Microelectronics
Industry Specific Applications for UV Technology

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

**UV TECHNOLOGY FOR MICROELECTRONICS**
Aquafine recognizes the challenges faced by water systems professionals in the design and construction of a water system for microelectronics production. Aquafine ultraviolet (UV) systems commonly perform four functions in producing pure water - disinfection, TOC (Total Oxidizable Carbon) reduction, ozone destruction and chlorine/chloramines destruction. Being well versed in how all components of a pure water system interrelate ensures optimum performance. Aquafine disinfection units address microbial contamination in the system by utilizing UV’s 254nm energy. This process destroys the DNA which prevents microbial proliferation.

In ultrapure systems, UV in combination with ozone provides an enhanced synergistic approach toward the reduction of trace organics. Organics 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.

Aquafine 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 removed by ion exchange resins and/or degasifiers. Should continuous ozone be a process requirement, Aquafine 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, Aquafine 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.

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**UV TECHNOLOGY**
Aquafine UV systems are engineered to focus the power of concentrated UV light utilizing one or several specially designed Aquafine Colorguard UV lamps, recognized in the industry for unsurpassed performance and reliability.

Aquafine also provides UV/H₂O₂ advanced oxidation solutions for the reuse of spent rinse water, which results in cost savings in utilities and waste treatment/disposal.

For questions regarding your application needs, please contact your local Authorized Distributor or Aquafine Corporation for more information.
TOC REDUCTION
Ultraviolet (UV) systems are used for the effective reduction of organics, commonly referred to as TOC (total oxidizable carbon). Reduction of TOC is accomplished by incorporating a 185nm UV system appropriately designed and sized as well as strategically located in conjunction with other equipment. Carbon dioxide is a typical by-product of 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.

DISINFECTION
This is the most common application of UV light in water treatment. A microelectronics water system could have several locations where UV equipment would be installed. Some typical locations of installation 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 destroying at least 99.9% of the bacteria present in the influent stream. Disinfection is also recommended for the process distribution loop and pre-storage tank.

OZONE DESTRUCTION
Ozone is commonly used in the pre-treatment area of a water system, as well as for sanitizing process and re-circulating systems. Prior to the point-of-use, the residual ozone needs to be destroyed to ensure the process water is not compromised. Because it is a non-chemical, fast acting mechanism, UV technology is the preferred method for ozone destruction. After considering the appropriate variables, a properly sized UV unit can be guaranteed to destroy the ozone to non-detectable limits, insuring the integrity of the process and the product. A dosage of 90 mJ/cm² is recommended for destruction of ozone residuals of 1.0ppm or less.

CHLORINE/CHLORAMINES DESTRUCTION
While the addition of chlorine and chloramines to city water may control bacteria 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 micro-organisms, while carbon beds can be inefficient, vulnerable to channeling and provide breeding grounds for micro-organisms. UV solves these problems while destroying chlorine, using a small footprint and reducing maintenance costs.