

Design and Build of an Aerosol Generator

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Project Overview

The purpose of this project is to design and build a Laskin nozzle that uses compressed air to turn vegetable oil into aerosol form. This device will be then used in the Union College Wind Tunnel PIV lab to replace the current fog machine. It will allow for control over the volume flow rate by varying the number of nozzles in use, as well as the concentration of particles by varying the air pressure the nozzles are run at.

Nozzle Design

A feedhole nozzle that has four cross-wise axial holes was chosen. Above these is a circular metal disc with holes aligned with those on the pipe. These holes allow for fluid flow to the air jet from the tube. These then creates small droplets within the air bubbles through the shearing as the air jet interacts with the surface of the collar. (Sabroske et. al. (1996))

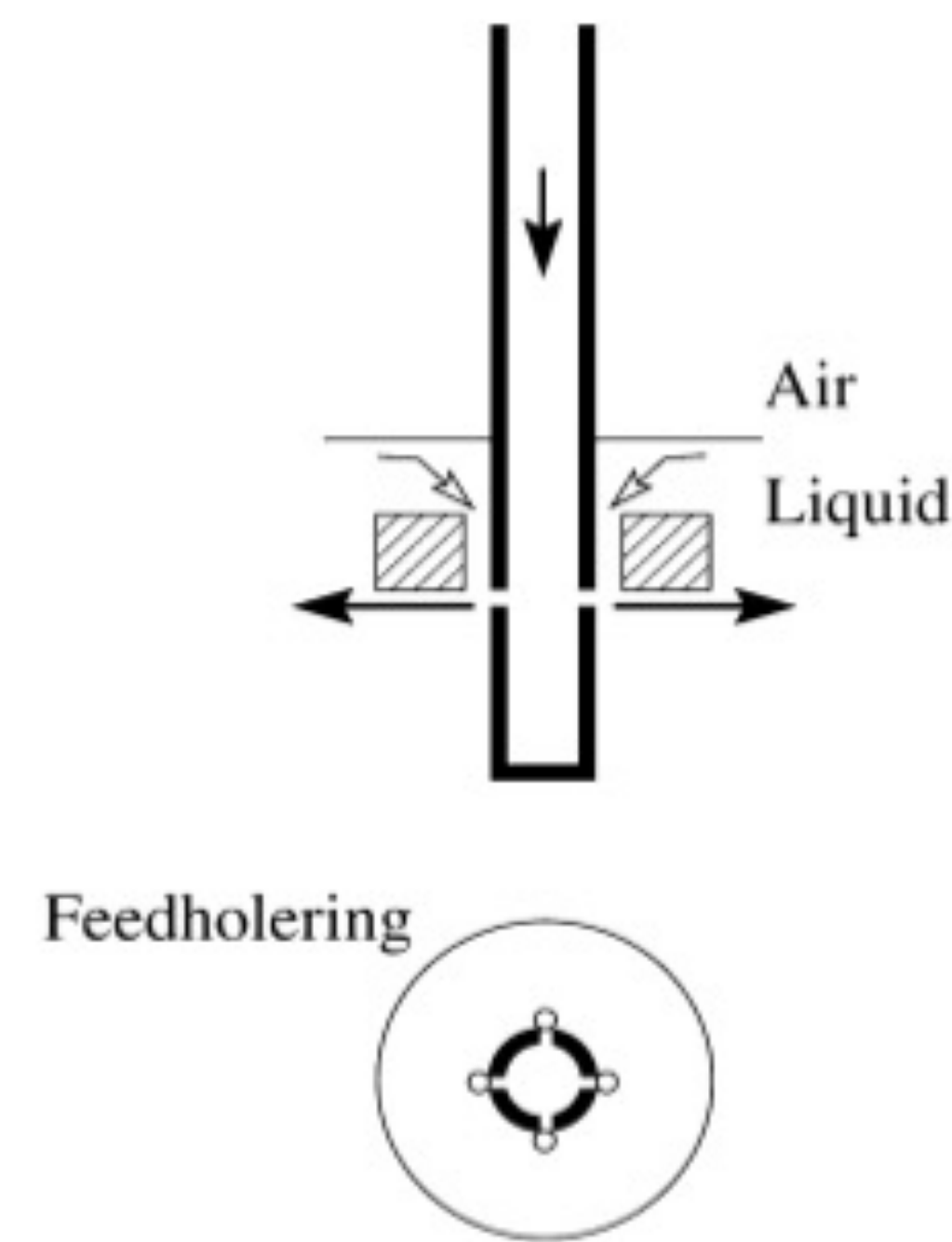


Figure 1: Feedhole nozzle diagram (Kahler et. al 2002)

