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SteriBeam Systems – Tailor-made pulsed UV applications

The food industry and pharmaceutical companies need to find ways to prevent their products from being contaminated with bacteria during the manufacturing process. However, current chemical methods and the irradiation with gamma rays and heat often lead to harmful by-products. The company SteriBeam Systems GmbH, whose managing director is the physicist and engineer Dr. Alexander Wekhof, offers solutions that are able to effectively and efficiently remove biological and toxicological contaminations. The company's technologies, based on UV light or electrical fields, also help to extract valuable substances such as vitamins or dyes from biological materials. Kehl-based SteriBeam Systems offers its clients the flexibility they need. The more complex the requirements of modern industry, the more individual the solutions need to be.

The requirements for the sterilisation of food or drug packages are becoming more and more strict. Methods such as the irradiation of products with gamma rays or the use of oxidation agents such as hydrogen peroxide affect the plastics material used and generate toxic by-products. It costs a lot of money to remove these toxic substances and industry is desperately looking for alternatives. One possible alternative is a method offered by SteriBeam Systems GmbH which uses pulsed UV sterilisation (PUV). The principle was developed by the physicist and engineer Dr. Alexander Wekhof in the late 1980s in the USA. Working with academic and industrial partners, Wekhof established the technological foundations and published his first papers.

The principle of the method is as follows: a food sample or drug package is exposed to extremely short pulses of UV light of a certain wavelength. The bacteria or spores that contaminate the material then develop severe DNA damage and hence become fully inactivated. Given the high energy of the pulses, the contaminations are virtually disintegrated. The sterilisation process is very clean because it does not generate any chemical by-products. "This principle is still the basis of all the devices SteriBeam Systems sells to its clients," said Wekhof.

Customized systems

Since 1996 Wekhof worked within his Wek-Tec GbR in Heilbronn to further develop his pulsed UV systems for R&D customers and to define the sterilization mechanism under intense PUV light. This work was completed in years 1999-2001, in part with colleagues from the Fraunhofer Institute (Aachen) by publications, since then cited worldwide. It became the base for building optimal PUV sterilization systems and prompted him to start SteriBeam Systems GmbH in Kehl. The new company also introduced his advanced version of the known sterilization-extraction technology with pulsed electrical fields (PEF). "These PEF systems for R&D applications feature a far broader selection of parameters and treatment chambers than other systems available on the market," said Wekhof.



Pulsed UV sterilization system for R&D applications. (© SteriBeamSystems GmbH)

Food and drug producers or laboratory-based scientists who work with contaminated samples have different requirements for sterilisation devices. Parameters such as pulse duration, pulse frequency or pulse temperature need to be adjusted to individual samples. "Clients come to me with very specific ideas for which I individually design the suitable device," said Wekhof. Based on the basic principle of UV sterilisation, Wekhof is able to adapt the devices to his clients' requirements. This is an approach that is used by very few companies. So what exactly is Wekhof's approach? "SteriBeam Systems provides the layout and the structural design of the machine, which is hence constructed by our manufacturing partners," explained Wekhof.

Large variety and new areas of application

This way of working guarantees great flexibility. The technology used and the sale of the systems constitutes SteriBeam's know-how. There are no ready-to-use off-the-shelf machines. Since the production processes of food and drugs are becoming increasingly individual and complex, the sterilisation solutions need to be tailored to the individual requirements of the company's clients. SteriBeam's services not only include the construction of the sterilisation device but also subsequent maintenance and other services. The clients can contact Dr. Wekhof at any time if they wish to change something. Wekhof also repurchases the machines, thus enabling his clients to purchase new systems at a moderate price should their requirements change. "Nowadays, it does not make sense to produce expensive sterilisation devices in series and hope to sell them," said Wekhof. "We have to modify our services and products to suit the rapidly changing interests of our clients as well as making financial concessions."



SteriBeam's technology can also be used to extract plant and fungal substances that can be directly shaped into food supplement tablets. (© SteriBeamSystems GmbH)

Many clients around the world benefit from Wekhof's technology, including industrial manufacturers, research centres and universities from Europe, Asia and North America. The company also offers a broad range of products. At one end of the scale, SteriBeam

Systems offers compact machines with fixed parameters that can also be used in small laboratories. At the other end of the scale, Wekhof is also able to construct complex sterilisation tunnels through which samples are transported on a conveyor belt and subsequently exposed to different conditions.

The company's latest offer is a technology for the extraction of plant and fungal substances. One device is able to enrich vitamin D2 from fungal powder and transform it directly into tablets. These pills made of mushroom powder contain a natural mixture of ingredients, such as anti-oxidants and enzymes, which can be superior to purely chemical formulations. In a society with a growing tendency to eat unhealthy food, such supplements can be an effective complement to human nutrition.

To expand his business Dr. Wekhof is currently looking for experienced marketing partners. Regarding SteriBeam's future perspectives he can be optimistic. A comparable variety and flexibility in the fields of PUV and PEF systems is hard to find elsewhere.

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