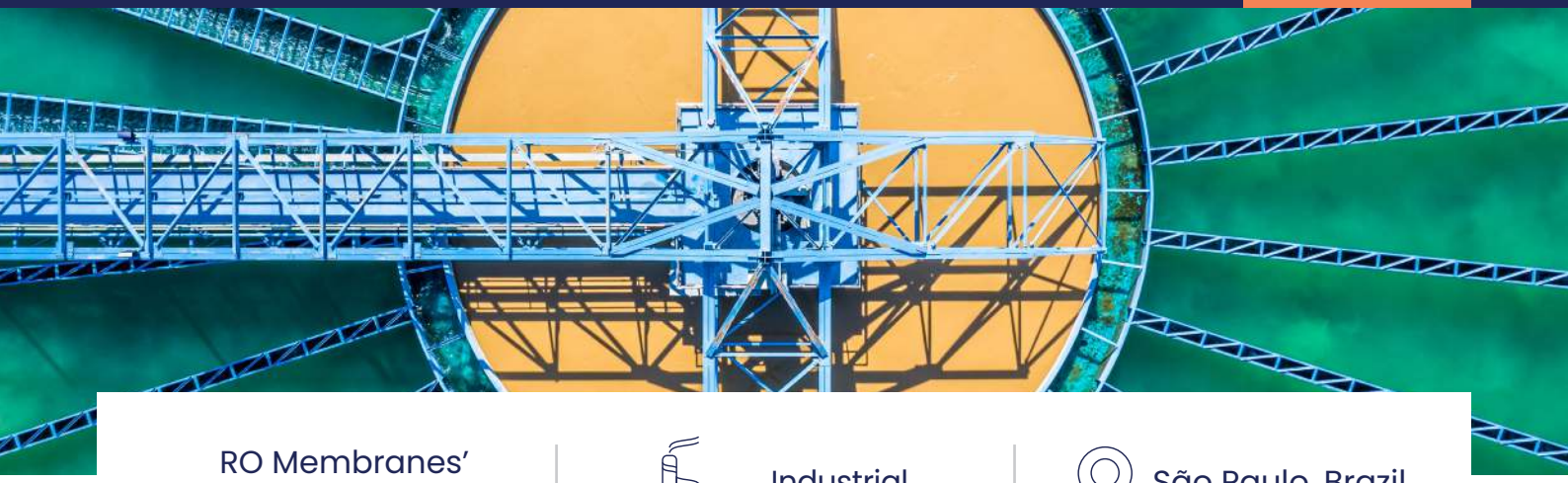


RO Membranes' Protection | Industrial | São Paulo, Brazil

RO Membranes' Protection at Aquapolo Ambiental Water Reuse Project, Brazil

Background

The Aquapolo Ambiental water reuse project, designed for a peak capacity of 1,000 liters per second of reuse water, provides industrial quality reuse water in São Paulo, Brazil. To meet the stringent industrial water reuse water quality requirements, Aquapolo processes influent wastewater in a conventional wastewater treatment plant followed by tertiary membrane bioreactors and partial reverse osmosis (RO) treatment. The facility has been using chemical biocides to protect its RO membrane elements from biofilm due to biological growth.

The Aquapolo facility, built on the grounds of the ABC Sewage Treatment Plant (SP WWTP), uses effluent from the sewage treatment plant as its influent. Given the stringent industrial water reuse standard requirements, a multi-process treatment scheme is used by Aquapolo to ensure the production of high-quality reuse water.

Effluent from the tertiary membrane bioreactor is either sent directly to a reservoir for storage and use or diverted to the RO skid for more advanced treatment. Aquapolo uses three RO skids with a total flow capacity of 1,000 m^3/hr to reduce conductivity at the final mixed water and meet the goals for industrial water reuse.

The Challenge

The RO membrane elements are susceptible to biological fouling due to the high organic load (biological and non-biological) in water reuse plants. Protecting the RO membrane elements from fouling is essential to minimizing the operational impacts of biological contamination on operating costs; which include increased membrane element and microfiltration cartridge replacement costs, decreased water quality production, and increased operating pressure.

Biocides have been used at the facility to control biofouling and protect the membrane elements. Chemical consumption is a key performance indicator for Aquapolo. They are continuously looking to improve their performance and minimize the use of chemicals and associated handling.

