

Press report

Disinfection of packaging with high intensity, cold and dry UV light

Hanau (Germany), March 2015

Intensive UV light means not a chance for germs!

The use of high-energy UV light reduces the germ load on packaging surfaces by up to 99.9%. This clearly prolongs the shelf life of foods such as yoghurt, curd or milk. Just a few seconds of the intensive, yet cold, light is enough to dispose of microorganisms such as bacteria, yeast and fungi. Compared to chemical and thermal methods, UV light radiation treatment is a very reliable, economic and, above all, environmentally friendly method and hence especially suitable for the processing of organic products.

Disinfection with ultraviolet light

In general, the method used to remove bacteria from packaging materials is disinfection, not sterilisation: Ultraviolet light at wavelengths of 254 nanometer (nm) is more energy-rich than the terrestrial UV light of the sun. This especially short wave UV light destroys the DNA of all micro-organisms. When installed purposefully, viruses are disabled in seconds and micro-organisms such as bacteria, yeasts and fungi are killed in an environmentally friendly manner, without the addition of chemicals. For a whole series of micro-organisms, the lethal dose of UV radiation is known and this is the dose after which the cells can no longer maintain their metabolism and can also no longer multiply. Because of the cell wall structure, the lethal dose for different pathogens is distinctly high. Consequently, bacteria such as salmonella and coli bacteria, which have a comparatively thin cell wall and can thus only slightly block the UV radiation, are extremely vulnerable and are very quickly destroyed.

By contrast, mould spores, such as of *Aspergillus niger*, have a thicker cell wall, which may even have pigments, to protect them against UV radiation. Killing them requires 10 to 100 times the UV dose needed for bacteria. As an alternative, it is advisable to use a

combination of UV radiation following the action of a diluted hydrogen peroxide solution (one to three percent). This combined method achieves an efficient and broad germicidal effect.

Important dimensioning parameter: The lethal UV dose

The necessary UV dose is calculated by multiplying the irradiation power (intensity) of the UV lamp by the length of time that irradiation takes place. The intensity of the radiation is also dependent on the distance between the UV module and the packaging. The UV intensity of a lamp decreases with the increase in operating hours. At the end of the lamp operating life there must still be sufficient high UV intensity to ensure a suitable disinfection power and the necessary lethal dose in the given radiation time.

Experience with Yoghurt filling for example has shown that pots of a depth of 150 millimeters (mm) can be effectively disinfected within four seconds and sealing foils in two seconds at the same intensity.

UV disinfection is used primarily for surfaces of package materials in contact with fresh milk products which are stored in the cold chain, such as yoghurt or kefir, to extend their shelf life. This means that the dairy has significantly fewer returns of spoiled product, saving time, effort and cost of disposal.

Up to 99.9 percent germs removed – Fraunhofer proofed

Even more intensively and reliably, the Heraeus Premium UV systems reduce the number of germs on the surface. The latest powerful systems have been developed especially for UV disinfection in the food industry. They remove up to 99.9 percent of germs. This is proofed by the report of the Fraunhofer-Institute for Process Engineering and Packaging, Freising, Germany. According to a method of the association VDMA, Fraunhofer has tested the efficiency of the decontamination by using Premium UV systems against certain micro-organisms (conidiospores of *Aspergillus niger*, endospores of *Bacillus subtilis*). During this count reduction test three respectively five log levels have been achieved within a distance of 20 mm.

The use of a novel lamps technology enables high intensities and a substantially longer service life. The use of just one UV module reduces the expenditure for servicing and associated costs. The short exposure times also contribute to reducing operating costs. Depending on the material, between two and four seconds are sufficient for the disinfection process.

The UV lamp is virtually the only consumable necessary. It has a service life of up to 12,000 operating hours which is equal to two years of actual use at 24 hours of operation per day. During that time, the Premium UV system can disinfect about 173 million cups on a machine with eight lanes. This means an investment of just 0.03 Euro cents per cup, a lot less than one Euro cent.

Easy handling - high safety

In addition to the economic benefits, the Premium UV systems feature easy installation and operation. The systems can simply be installed or retrofitted to existing filling and sealing plants.

Due to the integration into the respective HACCP concept, the quartz glass plate, the temperature and the emitter function can be monitored automatically. The quartz glass covers of the UV modules are provided with a breakage detector patented by Heraeus and thus part of the HACCP concept. If a quartz glass plate breaks, the detector sends a signal to stop the filling plant immediately. The type of protection of the Premium UV system is IP67, so it can also be used without restriction in wet environments of a CIP-machine (CIP = Cleaning In Place). Translucent plastic doors, e.g. made of Makrolon, are sufficient to provide protection against the radiation.

