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Team First 2026

MCEN 4151 – 001

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2026 Team First Report

I took this image for our Team First assignment for Flow Visualization. The goal of this assignment was to dive deeper into the world of flow visualization this time with the help of others, so that we could create something that would be much more difficult alone. The intent of this image was to demonstrate the flow of actively curing resin with a bubble in the center. Resin goes through a curing process where it becomes increasingly harder, and if done in a certain way can have bubbles within itself which we used to our advantage to take a fascinating picture of the flow phenomenon. My team consisted of myself, Aria Pathak, and Shae Roozing.



Figure 1: Original unedited Team First image.



Figure 2: Final edit of Team First image.

The setup for this image was simple as we only used a multicolored string light, a mason jar, and the resin. We learned that resin could cure using packing tape, so we created a square of tape and filled with resin to create out piece. The piece was about 2 inches by 2 inches and about half an inch thick. The bubble that formed within the piece showed actively curing resin moving downward with gravity as we rotated it about its center. The only other forces acting on the fluid here are its own viscous forces and the shear forces between the cured resin and the uncured resin. Spatial resolution was simple to cover given that the resin moves slowly and with the help of my teammates we were able to take pictures while moving the piece which allowed for more interesting moments to capture. The same is true with the time resolution.

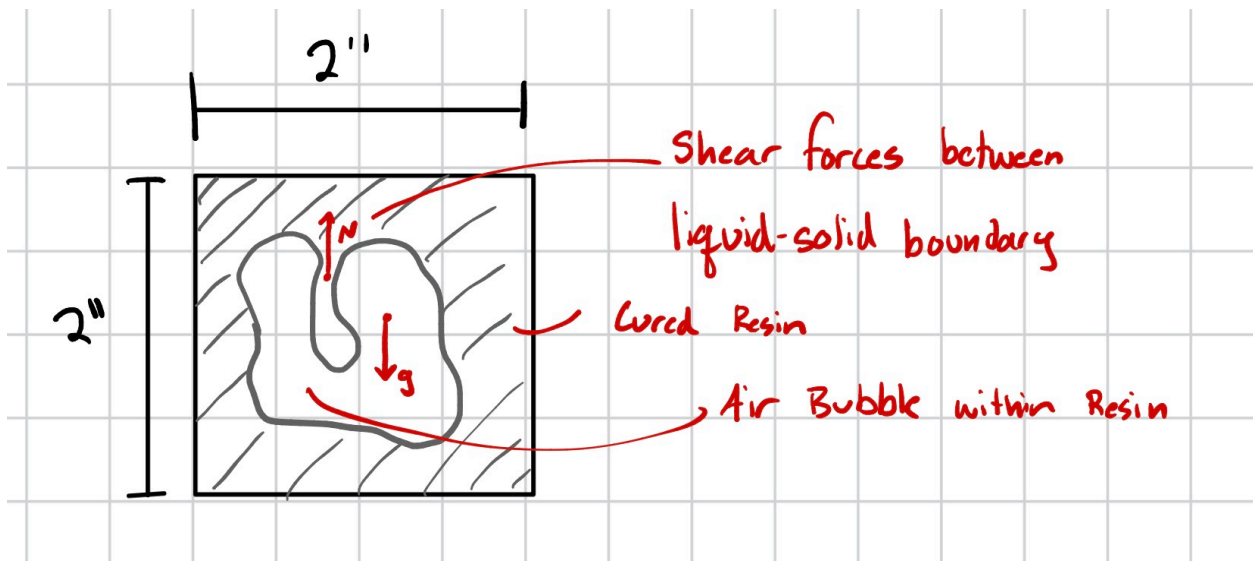


Figure 3: Sketch of resin piece. This is what was leaned against the mason jar filled with lights.

