

Mechanical Dehumidification Using High-Frequency Ultrasonic Vibration

Performing Organization(s): Oak Ridge National Lab/STEMiNC Inc.

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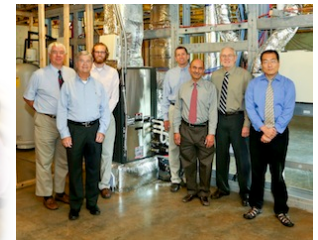
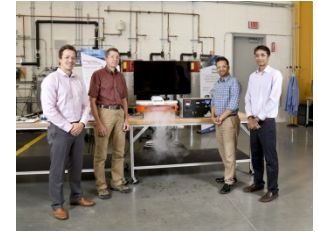


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Project Team:

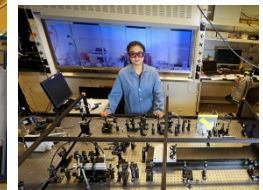
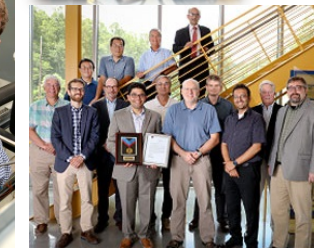
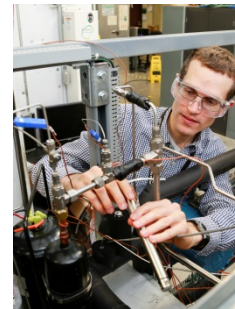
Oak Ridge National Laboratory (Building Equipment Research Group, Lead)

- Ayyoub Momen, R&D Staff
- Kyle Gluesenkamp, R&D Staff
- Viral Patel, R&D Staff
- Moonis Ally, R&D Staff
- Kashif Nawaz, R&D Staff
- Roger Kisner, R&D Staff
- Omar Abdelaziz, R&D Staff
- Brian Bischoff, R&D Staff



BERG:

40+ years of experience in building equipment research
15 Ph.D., 3 M.Sc., 3 Tec.
7 R&D100 Awards
25 Patents
DOE Energy 23 Award – 2nd place among all DOE programs
Peter Ritter von Rittinger International Heat Pump Award, 2017



STEMINC Inc.

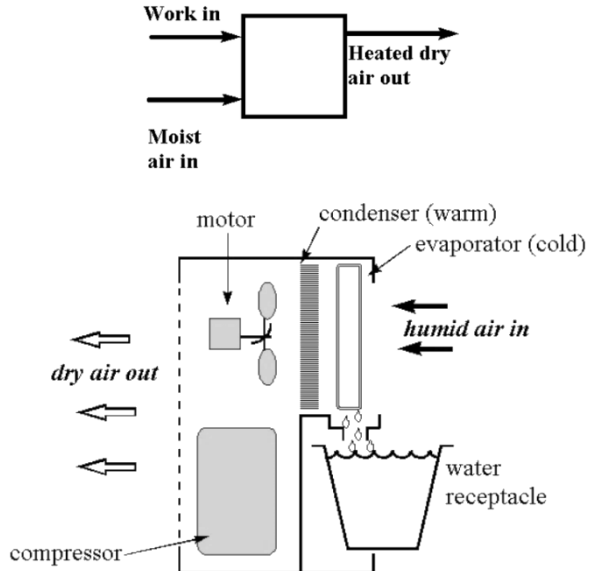
- Oswalnyr Martins, CEO, CTO



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The Problem

- Dehumidification is responsible for about 40% of the energy consumed by residential and commercial buildings.
- Dehumidification is conventionally achieved by conventional vapor compression cycle by cooling air below the dew point to condense water and reheat- A highly inefficient process for dehumidification.
- Liquid/solid desiccant based Separate sensible and latent cooling (SSLC) systems are 30-50% efficient compared to the VC based systems- Regeneration of the desiccant materials and management of the heat of sorption are critical issues.
- Advice: Conventional VC based dehumidification is a very energy intensive process and SSLC requires regeneration and heat of sorption management thus an innovative solution is needed to avoid the issues.



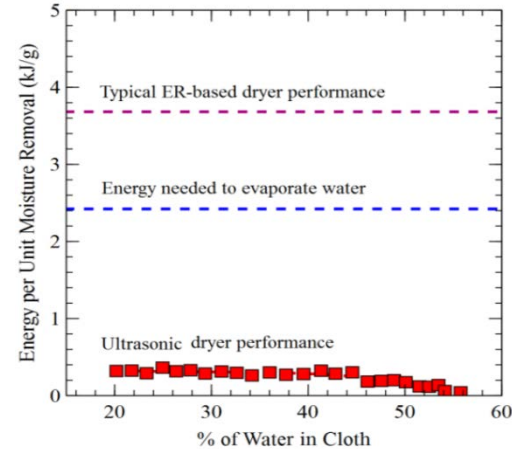
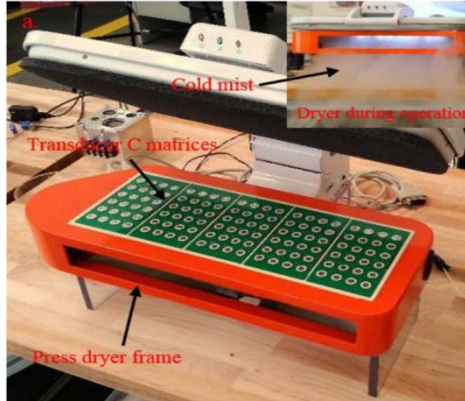
Source: <http://chem.engr.utc.edu/Webres/435F/Dehumidifier/Dehumid/R5-435-1.html>