Electronic control unit and ventilation are combined in a new media box to make retrofitting even more easy and reduce the space requirement. Based on the modular design principle, one to three UV modules can be operated with one control box. Expensive water cooling is not used as the Premium UV systems are cooled with air. The ventilation provided by one control box is sufficient to cool up to three UV modules. The control unit is stainless steel design and

EMC-protected (electromagnetic compatibility) and can be operated anywhere in the world at supply voltage frequencies of 50/60 Hz. The module has two 180 - 264 Volt connection sockets. Premium UV systems are equipped with an operating hours counter and an on/off lamp signal to make the entire monitoring process easier.

As an option, the Premium UV system may be equipped with a patented quick-start solution. This will reduce the warm-up time from about five minutes to 30 seconds, so the filling process can start more rapidly.

High-intensity and nevertheless cold

Due to their slim shape, Premium UV systems are used in particular to disinfect packaging materials in in-line filling machines with four to twelve rows of cups. As a standard, the new Premium UV systems are available in three sizes but they may also be adjusted especially to the machine environment. Although the UV modules generate a high irradiance, the UV light is cold. Therefore, the packaging material is not heated. This makes the disinfection method perfectly suited for the treatment of heat-sensitive materials such as plastic cups and sealing foils.

Taking account of various dimensioning criteria and with a sufficient high irradiance, UV disinfection is used as a simple, fast and reliable method in continuous operation in filling plants. However, outside the food production industry as well, e.g. to disinfect packaging materials in the pharmaceutical and cosmetics industry, the method of surface disinfection with UV light makes an important contribution wherever bacteria and viruses need to be inactivated in an environmentally-friendly manner. **UV application experts give you advice to implement the best possible UV design – ANUGA FOODTEC 2015, hall 5.2, stand D100.**

Heraeus, the technology group headquartered in Hanau, Germany, is a leading international family-owned company formed in 1851. We create high-value solutions for our customers, strengthening their competitiveness for the long term. Our activities focus on a number of markets: chemical and metals, energy and the environment, communications and electronics, health, mobility, and industrial applications. In fiscal year 2013, Heraeus achieved product revenue of €3.6 billion and precious metals trading revenue of €13.5 billion. With some 12,500 employees in over 110 subsidiaries worldwide, Heraeus holds a leading position in its global markets.

Heraeus Noblelight GmbH with its headquarters in Hanau and with subsidiaries in the USA, Great Britain, France, China and Australia, is one of the technology- and market-leaders in the production of specialty light sources and systems. In 2013, Heraeus Noblelight had an annual turnover of 138 Million € and employed 875 people worldwide. The organization develops, manufactures and markets infrared and ultraviolet emitters, systems and solutions for applications in industrial manufacture, environmental protection, medicine and cosmetics, research, development and analytical measurement techniques.

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Photos:



Heraeus Premium UV systems.jpg

Photo 1

The new Premium system is now even more powerful and safer - with acquisition costs of less than one cent per disinfected yoghurt cup. (Photo: Heraeus Noblelight GmbH)



Heraeus UV disinfection of foils.tif

Photo 2

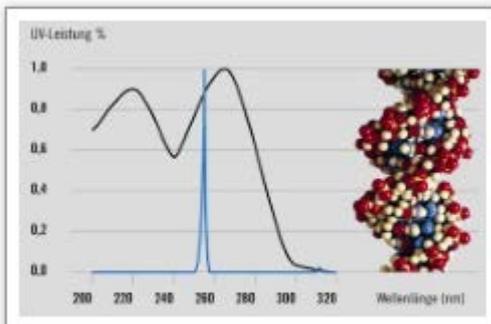
To make yoghurt non-perishable: Within seconds, packaging surfaces (here: foils) are reliably disinfected with intensive UV light, without the use of chemicals. (Photo: Heraeus Noblelight GmbH)



Heraeus UV disinfection of cups.jpg

Photo 3

With a combined method of UV light following the action of a weak hydrogen peroxide solution, even mould germs resistant to radiation can be inactivated on packaging surfaces. (Photo: Heraeus Noblelight GmbH)



Spectrum of activity .jpg

Photo 4

The wavelength spectrum of a Premium UV lamp (blue) at 254 nm and the spectrum of activity of the inactivation of micro-organisms (black). (Photo: Heraeus Noblelight GmbH)