A Low-Cost Device To Improve the Quality of Drinking Water: Utilization of Ultrasonic Transduction in Conjunction With Filtration

Atilano, Jose (School: Greybull High School)

Countries all over the world continue to develop and expand. Urbanization can cause significant problems including water sources being contaminated by bacteria. This research works to engineer a low cost device to improve the quality of drinking water through the use of ultrasonic transduction. The impact of this study is to provide an affordable water purification device. The transduction chamber was made from an existing plastic container. A set of dual transducers (50W, 40K) was wired in series and then attached to the bottom of the transduction chamber. To test the ultrasonic system, E. coli K-12 was placed into nutrient broth to start a culture. For each bacterial test, 1 mL of the broth culture was added to 200 mL of sterile water. The control sample was not treated with ultrasonic pulses. The test samples were 15, 20 and 30 minutes. To determine the bacterial population, 40 mL of the test solution was placed into a BioPaddle chamber and allowed to react with the media for 30 seconds. The paddle was then incubated for 48 hours at 37 Celsius. The paddles were observed for both general bacterial concentration and specific colony counts. These values were recorded and graphed for comparison. After use, paddles were placed into a bleach solution to sterilize them. After consistent observation, I can summarize that the ultrasonic device effectively reduced bacterial colonies. The device was effective as the time spent working was increased accordingly from 15 to 30 minutes. E. coli bacterial colonies decreased significantly, with an all-time low of 241 colonies detected, a reduction of 60%. These results show that ultrasonic transduction is an effective means of treating drinking water and improving water quality at an affordable price.

Awards Won:
China Association for Science and Technology (CAST): Award of $1,200