect power and consequence in terms of ultrasurface heating.

The technology's efficacy has been demonstrated on a wide range of microorganisms: bacteria (vegetative cells and spores), moulds, yeasts, viruses. In view of the low energy levels needed to generate the flashes, pulsed light has been classified in the soft technologies category, along with high pressure and pulsed electric fields. Among these technologies, pulsed light stands out on account of its demonstrated efficacy in destroying thermoresistant spores. Decontamination levels attained depend on the number and power of the flashes applied to a surface. They can reach a 6-log reduction on bacterial spores.





PULSED LIGHT TREATMENT **ON POLYSTYRENE SURFACE** 

Inactivation profiles of A. brasiliensis, B. subtilis, B. pumilus, B. atrophaeus depending on medium Fluence Reduction curves: 1 flash - Results obtained by C. Levy, PhD student, on Claranor 3 lamp pilot equipment, 200

#### SURFACE TREATMENT

Pulsed light is a surface technology; only the areas reached by the flashlight – directly or by reflective phenomena - are decontaminated. Shadow effects, linked to the shapes of the objects treated, constitute the limit of the technology.



The flashes are produced by flash lamps, filled with Xenon gas, heaviest noble gas and giving the best UVC vield.

Electrical energy, typically 300J, is accumulated in a capacitor during fractions of a second and discharged in the lamp, where it ionizes the Xenon to create a plasma. It produces a very intense emission of white light, rich in UV, within a short time (300 µs). The result consists in a pulse of very high power, reaching 1 MW (300J/0,3ms). The process enables to achieve a 6-log reduction. Depending on the charging power, the capacitor is reloaded in 0.2s.

Lamp Energy = 300 J	= 1	MWatt
Flash time = 0,3 ms		



#### Validation Trial of Tubs

The initial count, 1,6 10E8, was calculated as average of count on positive bioindicator samples. The decontamination rate of each sample was calculated by difference between average initial count and end count on treated sample. A 6,7 log and 7,1 log reduction were achieved for the lower and the higher number of flashes.



#### PHYSICAL PRINCIPLE

#### LIGHT PULSED PRODUCTION



- 1 Charging capacitor
- 2 Triggering lamp ignition with 20 kv pulse
- 3 Discharge of the capacitor in the lamp.
- Production of a plasma emitting white light

#### MICROBIOLOGICAL VALIDATION

The Pharmaceutical industry needs bioindicators to perform regular qualifications.

Claranor is already collaborating with an industrial lab specialized in pharma process validation, having all quality certifications. This lab delivers an industrial BI adapted to a surface decontamination with pulsed light at 4log for the moment.





#### **APPLICATIONS**

#### TUB DECONTAMINATION

The Robotic Tub Decontaminating System with pulsed light enables to decontaminate at 6-log 2 tubs/min in a VHP sterilizable Isolator. It brings to the industry a new reference in terms of low foot print, extremely short down times, easy maintenance, reduced capex and opex

- Traceability on flashes
- Light intensity measurement
- Energy consumption <3kW
- Lamp change every 100,000 tubs
- Simple lamp change by user
- Access to reflectors and lamps from outside, enabling intervention on lamps without breaking sterility of the chamber
- Power electronics in changeable rack
- Low maintenance



#### FOIL / FILM / BAG DECONTAMINATION

The decontamination of foils, films and bags/pouches formed out of it is a common process in the pharmaceutical industry. Pulsed light can be used as (pre-) treatment to decontaminate several materials (aluminium, PE, PP, composite...) in a fast and safe way.

- High efficiency: 4 log reduction on moulds and bacterial spores
- Single/double side
- Speed rate up to 20 m/min
- Low energy consumption, low carbon footprint
- Competitive TCO compared to UV, chemicals or gamma-irradiation
- Non thermal treatment, respects the integrity of the packaging
- No risk of chemical residues

Infusion Bag decontamination



Several goods like product ingredients and packaging material have to be decontaminated on their surfaces before entering cleanzone areas. The decontamination with Pulsed Light in a tunnel allows you to automatize this process in a chemical-free and faster way than with common established technologies.

- High efficiency: 3 log reduction on moulds and bacterial spores (Bacillus pumilus)
- Laminar flow inside the whole tunnel
- Continuous System
- Speed rate up to 4 pouches or trays /min
- Single/double side
- Low energy consumption, low carbon footprint
- Non thermal treatment
- No risk of chemical residues

For smaller batches or by transferring goods into isolators a pass box or transfer chamber with integrated pulsed light can be used. The advantages are also here a radiation-, chemical-, residue-free and quite fast transfers.

- Air tight and overpressure system from cleaner side
- Adjustable in height
- Fast < 1min
- Discontinuous system
- Auto decontamination of the chamber

We provide cost efficient alternatives to chemical treatment for the decontamination of pharmaceutical secondary packaging.

We develop customised equipment based on your specifications, which can be integrated into your production lines, in order to provide you with a personalized solution.



#### SEMI-AUTOMATIC OR AUTOMATIC TUNNEL





#### TAILORED MADE SOLUTION





### WORLD LEADER IN PACKAGING DECONTAMINATION BY PULSED LIGHT



## IN-DEPTH KNOWLEDGE OF MICROBIOLOGICAL VALIDATION TESTS

Our decontamination equipment units are designed and manufactured in France. They are tested in our microbiological laboratory.

We carry out hundreds of microbiological tests every year in our laboratory or on industrial sites.



## A SUPPORT DURING THE ENTIRE LIFETIME OF YOUR CLARANOR EQUIPMENT

From standard to customized decontamination solution.

Our microbiological laboratory works in close collaboration with our design department to provide you the best calibrated solution in terms of microbiological efficiency and investment.

# **YOUR CONTACTS**









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