Parameter	Influent	Industrial Water Reuse Standard
COD	100	25
BOD	30	10
Ammonia	20	1
Phosphorous	5	0.5
TSS	40	2
Turbidity	15	1
Conductivity	900	720

Aquapolo Water Quality Parameters

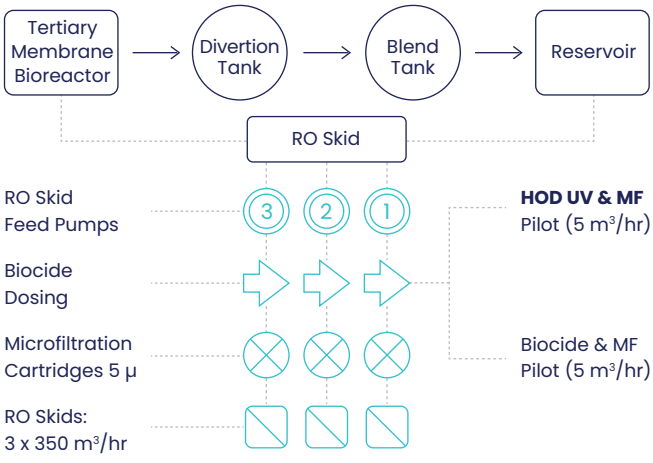
The Solution

In 2016, they decided to pilot and test the efficacy of Atlantium's HOD™ (Hydro-Optic Disinfection) UV technology as a non-chemical biofouling control method. Atlantium HOD systems effectively prevent the biofouling of RO membranes. This is achieved 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 biofouling prevention and micro organism inactivation.

Atlantium provided one RZ Series HOD UV system to Aquapolo for a pilot study to evaluate its ability to protect RO membranes/cartridges from biological fouling. The HOD UV technology was compared in a side-by-side study with chemical biocides.

The pilot study was commissioned on 14 July 2016 and was completed in April 2017. The disinfection efficacy of the HOD UV system was assessed during four test runs. The pilot was undertaken at the RO Skid 1 feed pipeline. Two side streams of 22 gpm (5 m^3/hr) with 65-70% UVT were diverted to two newly installed treatment trains in parallel. Each treatment train contained a set of six 5-micron filter cartridges 10" in height. The microfiltration cartridges used in the pilot study matched the supplier specifications for cartridges used at RO Skid 1 and Skid 2. One treatment train was used as a reference for biocide treatment while the other installed the HOD UV unit for non-chemical biofouling treatment and testing.

The objectives of the pilot study were to evaluate the disinfection efficacy and performance of HOD UV compared to biocide treatment and undertake a feasibility study to verify the UV dose required for full-scale treatment. Pressure drop was selected as the variable for comparison between the biocide and HOD UV-treated microfiltration cartridges. A maximum of 2.0 kg/cm^2 was determined as the end of cartridge life.