Particle Size Distribution

This nozzle design with 1mm diameter holes creates the particle distribution shown in figure 2 with around 90% of particles being below 2 microns. An impactor (figure 3) was placed in the aerosol outlet to remove the larger particles. The flow is accelerated into a plate and the larger particles, having greater inertia, stick the plate and are removed from the flow.

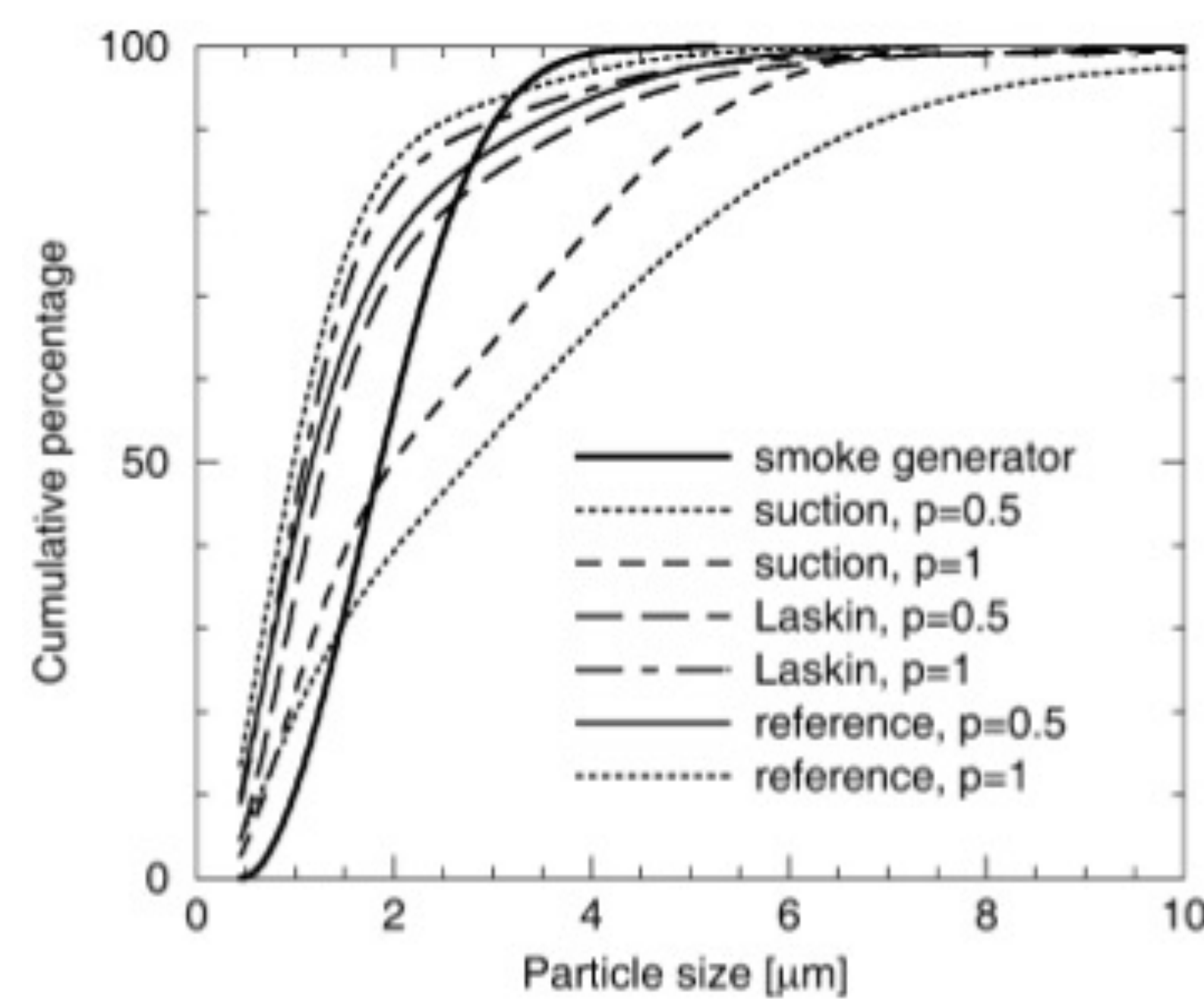


Figure 2: Shows the cumulative distribution of particles in relation to particle size Laskin is the feedhole nozzle. The variable p is pressure in bars. (Kahler et. al. 2002)

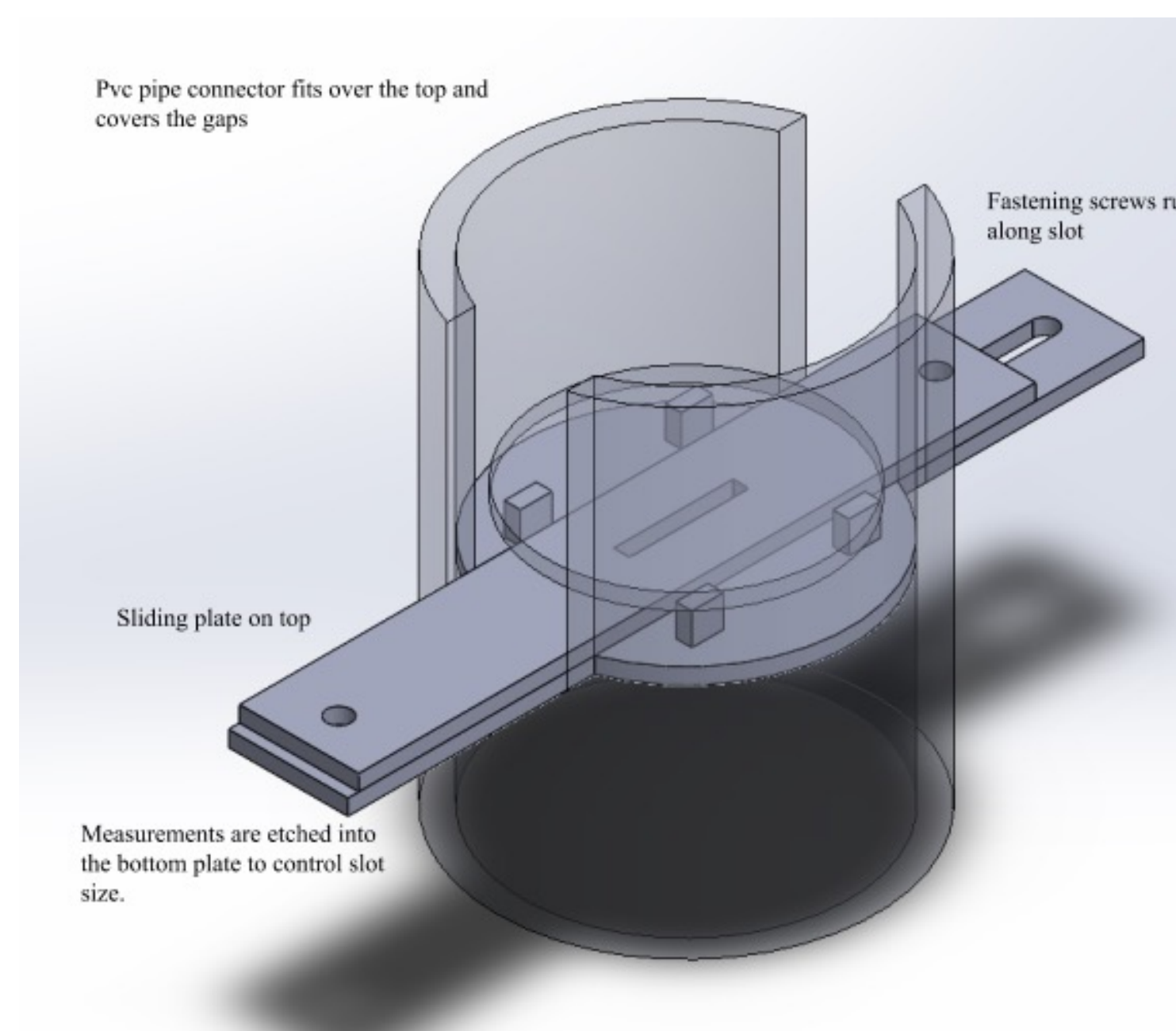


Figure 3: The impactor model, made from pvc and acrylic plates.

