

Team Second – Bottle Cavitation Report

Geya Kairamkonda

MCEN 4151

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Assisted by teammate Riley Kenyon

After having taken fluid mechanics with Professor Knusten in Spring 2017, I was enthralled by the subject. Moreover, the concept that I kept thinking about was cavitation. For my team second image, I chose to perform and image a cavitation experiment so that I could understand it better and see it from a unique perspective. Riley Kenyon and I worked together for this project.

Link to video: <http://www.flowvis.org/2018/03/12/team-second-geya-kairamkonda/>

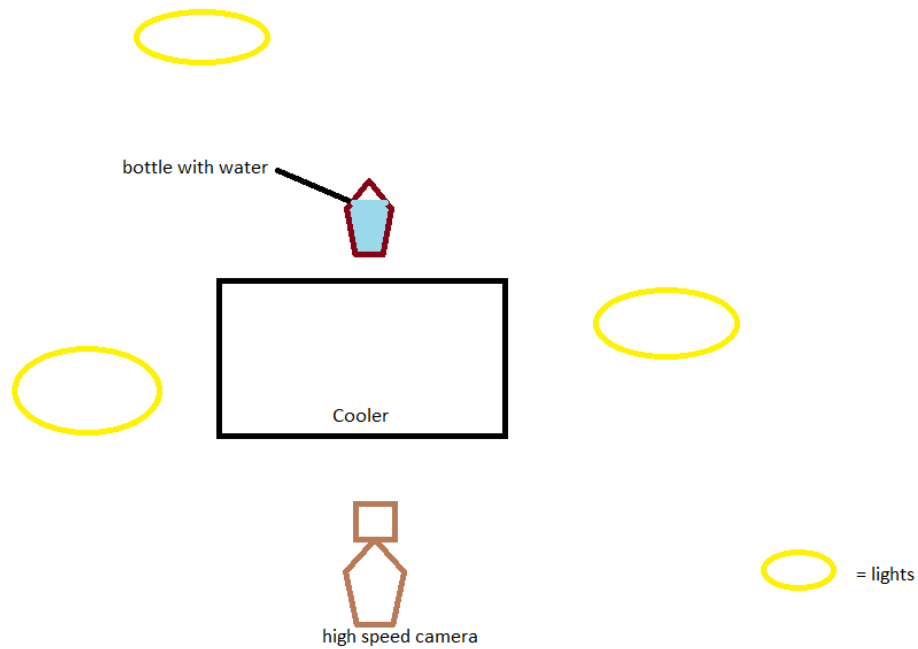


Figure 1. Sketch up setup



Figure 2. Actual setup

For this experiment, an IZZY glass bottle was used for the actual cavitation. The bottle was filled with water and held over an empty cooler. Once we got the image in focus, Riley hit the top of the bottle with his hand, causing the bottle to cavitate. A basic sketch of the set up is shown above. Figure 2 shows a picture of the actual setup.

Cavitation is caused when a liquid, which is not carbonated, experiences a substantial change in pressure which causes the water to boil because the pressure of the liquid will reach a pressure lower than its saturation pressure. This boiling results in bubbles rapidly collapsing producing a shock wave, which breaks the bottle in this case.

A high-speed camera from CU Boulder Integrated Teaching and Learning Laboratory was used to film the experiment. The following specifications were used:

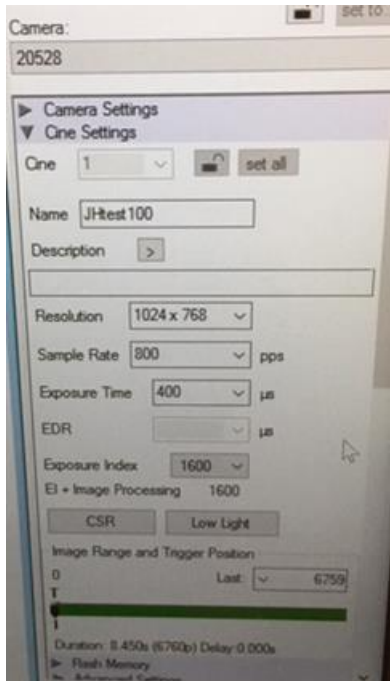


Figure 3. Specifications used on high speed camera

The specifications detailed in Figure 3 were used because they resulted in the highest resolution and most interesting video of the experiment.

Other choices made include:

1. Size of field of view: 7 inches for best focus
2. Distance from object to lens: 2.2 ft used because it resulted in best focus
3. Lens focal length: 3ft used for best focus
4. Type of Camera: High speed camera used to capture bottle cavitation in slow motion
5. Exposure
 - a. Time: 400 microseconds used to help with lighting
 - b. Index: 1600 used to see both bubbles and glass clearly
6. Final processing
 - a. Music: “Acoustic Breeze” – open source music through Windows movie maker
 - b. Cropping video to edit out beginning waiting portion

My own personal critique of this video is that it was well done but the post processing could have been done better to further enhance it. I would make the music match a little bit better, especially the cymbal crash and the initial breakage of the bottle. I would also change the color because it isn't that pretty of a yellow right now.