Sterilization Technology Overview

The use of ultraviolet light (UV) for sterilization is well known and universally accepted. Professor Anne Rammelsberg of Millikan University explains that UV energy initiates a reaction between two thymine molecules within DNA. Although bacteria can normally repair damaged DNA, when the damage is sufficiently extensive the cell ceases to function. This same response can be engendered in viruses and fungi relative to the wavelength used and the light intensity.

The most common sterilization lamps are UV fluorescent that produce a concentrated UV wavelength of 253.7 nanometers (nm) which corresponds to the emission band of mercury. New light emitting diode (LED) lamps can produce UV radiation from 255nm to 280nm. More powerful UV emitters like xenon lamps can produce a comprehensive UV output. In general, UV sterilization is accomplished using UV-C that falls between 280nm and 100nm.

The shorter the electromagnetic wavelength is, the more energy it carries. Ultraviolet radiation covers three ranges: UV-A (315nm~400nm) UV-B (280nm~315nm), and UV-C (100nm~280nm). More than 95% of UV-C light is blocked from reaching the earth's surface by ozone. Radiation from UV-C to UV-B is called "ionizing" because it can alter chemical structures like turning oxygen into ozone (O_2 to O_3). Ozone is a powerful oxidizer and can act as an independent sterilization agent and process. UV water treatment relies upon creating ozone within water to kill bacteria and viruses.

Drawbacks to most UV sterilization approaches include photobiologic hazards, ozone pollution, and line-of-sight effectiveness. Pathogens that are not directly exposed to UV radiation will survive and multiply. However, this is equally true for chemical treatments that do not come in direct contact with pathogens.

Ultra-Tech™ Lighting has created a new form of UV radiation generator based upon Nikola Tesla's magnetic induction wave generator incorporated into his magnetic induction lighting (MIL). Although there are standard MIL bulbs that produce UV-B in the mercury emission wavelength of 253.7nm, research has demonstrated

that concentration at 207nm is particularly advantageous because it poses the least threat to human tissue while remaining potently fatal to bacterial and viruses. Ultra-Tech™ Sterile-Bright™ technology generates radiation from below 207nm through 280nm. A modest amount of visible near UV is also emitted to demonstrate that the lamp is operational. A unique modulation scheme is combined with the spectral output to maximize germicidal effectiveness and destroy fungi and spores.

Sterile-Bright™ attacks DNA and cell wall integrity. Using a specialized carrier frequency approach, ionizing radiation below 200nm is able to travel further through the atmosphere before being neutralized by oxygen and nitrogen. This approach provides a more effective "kill rate" at longer distances and creates ancillary sterilization agents including hydrogen peroxide (H_2O_2) from atmospheric water. The multiple sterilization pathways generated by Sterile-Bright™ combines mutually exclusive and proven disinfection and sanitization modalities for the most comprehensive and effective nonchemical approach* that addresses bacteria, viruses, funguses and spores. The light is also effective for destroying larvae and other pests.

The specific application introduces disinfectants with very short half-lives to insure a safe post treatment environment. Ozone and hydrogen peroxide vapor quickly dissipate under normal circumstances and do not pose health hazards after treatment. Sterile-Bright™ technology is far less expensive than burst xenon UV generators and other approaches. With an operating lifecycle exceeding 100,000 hours, the service exceeds eleven years operating 24 hours by 365 days per year.

For more information contact:

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*Note: Ozone and hydrogen peroxide vapor are considered chemical sterilization agents.