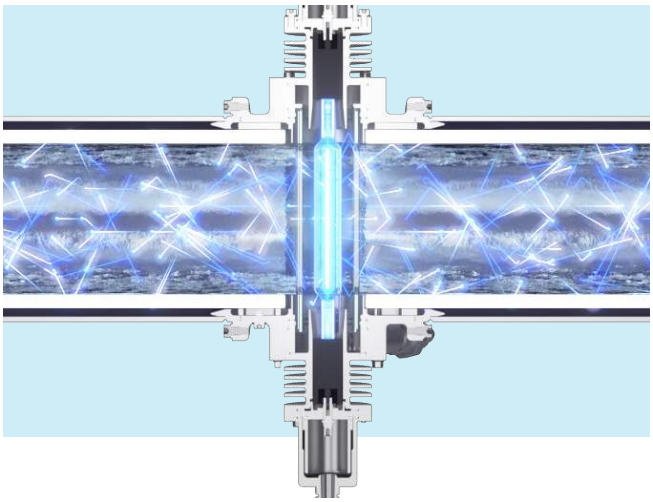


Results

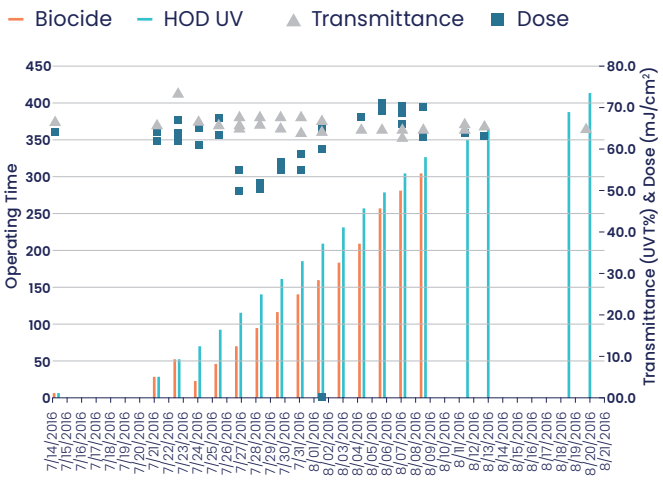
The first test run took place on 14 July 2016 to 21 August 2016. Initial microbial sampling was analyzed by an external authorized laboratory for heterotrophic plate count (HPC). Samples were collected aseptically in sterilized PP jars. Sampling and testing was done according to the standard method 9215 A e B- 22a edition, incubated at 30°C during 48 hours.

Results were very promising and showed the HOD UV was more effective compared to biocides. In terms of performance, the HOD UV treatment train operated for 412 hours before the microfiltration cartridges reached the end of their life, while the biocide treatment train operated for 352 hours. The HOD UV treatment train operated 17% longer than the biocide train.

The second test run took place during 7 October to 30 October 2016. In terms of performance, the HOD UV treatment train operated for 499 hours before the microfiltration cartridges reached the end of their life, while the biocide treatment train operated for 384 hours. The HOD UV treatment train operated 30% longer than the biocide train.

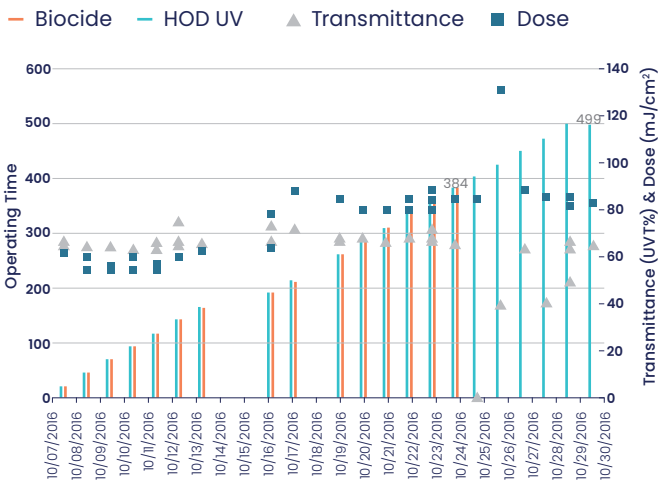


HOD UV Pilot Data - First Run



Data from first run 14 July to 21 August 2016

HOD UV Pilot Data - Second Run



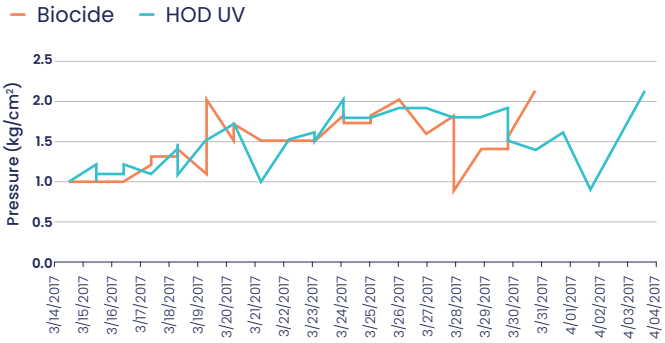
Data from second run 7 October to 30 October 2016

The third and final test run, was initiated on 14 March 2017 and completed on 3 April 2017. Microbial analysis showed the HOD UV was performing better than biocides. The HPC counts for UV disinfection ranged from 1.3 x 10^2 cfu/ml to < 1 cfu/ml, while the biocide train remained 1.6 x 10^2 cfu/ml.

In terms of performance, the HOD UV treatment train operated for 425 hours before the microfiltration cartridges reached the end of their life, while the biocide treatment train operated for 323 hours. The HOD UV treatment train operated 35% longer than the biocide train.

The pilot evaluation of the HOD UV system determined that the technology provided better biological fouling control than biocide treatment. The HOD UV system positively affected the performance of the microfiltration cartridges, increasing the life of the elements between 30-35%. The HOD UV system also provided a greater reduction in bacteria levels compared to biocides; the HOD system averaged a 3-log reduction (99.9% removal).

HOD UV Pilot Data - Third Run



Microfiltration filters pressure drop (kg/cm²) during third test run

050524

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

ATLANTIUM

info@atlantium.com | atlantium.com