Removal of Micro and Nano Plastics at the Point Loma Wastewater Treatment Plant

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INTRODUCTION

Micro and Nano Plastics (MNPs) are of emerging concern in wastewater treatment facilities because they are broken up and passed through the treatment process as smaller pieces. Point Loma Wastewater Treatment Plant (PLWWTP) is an advanced primary treatment facility that discharges directly to the Pacfic Ocean, potentially harming marine life with MNPs.

OBJECTIVE

The objective of our Removal of MNPs at PLWWTP Project is to add a dynamic membrane bioreactor filter (anDMBR) to the existing treatment train to effectively remove MNPs prior to discharge from PLWWTP.

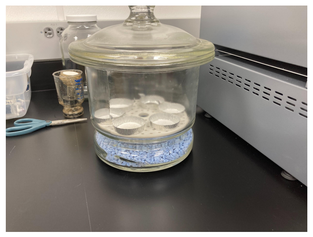
BACKGROUND

The typical primary treatment process breaks up larger pieces of plastic into MNPs. Currently, PLWWTP has no way of tracking or mitigating MNPs in their water. Pure Water will be taking approximately half of PLWWTP's daily average flow, opening up six of their sedimentation tanks for our anDMBR.

WATER SAMPLING

ANALYSIS

Influent and effluent wastewater samples were vacuum pumped through three nanometer filters to then be desiccated and imaged by scanning electron microscopy to determine MNP concentrations.

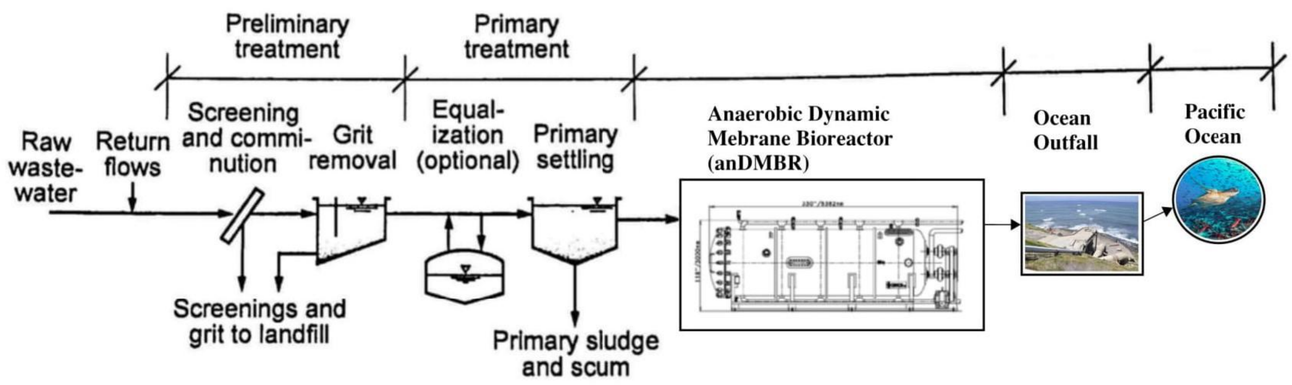


HYDROLOGY STUDY

The implementation of an anaerobic dynamic membrane bioreactor was designed for the Point Loma Wastewater Treatment Plant using a flow of 70 million gallons per day. The filtration unit will contribute about 0.01 feet of head loss, insignificant enough to disrupt the treatment train. The PLWWTP has both overflow rates and weir loading rates that are very high for typical sedimentation basins, and these parameters are independent from the effects of the filtration unit.

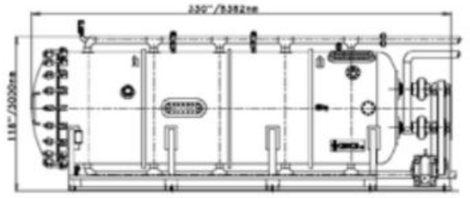
Title	Symbol	Value	Units
Observed Concentraion of MNPs	Co	100,000.00	MNPs/m^3
Estimated Weight of MNPs	M	1.65	g/MNP
Concentration of MNPs	C	165,427.84	g/m^3
Peak Hourly Flow	Qhourly	5,833,333.33	gallons/hour
Overflow Rate (Average Flow)	ORavg	1,620.37	gallons/ft^2-day
Overflow Rate (Peak Flow)	ORmax	3,240.74	gallons/ft^2-day
Weir Loading Rates (Average Flow)	WLRavg	81,018.52	gallons/ft-day
Weir Loading Rates (Peak Flow)	WLRmax	162,037.04	gallons/ft-day
Head Loss	hL	0.01	ft

UNIT LOCATION IN TREATMENT PROCESS



DYNAMIC MEMBRANE

An ultra-filtration dynamic MBR is recommended as it will sufficiently mitigate MNPs with 1-10 nanometer pore sizes. This filtration unit also reduces backwashing, flushing time, and chemical use.



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