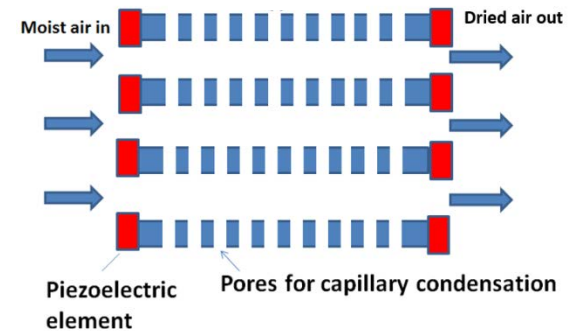
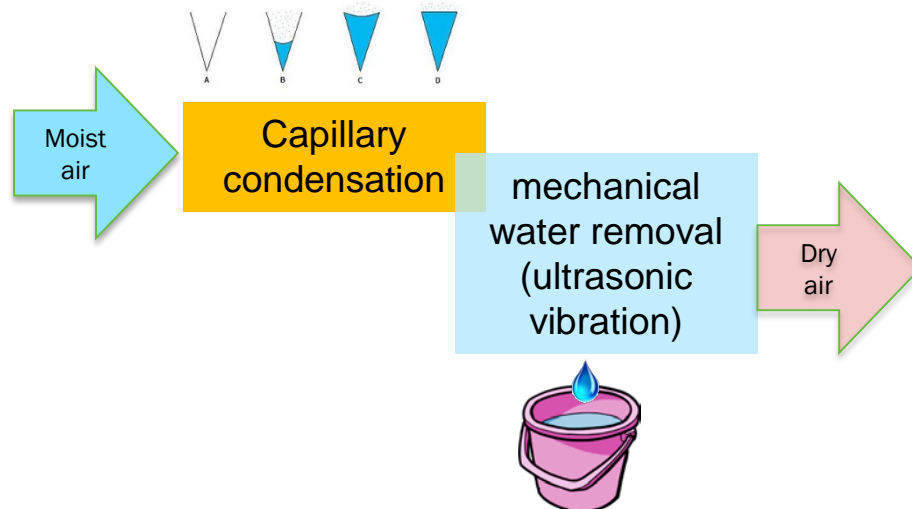
Efficiency: 972–3000 kJ/kg water removal

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The Solution: Bypassing the cooling-based condensation!



We have already shown that piezoelectric vibration could significantly boost the drying efficiency.



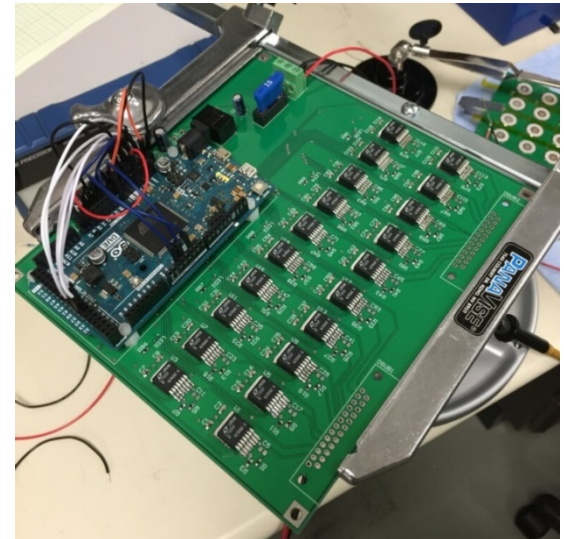
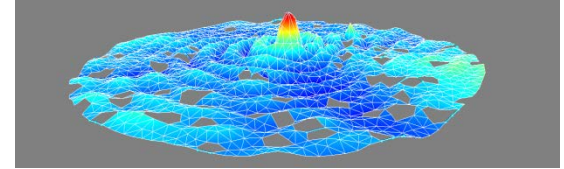
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Advantage, Differentiation, and Impact:

- Introducing a new dehumidification process (proof of concept prototype capacity ~ 0.1 l/Day)
- Cost competitive product saving
- 3-5 times more efficient dehumidification process (~250 kJ/kg of water removal compared to 372-3000 kJ/Kg in conventional systems). This translates to 32-85% operating cost savings.
- Opens up new opportunities for Separate sensible and latent cooling (SSLC) systems due to 48% enhanced efficiency and 30% compactness.
- The technology can save 715 TBtu of energy annually by 2030
- This amount of savings would support 6,020 new jobs over 10 years

Target Market:

- Residential and commercial dehumidifiers



Thank You

Oak Ridge National Laboratory, Building
Equipment Research Group

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