



TOC Reduction



Industrial



India

TOC Reduction for Solar Photovoltaic Plant, India

The Challenge

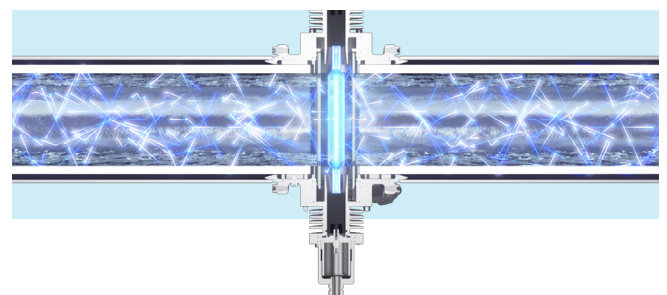
A Solar Photovoltaic (PV) manufacturing plant with a capacity of 1.2 GW in India relies on ultrapure water (UPW) for use in the production of solar PV cells. Any impurities in the water must be removed. Faced with elevated Total Organic Carbon (TOC) levels of 500 ppb, The facility needed a non-chemical treatment approach to remove organics and reduce TOC levels.

The Solution

The plant installed five Atlantium RZ Series HOD™ (Hydro-Optic Disinfection) UV systems. Atlantium's HOD UV systems provide effective disinfection by combining ultraviolet water disinfection technology with hydraulic and optic principles. The HOD UV system features the unique Total Internal Reflection (TIR) technology that recycles UV light energy, ensures homogenous UV dose distribution, provides superior power (kW) efficiency compared to traditional UV, and achieves unprecedented micro-organism inactivation. The HOD UV systems were installed immediately after the double-pass reverse osmosis (RO) system to accommodate a flow rate of 20-100 m³/hr (88-440 gpm). The proprietary medium-pressure UV systems were supplied with a UVT sensor, UV dose sensor on each lamp, and flow meter. The systems were installed with pure silica UV lamps that generate 185 nm of UV, the dose required to destroy organic contaminants present in the water.

TOC reduction is achieved via three types of reactions initiated by UV that work to destroy and/or remove organic carbons. The primary reaction is an oxidation process that begins when high-energy 185 nm UV is used to dissociate water molecules, thereby creating hydroxyls (free OH⁻ radicals). The hydroxyls created by UV are highly reactive and readily combine with other molecules, such as the hydrocarbon molecules that make up TOCs. When hydroxyls combine with the TOC hydrocarbons, they form water and carbon dioxide molecules; TOCs are destroyed and the oxidation is complete.

The second reaction works to remove/destroy TOCs whereby the ultraviolet photons dissociate organic molecules directly. This results in TOC removal by means of destruction. A third UV reaction occurs when deionization is added downstream of a UV reactor. Ultraviolet energy will ionize TOCs, which allows for subsequent removal by a deionization system. A side benefit of using UV for TOC reduction is that the TOC lamps will also generate significant levels of 254 nm output and consequently provide high levels of microbial reduction (disinfection).



Results

Following the full-scale installation of the HOD UV technology at the Solar PV plant, the technology reduced TOC concentrations from inlet values of approximately 500 ppb down to effluent values of less than 20 ppb. The technology was proven to be an environmentally friendly, non-chemical method to reduce TOC concentrations for the facility.



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About us

For more than two decades, Atlantium Technologies has helped to ensure water safety with its innovative HOD™ (Hydro-Optic Disinfection) UV technology and novel approach to performance, monitoring, and control. Atlantium's superior, environmentally friendly water treatment solutions ensure stable, efficient, and dependable production.

With thousands of full-scale installations for leading brands in various industries globally, we're committed to consistently meeting our customers' water quality needs, ensuring pure results.



Pure Performance