ATMOSPHERIC WATER CAPTURE AND THE EFFECTS ON ORGANIC MATTER

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ABSTRACT

The goal of my research is to evaluate atmospheric water capture potential using two different technologies: a compressor dehumidifier and a desiccant dehumidifier to determine if water captured from the atmosphere will have higher organic matter closer to traffic areas impacted by automobile exhaust vs. data collected from green fields, a building rooftop, residential backyard, and pine forest that is less impacted by localized air pollution.

BACKGROUND INFORMATION

During municipal and natural water disasters, conventional water supplies may be inaccessible and not safe for use. Some examples:

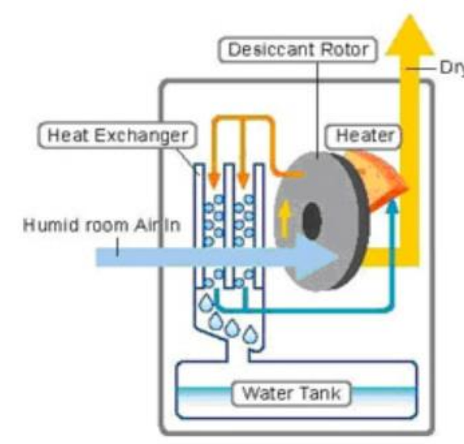
In these cases, the atmosphere, which contains 3.4 quadrillion gallons of water, could serve as an obtainable source for drinking water. In order for this technology to be widely applied, there needs to be an understanding of the impact of climate and location on the volume of water produced, the energy cost, and water quality.

RESEARCH METHODS

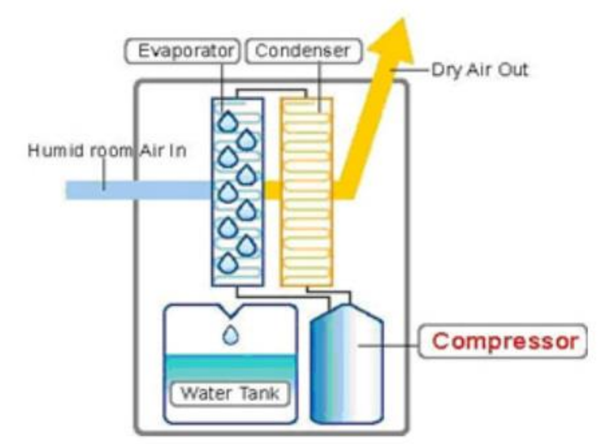
- Ran desiccant (Eva-Dry) and compressor (Frigidaire) dehumidifier machines at locations: ISTB4 rooftop, SDFC Intramural fields, Pine Arizona forest, Avondale residential home, and Rural parking structure
- Recorded relative humidity, temperature, and time at the beginning and end of the experiment
- Recorded energy usage using a power meter (KWH)
- Recorded volume of water collected after test run
- Measured UV 254, pH, turbidity, conductivity, and Dissolved Organic Carbon (DOC)

Figure 1. Experimental setup

RESEARCH METHODS



Desiccant Dehumidifier



Compressor Dehumidifier

RESULTS

Sample ID	RH (%)	pH	Turbidity (NTU)	Conductivity (µS/cm)	UV254	DOC (mg/L)
Residential C-1	15.6	6.52	0.30	28.8	0.019	6.14
Residential D-1	15.6	6.81	0.20	21.1	0.008	5.12
Rooftop C-3	17.5	6.69	0.16	17.8	0.005	7.85
Rooftop D-3	17.5	6.57	0.53	37.4	0.031	3.96
Pine, AZ C-2	32.0	6.46	3.63	17.5	0.035	3.48
Pine, AZ D-2	32.0	5.74	0.14	7.98	0.005	2.98
0902 Green Field-C	36.5	6.47	0.63	14.0	0.016	2.40
0902 Green Field-D	36.5	6.33	0.30	14.1	0.007	2.71
0902 Rooftop-C	40.0	6.30	0.21	12.1	0.010	2.02
0902 Rooftop-D	40.0	6.34	0.25	12.1	0.006	4.38
0902 Garage-C	45.5	6.32	0.33	16.3	0.015	3.02
0902 Garage-D	45.5	6.34	0.28	15.8	0.008	7.00

