MICROELECTRONICS

INDUSTRY-SPECIFIC APPLICATIONS FOR UV TECHNOLOGY

APPLICATION: Microbiological Inactivation, TOC Reduction, Chlorine/Chloramines Reduction | UV SERIES: Avant™, OptiVenn®, Logic™

In Microelectronics, Aquafine UV systems provide a synergistic approach towards the reduction of trace organics and microbial contamination for ultrapure water.

UV Technology

Aquafine® Ultraviolet light (UV) Systems from Trojan Technologies commonly perform four functions in producing pure water - microbial inactivation, TOC (total oxidizable carbon) reduction, ozone reduction and chlorine and chloramines reduction. They are engineered to focus the power of concentrated UV light using specially designed Aquafine Colorguard UV lamps, recognized in the industry for unsurpassed performance and reliability.

We also offer UV/H_2O_2 advanced oxidation solutions for the reuse of spent rinse water, which provide cost savings in utilities and waste treatment/disposal.

UV Technology for Microelectronics

We recognize the challenges faced by water professionals in the design and construction of water systems for microelectronics production. Being well versed in how all components of a pure water system interrelate ensures optimum performance. Our UV systems address microbial contamination by inactivating the DNA of microorganisms to prevent reproduction.

UV, in combination with ozone, provides a synergistic approach toward the reduction of trace organics, which are among the most difficult contaminants to control in a pure water system. As critical dimensions for integrated circuits continue to decrease and transistor capacities continue to increase, contaminants in the parts per trillion ranges can produce yield-impacting defects. Organics are polar and weakly ionize in ultrapure water. This poses a considerable challenge to ion exchange resins. To prevent TOC leakage from polishing deionizers, silica and/or boron levels are typically monitored to determine when regenerations should be performed.

Our TOC reduction units complement the organic scavenger resins of the polishing loop by oxidizing trace organics into free radicals (R-OH-) and carbon dioxide, which are more readily addressed by ion exchange resins and/or degasifiers. Should continuous ozone be a process requirement, our UV systems can be used to protect both product and costly microelectronic manufacturing equipment by the dissociation of ozone into dissolved oxygen. If dissolved oxygen (DO) is a concern, our engineers can provide assistance for reducing or eliminating DO as well. For these reasons, more manufacturers around the world trust Aquafine for UV systems, application assistance, and support.

Aquafine®

MICROELECTRONICS

UV Applications in Microelectronics

TOC Reduction

UV is used for the effective reduction of organics, commonly referred to as TOC (total organic carbon). Reduction of TOC is accomplished by incorporating a 185 nm UV system, appropriately designed and sized, as well as strategically located in conjunction with other equipment. Carbon dioxide is a typical by-product of a TOC reduction process, resulting in a drop in the resistivity of water. While most organic molecules are oxidized into carbon dioxide and water molecules, other more resistant species become weakly ionized or charged, after absorbing the UV. This is why polishing deionization (DI) beds are typically placed downstream of the TOC reduction units, so that they not only remove the charged/ionized organics, but also restore the resistivity to the water.

Microbial Inactivation

This is the most common application of UV in water treatment. A microelectronics water system could have several locations where UV equipment would be installed. Some typical locations would be post-carbon filter and pre-RO (reverse osmosis). When installed downstream of the carbon bed and/or directly upstream of the RO unit, a UV system can significantly reduce the microbial counts by inactivating the microbes present in the influent stream. Inactivation is also recommended for the process distribution loop and pre-storage tank.

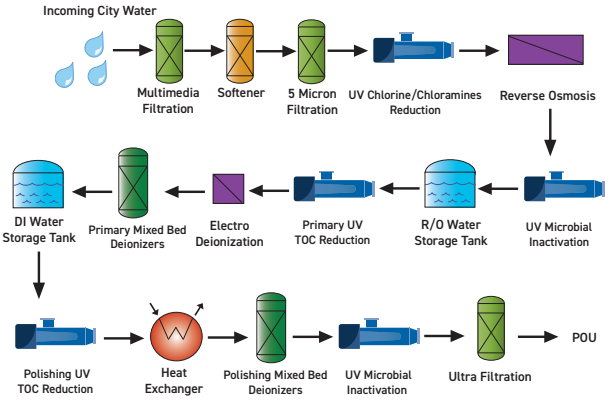
Ozone Reduction

Ozone is commonly used in the pre-treatment area of a water system, as well as for sanitizing processes and re-circulating systems. Prior to the point-of-use, residual ozone needs to be reduced to ensure the process water is not compromised. After considering the appropriate variables, a properly sized UV unit can reduce the ozone to non-detectable limits, ensuring the integrity of the process and the product. A dosage of 90 mJ/cm^2 is recommended for reduction of ozone residuals of 1.0ppm or less.

Chlorine/Chloramines Reduction

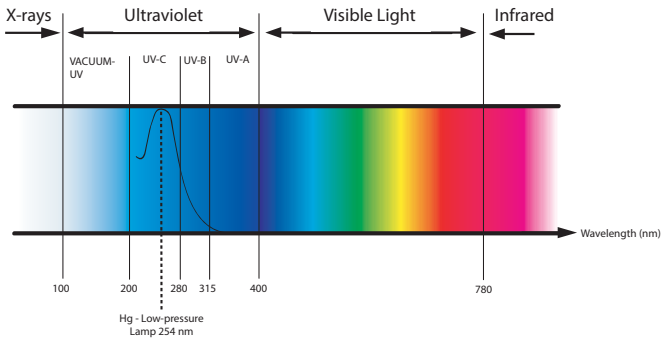
While the addition of chlorine and chloramines to city water may control microbial contaminant levels, they have undesirable effects on the degradation of membrane filtration or RO. Popular methods of removal, such as carbon beds or chemical injection, have proven to be problematic. Sodium metabisulfite involves replacing one chemical with another and creates food for microorganisms, while carbon beds can be inefficient, vulnerable to channeling, and provide breeding grounds for microorganisms. UV solves these problems while reducing chlorine, using a small footprint, and reducing maintenance costs.

Microelectronics Water Treatment System



Ultraviolet (UV) light is invisible to the human eye, occupying the portion of the electromagnetic spectrum between X-rays and visible light. A unique characteristic of UV light is that a specific range of its wavelengths, those between 200 and 300 nanometers (billionths of a meter), are capable of inactivating microorganisms.

ELECTROMAGNETIC SPECTRUM



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