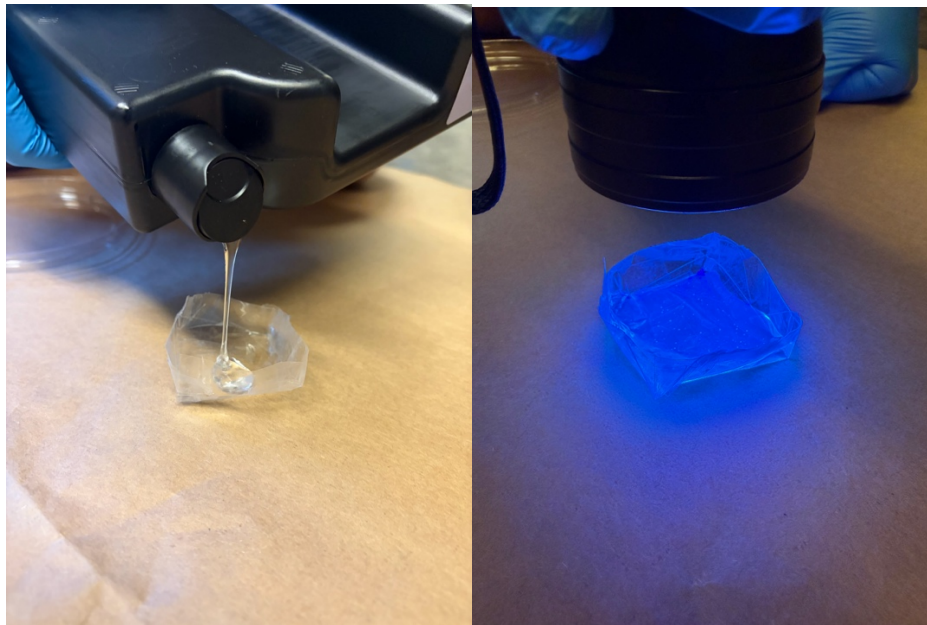


Figure 4: Tape container with resin being activated by UV light.

For this analysis I calculated the Reynolds number to discuss the laminar nature of the resin. Because resin has varying viscosity as it cures, I am choosing to analyze the uncured resin which is still viscous. When calculating this number, the required variables are density ρ , a characteristic length L , an average velocity v , and dynamic viscosity μ . The characteristic length here will be 1.25 inches (0.03175 meters) as it is the approximate diameter of the bubble of resin. We turned our piece of resin every 3 seconds which gave us an average speed v of 0.0105 meters per second. The resin we used was the Form Labs Clear V5 resin. According to the Form Labs data sheet Clear V5 resin has a dynamic viscosity of 1.4 pascal seconds and a density of 1210

kilograms per cubic meter [1]. Using these values, we can find the Reynolds number for the apparatus to be as follows.

$$Re = \frac{\rho v L}{\mu} = \frac{1210 \frac{kg}{m^3} * 0.0105 \frac{m}{s} * 0.03175m}{1.4 Pa * s} = 0.296$$

Because a Reynolds numbers of around 2300 is considered turbulent we can see that we are still far below this number, which shows the still present viscosity of the resin in the bubble. The viscosity of resin can also affect the curing time, which we did observe as we were doing our experiment. For some of the pictures we were shining the UV light on the piece which activates the resin, and we found that our resin took longer to cure than we were expecting which is likely due to the high viscosity of the starting liquid [2].

To demonstrate this flow, we lit the scene up with a mason jar filled with string lights of different colors. The piece of resin was leaned directly against this mason jar, and the camera was only around 2 inches from the resin. We were also in a room with no lights on and only a very dim natural light. The lighting in the room was key to the picture as we only really had the string lights to show the highlights and shadows of the resin bubble. We also had some of the light from the UV bulb we used to cure the resin.

For this image I was very close to the object because it allowed for the most focus and it was taken on a DSLR Canon EOS Rebel T2i. The picture was taken with a 58-millimeter focal length lens, with an aperture of f5.6, a shutter speed of 1/100, and an ISO2000. The original image was 5184x3456 pixels, and the edited final image was 2450x1711 pixels. Most of the pixels were taken out due to my crop of the image.

I think this image reveals the flow of resin in a super interesting way, as the bubbles that come up during the curing process are not usually something someone is looking for. So using them to our advantage was fun and creative, and I think that I like that the most about the picture. I also really like the colors in this picture as they are vibrant and there is a solid contrast. I think the fluid physics are shown well, and I think I would improve this picture by reducing the ISO. I think it turned out a bit grainier than I would have hoped, but part of this was due to post processing. I think to develop this idea further we could have found a better way to frame the image so that more of the obscurities of the bubble would be highlighted.

Resources:

[1] Form Labs (2026) <https://formlabs-media.formlabs.com/datasheets/1901266-TDS-ENUS-0.pdf>

[2] Shining 3D (2026) <https://support.shining3ddental.com/en/support/solutions/articles/60001647487-effect-of-resin-viscosity-on-curing-time>