Figure 2. Water Quality Test Values

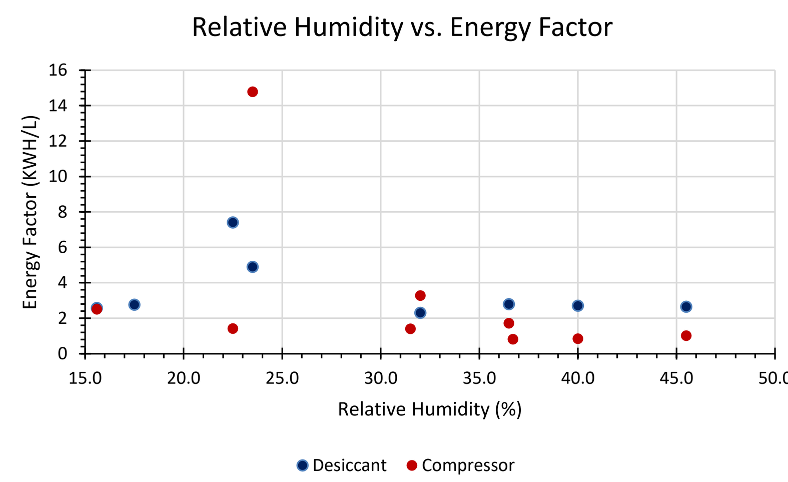


Figure 3. Relative Humidity vs. Energy Factor

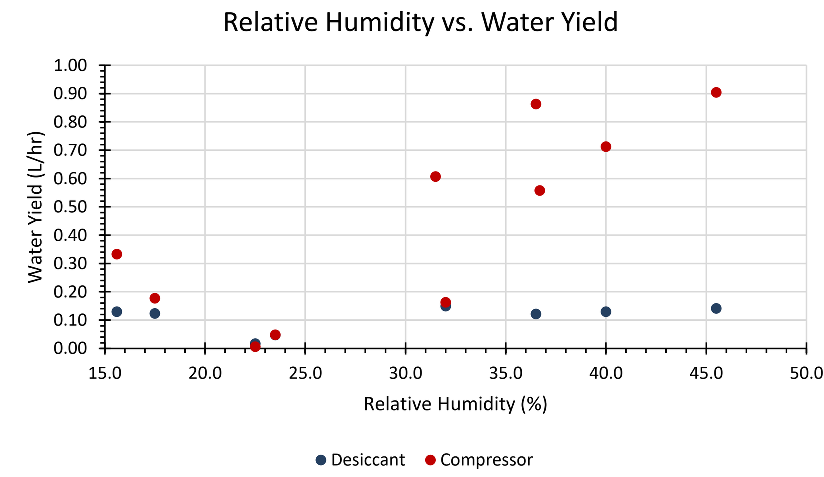


Figure 4. Relative Humidity vs. Water Yield (Liters per hour)

