

# Optimization of Ultrasonic Waves Application in Municipal Wastewater Sludge Treatment Using Response Surface Method

Mahdi Ghafarzadeh<sup>1</sup>, Rezvan Abedini<sup>\*2</sup>, Rohollah Rajabi<sup>3</sup>

1- Sharif University of Technology, Tehran, Iran, ghafarzad\_mahdi@sharif.edu

2- Amirkabir University of Technology, Tehran, Iran, rezvanabedini@aut.ac.ir

3- K. N. Toosi University of Technology, Tehran, Iran, rrajabi60@gmail.com

## Abstract

Today, many limitations are faced in sludge treatment and disposal. Therefore evaluation of different approaches to reduce sludge production in the activated sludge process has attracted great attention. Application of ultrasonic waves in sludge treatment caused to reduce sludge volume and accelerate sludge digestion. This research intended to study the efficiency of ultrasound in dewatering biological sludge in wastewater treatment plants under different conditions. In this study, response surface method was used to investigate results and optimum conditions were determined. Sludge was treated in different conditions as follows: 330 to 920 watts ultrasound power, 1.5 to 3.9 liters sample volume and 6 to 20 minutes ultrasonic exposure duration. Then, the effect of waves was studied in terms of SRF (specific resistance to filtration). Results of the experiments showed that, the ultrasonic method significantly increases the SRF. Also based on response surface method, the best performance of ultrasonic application in sludge treatment is achievable at the following conditions: 625 watts ultrasound power, 2.7 liters sample volume and 13 minutes ultrasonic exposure duration. A mathematical model for accurate prediction of SRF changes of the sludge was derived using statistical data.

**Keyword:** Sludge Treatment, Response Surface Method, Ultrasonic.