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MCEN 4151 - 001
Get Wet Report
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Figure 1: Final image used in post

The purpose of this assignment was to enable students to “get their feet wet” taking pictures of different types of fluid flow. I have minimal experience using cameras, so my goal for this image was to get a picture of the smoothest laminar flame that I possibly could while simultaneously getting acquainted with my camera and learning how to take a clear photo. I figured that the best way for me to do this was to use a match and photograph it as closely as possible to really bring out the smoothness of the flame at its edges.

In order to prepare this image, I positioned my setup on a concrete floor in a dark area with a wall which served to block any sort of wind that may disrupt the laminar flame. I placed a pile of matches on the concrete floor so as to minimize the chances of catching anything else on fire. From there, I had my camera positioned approximately 6 inches away from the flame at an angle

of 45 degrees. Once safely set up, I lit the pile of matches and began to take several photos of the flame.

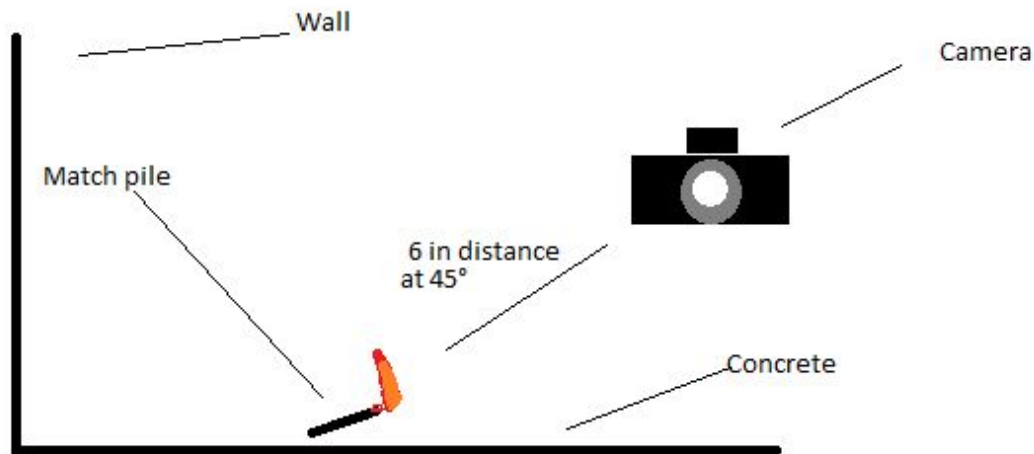


Figure 2: Setup of experiment

The flame in the image is considered laminar, which means that it has a very low Reynolds number (i.e. less than 2300) [1]. In the case of a match burning, the flow velocity is close to zero since the flame's fuel is simply the match itself sitting still and being burned as opposed to a fluid fuel being sprayed or rocket propellant. This very low flow velocity allows the flame to maintain its shape without the standing air around it disrupting its flow very much at all. However, if moving air from an external force were to interfere, the laminar nature of the flame would be disrupted. This fact is why it was imperative to have a wall blocking outside air in order to ensure the flame was able to remain laminar in nature.

In terms of visualization techniques used, I wanted this to be as simple a photo as possible, so I simply used a regular match that can be found in any store where matches are carried. I didn't set any sort of lighting up and only used the light emitted from the flame itself, and environmental factors played a minimal role since the wall served to block any from interfering.

When taking the photo, I used a mirrorless camera set on the aperture setting and set the shutter speed to only $\frac{1}{4}$ and the ISO to 800. These were the only two things that I remembered changing because this was the first time I had ever really used a camera in a technical setting and didn't know how to adjust the other settings or what they would do. The only editing I did for the final photo was to slightly increase the brightness so as to make the flame brighter and to increase the sharpness slightly to highlight the smoothness of the flame.

The thing that I liked most about this image was how warm it seems; the scale of it seems to be bigger than it actually is and the light reflecting off of the background makes it seem like it's a cozy campfire. I feel like I did accomplish my goal of displaying the laminar nature of the match flame fairly well; however, I would've liked to have known how to work my camera more effectively at the time to keep everything more in focus and make the image a little sharper. One question that I did have was how does a match have a laminar flame while a campfire tends to be fairly turbulent despite the fact the both of their fuel sources are sitting still? In the future, I think that I could perhaps have the match standing up straight so that more of the focus is actually on the flame itself and not a pile of matches.

References

[1] Engineering ToolBox, (2004). *Laminar, Transitional or Turbulent Flow*. [online] Available at: https://www.engineeringtoolbox.com/laminar-transitional-turbulent-flow-d_577.html [Accessed 2 Oct., 2019].