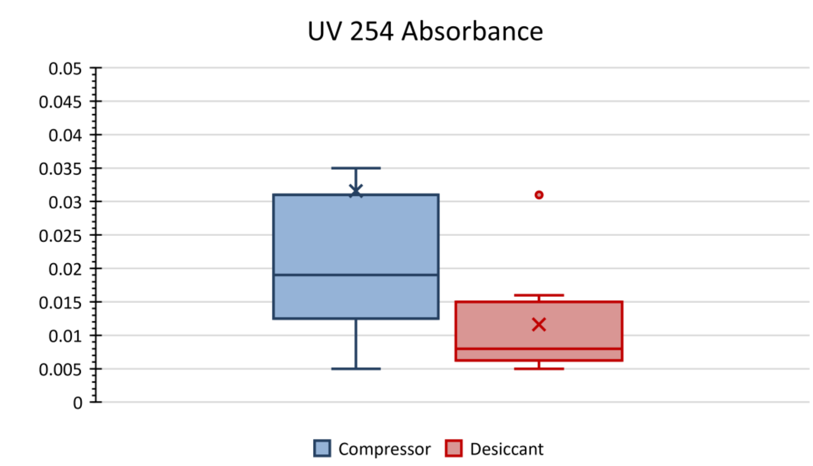


Figure 5. UV 254 absorbance for both dehumidifier systems

RESULTS

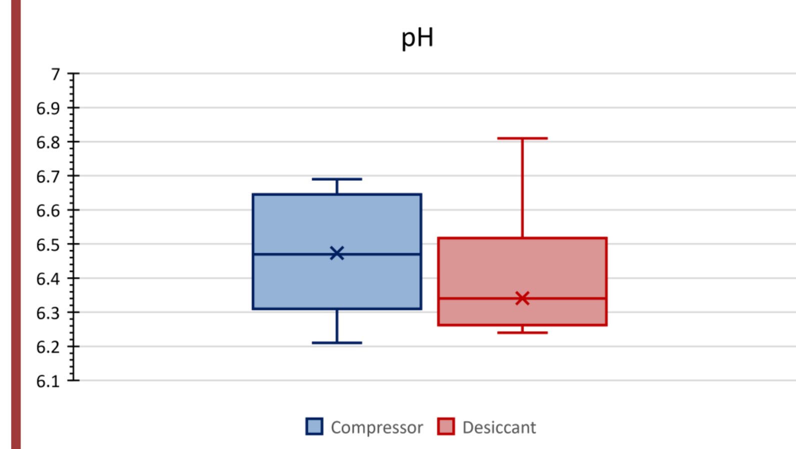


Figure 6. pH for both dehumidifier systems

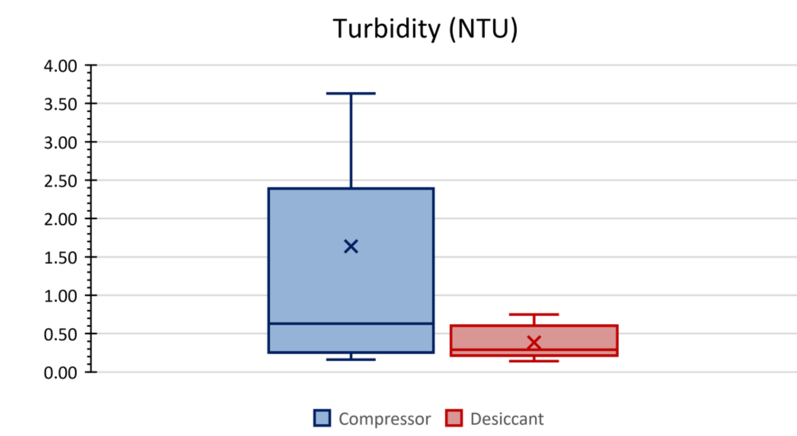


Figure 7. Turbidity for both dehumidifier systems

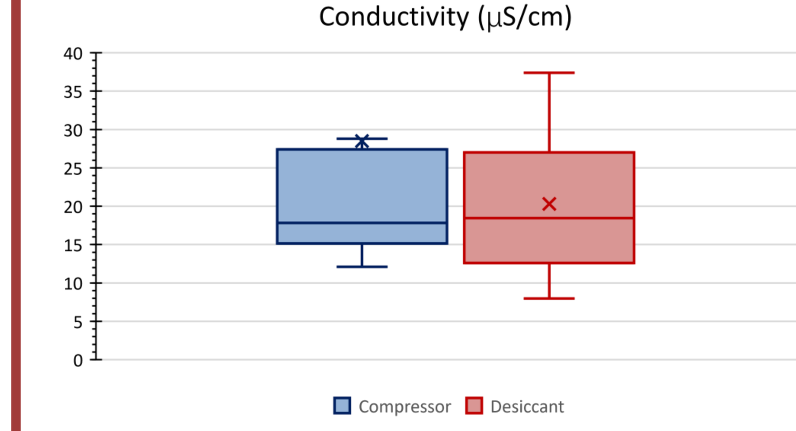


Figure 8. Conductivity for both dehumidifier systems

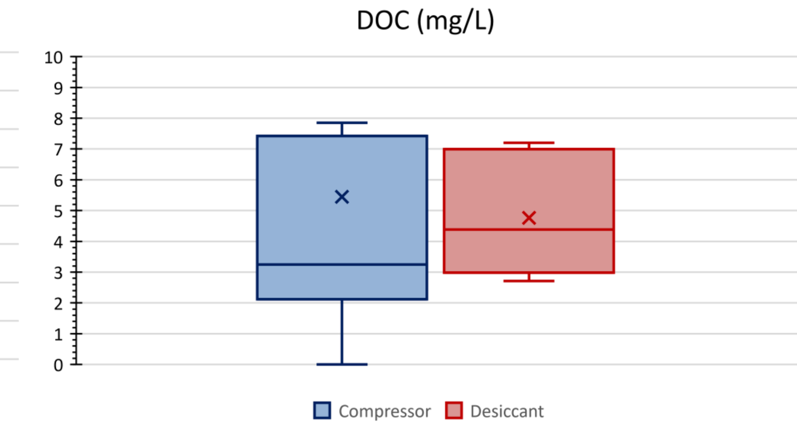


Figure 9. Dissolved Organic Carbon (DOC) for both dehumidifier systems

CONCLUSIONS

- For Figure 3, we can conclude that for a relative humidity <30%, the compressor machine uses more energy per liter vs. relative humidity >30%, where the desiccant uses more energy per liter
- Overall, for Figure 3, as relative humidity increases, energy usage decreases
- For Figure 4, relative humidity both <30% and >30%, the compressor machine produced more water per hour
- Overall, for Figure 4, as relative humidity increases, water produced per hour also increases
- Figure 9 shows lower DOC values for the compressor machine vs. the desiccant machine. However, the desiccant machine produced superior water quality according to Figures 5-8

ACKNOWLEDGMENTS

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