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MCEN 4151-001

Team Assignment #1

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10/10/18

Water Droplet Collision

The purpose of this experiment was to capture the collision of a water droplet and a Worthinton jet. The water drop apparatus used for this experiment employs a solenoid valve attached to a reservoir which is suspended above a pool. The solenoid is control by a micro-controller, which is in turn controlled by an application on the user's phone. The user then has the ability to control the drop size, number of drops, and time between drops. The apparatus also has the capability to connect to a DSLR camera and time the capturing of images with the dispensing of water. However, we had some difficulties with getting the settings of the DSLR correct in order to allow app control so we had to time the photos manually. This proved to be too difficult to time at the exact moment the second droplet collided with the Worthinton jet so I decided to capture the fluid flow with a slow motion video on a phone camera.

We first filled the reservoir with milk and the pool below with water and approximately 10 drops of blue food coloring for contrast. The solenoid was approximately 12 inches above the pool of water. Then to add a bit more motion and flare to the image we added a thin layer of vapor above the water in the pool. I would first inhale the vapor from my vaporizer and then exhale it above the water in the pool and wait for it to settle. I would then count down and then actuate the solenoid using the app while the other three took photos and videos of the droplets. The lighting used for the image was a combination of overhead CFL bulbs and two phone flashlights.

When the first droplet hits the water it pushes the water downward and out in a crater shape. As the water rushes back together, it collides with itself and rebounds upward in a jet formation. If the second droplet it timed correctly it will then collide with this jet which you can see in the video. I think the vapor was a nice addition, especially in a slow motion video, because you can see the first droplet penetrate through the thin layer of vapor disturbing it very little. As the jet rebounds and collides with the second droplet it stirs up the vapor more and reveals the blue water beneath.

I liked how the video turned out and did very minimal post processing on it. I increased the contrast a little bit to bring out more of the blue color and played around with the speed of the video so that you could clearly see the jet forming and colliding with the second droplet. In the future I would like to crop some of the background out since it is a little distracting or frame the image better.