

PRETREATMENT EFFECTS WITH ULTRASOUND OVER PURIFIED WATER DISINFECTION.

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Abstract

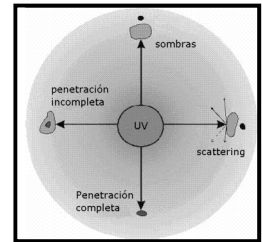
Due to the importance of a suitable water disinfection in order to insure a pollutant effect minimization against environment, this work has been carried out to determine how can affect an ultrasonic pre-treatment upon disinfection step. It has been confirmed the ultrasonic disintegration of bacterial cells in treated water and disinfectant power of treatment by itself, which is not enough to be used as a single method in water disinfection. It has also been proved that from a technical and economical point of view the combination of UV and ultrasound improves the UV treatment performance. Finally, it has been detected that an ultrasonic pre-treatment increases chlorination effectiveness, however the high cost in this combination makes it unfeasible at industrial scale.

Keywords:

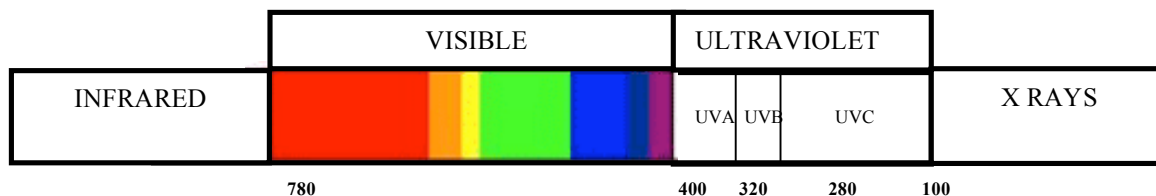
Disinfection, ultraviolet radiation, ultrasound, pretreatment

Introduction

A lot of studies have proved that efficiency of disinfection method by ultraviolet radiation is highly dependent on suspended solids concentration, due to the fact that those suspended solids can protect bacteria and viruses from being destroyed by disinfectants. A lot of those little particles tend to scatter UV light, others block UV rays and, for the last, some even incorporate inside, through formation of flocs, matter to treat.



Use of ultrasound in wastewater treatment, can improve disinfectant properties of ultraviolet light. Ultrasound breaks external cell structure and UV light can easily reach biological cell.

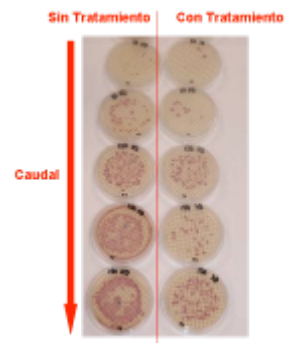
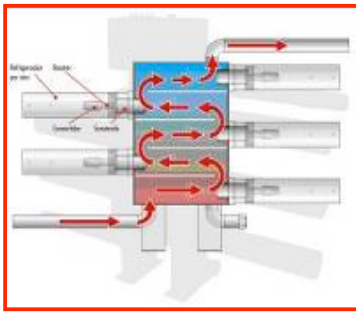


Effect that UV light produces over microorganisms for eliminating them is as follows: Penetration capacity of UV radiation allows to cross through microorganism cell wall and reach cell nucleus, where we can find nucleic acid that suffers photochemical damage and has a cellular restructuring, thus preventing reproductive capacity of the pathogen and, by this, its elimination.

Level for cell damage depends of UV absorbed energy dose by microorganisms and of UV radiation resistance. Most of viruses and bacteria require relatively low doses for their inactivation. Parameters that affect to UV disinfection are: Dose and intensity of UV radiation. And wastewater parameters that affect to intensity of UV radiation are: UV transmittance (%T), Total Suspended Solids (TSS), Particle Size Distribution (PSD) and total hardness.

Methods

Technical University of Hamburg–Harburg (TUHH) has developed engineering from ultrasound radiation until designing Ultrasonic Sludge Treatment DUMO Ultralyzer. The aim of installation of DUMO system is to increase efficiency and performance in wastewater treatment plants.

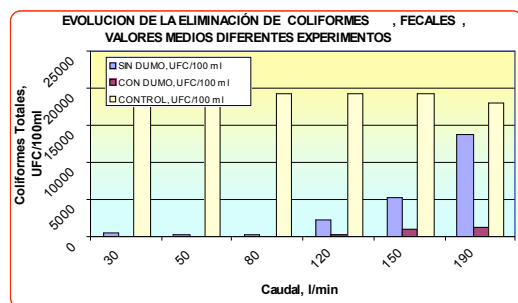
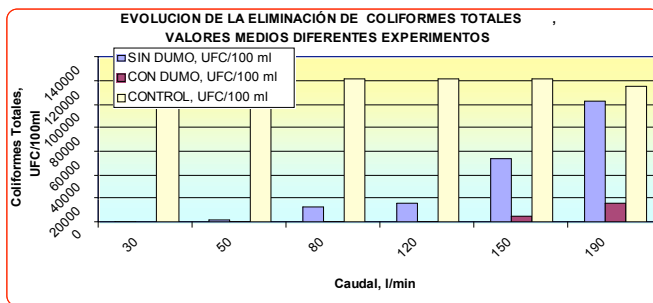


Application of ultrasound treatment, combined with other disinfection techniques, as UV radiation and sodium hypochlorite dosage, causes particles breakage, leaving them suitable for later disinfection treatment, at the same time ultrasound has slow disinfection capacity.

Summing-up

We have attached conclusions obtained after studying them:

Ultrasound pretreatment increases efficiency of ultraviolet radiation in one logarithmic unit, possibly because of decreasing size particle.



Economic balance (with only direct operating costs) does not justify neither warranty combination of both processes, although hydraulic system in installation does not allow to expand disinfection channels, a ultrasound pretreatment can act as element for expansion capacity.

Chlorine demand of outlet water from filters of Treatment Plant in Lorquí decreases in 15–20% by using Ultrasound pretreatment.

System economic balance does not recommend combination of ultrasound and chlorine treatment.

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