Aerosol Generator Construction

A 2.5-gallon bucket was used as the tank holding the vegetable oil. Four nozzles were mounted through the top and flexible tubing was used to feed air into each.

The aerosol produced is accelerated through the impactor at the center of the top. The speed that the flow leaves is controlled by changing the size of the exit hole. Then it exits the generator through the pvc manifold at the top.



Figure 4: Laskin Nozzle aerosol generator fully constructed.

Testing Aerosol Generator with Wind Tunnel

Ongoing tests are being conducted with the Union College wind tunnel to see if the aerosol generator produces enough particles for PIV testing.

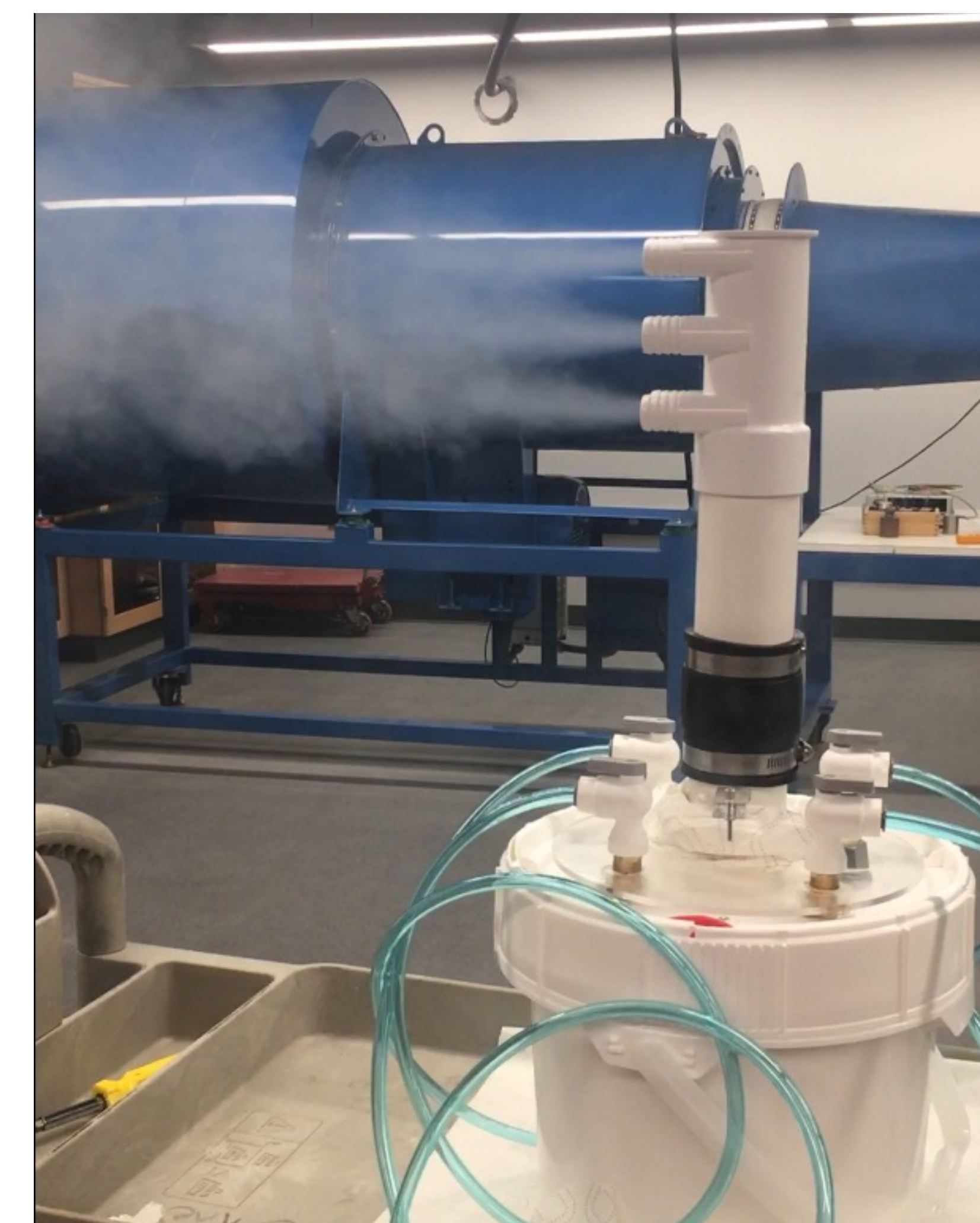
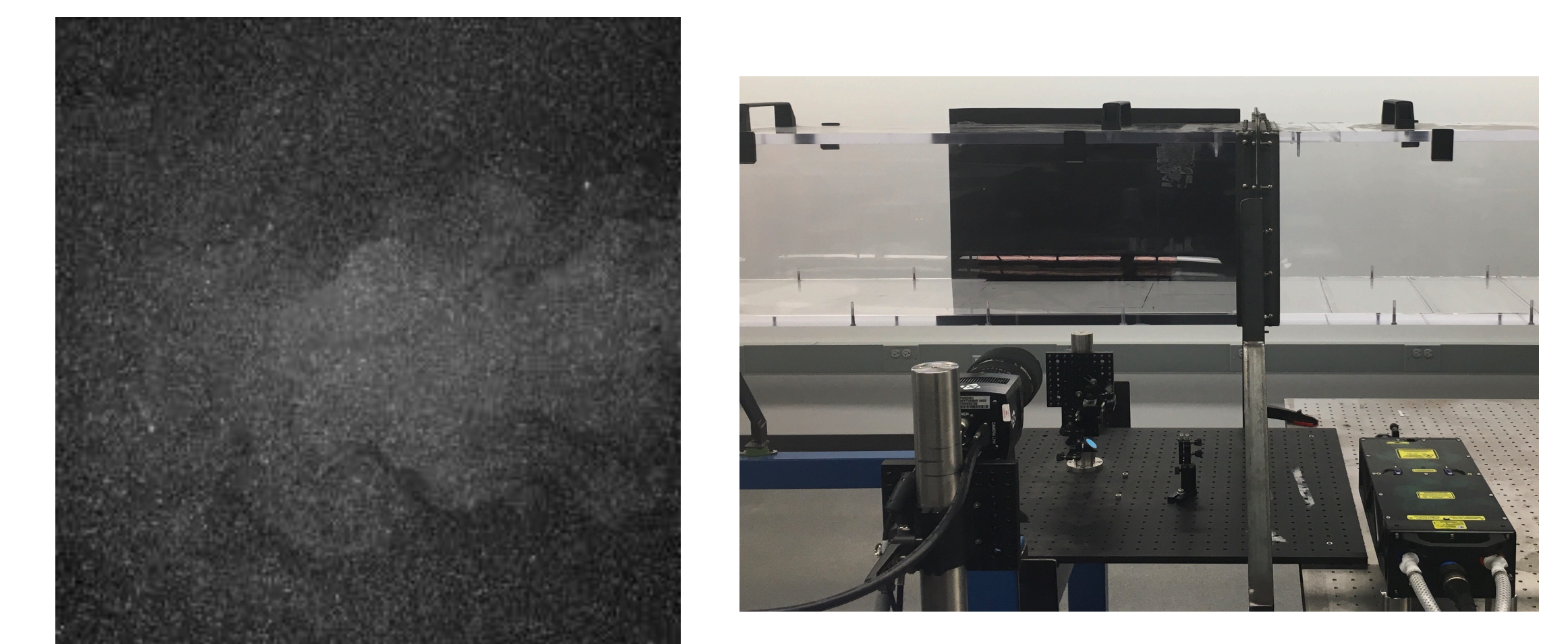


Figure 5: The aerosol generator dispersing vegetable oil particles.



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- Sabroske, K. R., Hoying, D. A., & Rabe, D. C. (1996). *U.S. Patent No. 5,498,374*. Washington, DC: U.S. Patent and Trademark Office.