Conversion of Chlorine to UV Disinfection

Irvine, California

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Project Overview

The purpose of the project is to convert the dual chlorine disinfection and existing UV disinfection system from the pseudo site of Irvine Ranch Water District''s Michelson Water Reclamation Plant to an all UV disinfection process.

UV Research

What is UV Disinfection?

Utilizes waves ranging from 240-280 nm wavelengths to deactivate microorganisms through radiation and damages nucleic acids, achieving the purpose of disinfection.

ADVANTAGES	DISADVANTAGES
• No release of carcinogenic by-products and chemical residual • Less traffic for chemical delivery • Ensures safety for the communities and employees. • Shorter retention time • Cost-effective	• Cannot eliminate the minerals of the hard water • Turbidity and TSS in the wastewater can render UV disinfection ineffective • No measurable residual to indicate the efficacy

Design Constraints and Parameters

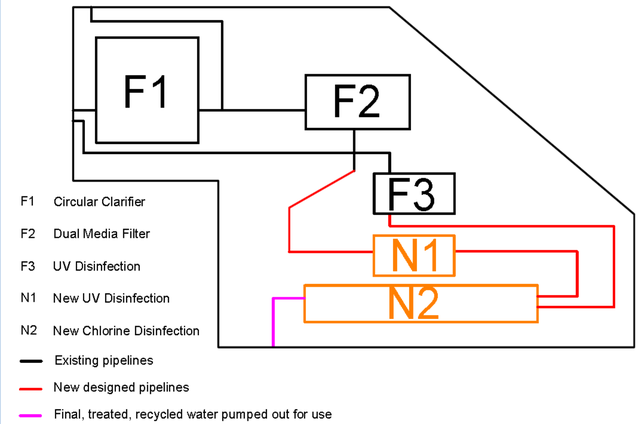
	Chlorine Disinfection	UV Disinfection
Influent Flow (MGD)	Average Day: 18.5	Average Day: 15.9
	Peak Hour: 19.5	Peak Hour: 21.8
HRT (MInutes)	Average Flow: 142	Average Flow: 0.167
	Peak Flow: 135	-
BOD of Effluent (mg/L)	<20	<10
Turbidity of Effluent (NTU)	<2.0	<0.2
TSS of Effluent (mg/L)	<20	<20
Total Coliform of Effluent (MPN/100ml)	<2.2	<2.2
Virus Removal	-	99.999%

Design Criteria

A report or request must be filled out for the following:

- The California Recycled Water Criteria - Title 22
- Regional Water Quality Control Board (RWQCB)
- Department of Drinking Water (DDW)
- Ultraviolet Disinfection – Guidelines for Drinking Water and Water Reuse (NWRI/AWWARF, May 2003)

Design Site Layout



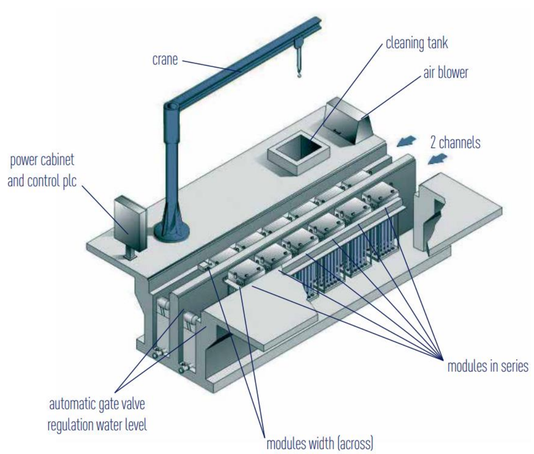
Construction Phasing

Phase 1: This phase will divide and divert the flow from filtration to chlorine with 10 MGD going through the chlorine chamber and 10 MGD going to the existing UV system through a submersible pump.

Phase 2: The empty section of the chlorine tank will be filled with subsequent construction of the new UV pipelines. Construction of the new UV system with open area to build a second one if needed.

Phase 3: Redirect all flow from filtration to the new UV. Retrofit the last row of the chlorine chamber to be a chlorine residual contact tank.

UV System: aquaray 40HO



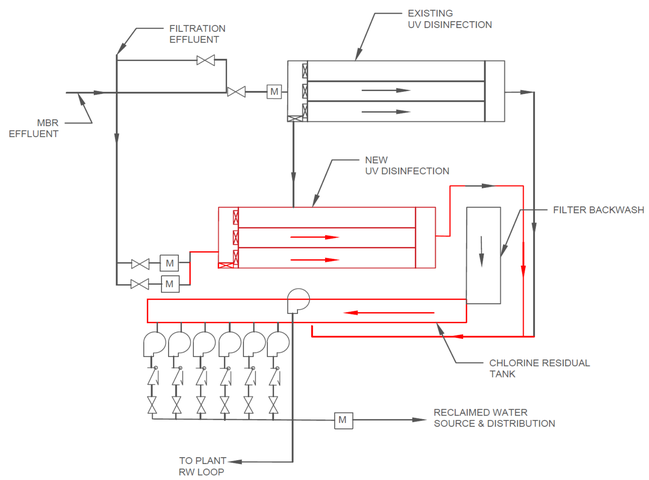
	Length(in.)	Width(in.)	Height(in.)
Module Dimension	30	24.52	87.98

Flow Rate per module(m^3/h)	Number of Lamps per Module	Average Lamp Lifetime(hrs)
315 - 500	40	10,000 - 15,000

**Assuming 30mJ/cm^2 and 65% UVT

Power Supply: 400V/3ph + N/50-60Hz

Design Process Flow



Prospective Agenda

Design the facility for the new UV system

Operations and maintenance cost analysis

Electrical system analysis and retrofication

Ensure that each phase of design complies with the design criteria mentioned

Obtain the necessary permits

References

1. "Advantages and Disadvantages of Ultraviolet Radiation." *BIOTECH*, biotechwater.com/advantages-disadvantages-ultraviolet-radiation/.
2. "UV vs. Chlorine for Wastewater Disinfection." *Treatment Plant Operator*, 30 Aug. 2018, www.tpomag.com/blog/2018/09/uv-vs-chlorine-for-wastewater-disinfection_sc_0039e.
3. *Aquaray® 40HO*. Suez Water Technologies, www.suezwatertechnologies.com/sites/default/files/2018-10/Suez_aquaray_40HO_UK.pdf.
4. *Ultraviolet Disinfection*. www.nesc.wvu.edu/pdf/WW/publications/eti/UV_Dis_tech.pdf.
5. IRWD Phase 2 CAD files provided by Carl

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