Background
- Mint industry currently relies on steam distillation to extract mint oil.
- Experimental microwave mint extraction method has potential of higher efficiency and lower cost.

Problem
Extracted oil/steam mixes with air and forms an aerosol, which is difficult to recover in typical condenser system. Industrial microwave process implementation requires coalescer development.

Possible Solution
A coalescer: equipment to mechanically force aerosol droplets together, therefore increasing size and allowing for more efficient oil recovery.

Objective
To build aerosol generator capable of producing aerosol from steam and create documentation for future teams to reproduce and test with a coalescer.

Methods
A pilot plant operating at about 17% industrial capacity was constructed in order to set up for experimental coalescer operations. Steam from Oregon State University pipelines was used in place of the microwave apparatus.

Aerosol Generator System
- 30 psi steam source piped to globe valve to control steam flows.
- ½” galvanized steel pipe manifold delivers source steam into generator.
- Steam discharge port diameters increase along pipe length as pressure decreases.
- Wooden base supports piping manifold and hood.
- Piping manifold lays on the base, underneath the hood to deliver steam.
- Reflectix insulation covers interior of hood to reduce heat loss causing condensation.
- Hood and fan system collect steam and air mix to form aerosol to be sent to coalescer.
- Outlet temperature monitored using Vernier temperature sensors.
- PVC sheet collects condensate.

Temperature Profile
Vernier temperature probes determined a ½ globe valve rotation to reach 70°C outlet temperature and system startup time of less than 2 minutes.

Aerosol Droplet Sizing
Aerosol droplet images were collected on glass covered in Rain-X and captured by Proscope HR2 with 50x lens. Analytical Digital Image software calibrated images to find 21 pixels:0.01 inch ratio.

Future Work
Aerosol generator can be rebuilt using assembly instructions and run following SOP (standard operating procedures) to be tested with a coalescer.

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Fig. 1: Continuous Solvent-Free Microwave Extraction Process Flow Diagram (Smith, C. MS. 2013.)

Fig. 2: Coalescence process capturing the aerosol droplets, coalescing, and releasing fluid for recovery.

Fig. 3: ½” diameter piping manifold delivers steam to hood through holes of varying diameter along length of pipe.

Fig. 4: Hole diameters along each pipe.

Fig. 5: Aerosol generator system side view. Steam is delivered through pipes and collected in the hood where it mixes with air to form aerosol.

Fig. 6: Aerosol droplets collected on glass surface.