Sustainable Liquid Desiccant System Research

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ABSTRACT

The goal of my research project was to find a desiccant to be implemented into the liquid desiccant system and reduce relative humidity by at least 30%. The current desiccant being used is calcium chloride. The desiccant system’s results were analyzed, the system was tested many times to try to achieve 30% dehumidification. Ideally once the system can reduce relative humidity 30% it will be installed into the solar powered Interlock House to reduce energy consumption by reducing the reliance of the AC on electricity use. Organic desiccants were also researched to improve the system’s results, as well as remove some of the negative effects caused by CaCl₂.

RESEARCH QUESTIONS

How much is the current liquid desiccant system lowering the relative humidity?

What organic desiccants can be implemented to improve the current liquid desiccant system?

METHODS

While the liquid desiccant system is running, sensors are retrieving data which is used in the following equations to find the absolute humidity and relative humidity. These values are used with temperature to determine how the air feels.

\[
\begin{align*}
\text{AH} &= \frac{P_{\text{w}}}{P_{\text{w,sat}}} \times 100 \\
\text{RH} &= \frac{P_{\text{w}}}{P_{\text{w,sat}}} \\
\text{P}_{\text{w}} &= A \times 10^{4} (T + T^3) \\
\text{P}_{\text{w,sat}} &= 0.612 \times 10^{7} R + 4.285 \times 10^{9} R^2 + 1.674 \times 10^{12} R \\
\text{A} &= 7.591386 \\
\text{T} &= \text{Temperature (Celsius)} \\
\text{m} &= 6.116441
\end{align*}
\]

RESULTS & DATA ANALYSIS

While keeping the input humidity constant, this compares the absolute and relative humidity. The AH shows a change, while the RH is almost the same for input and output. This shows that the output temperature of the air is cooler than the input.

This data was taken as the input AH was growing throughout the experiment. This shows that the system achieves a higher percent dehumidification when the input AH is higher.

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REFERENCES

