MIME

A NOVEL WATER DESALINATION TECHNOLOGY USING A PRESSURE-BASED SPRAY EVAPORATION MEASUREMENT TECHNIQUE

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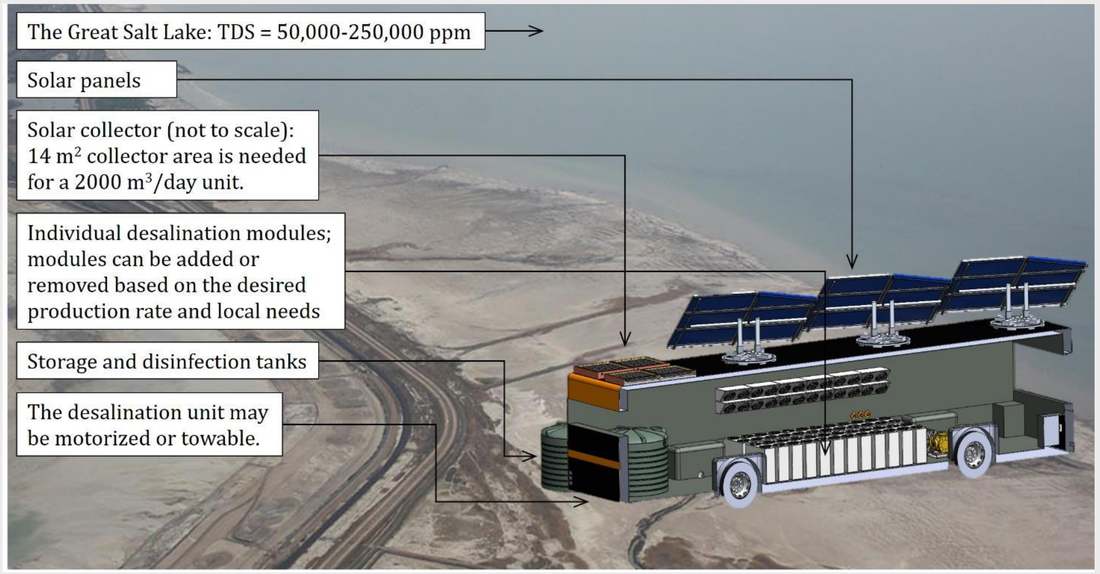
WATER SCARCITY

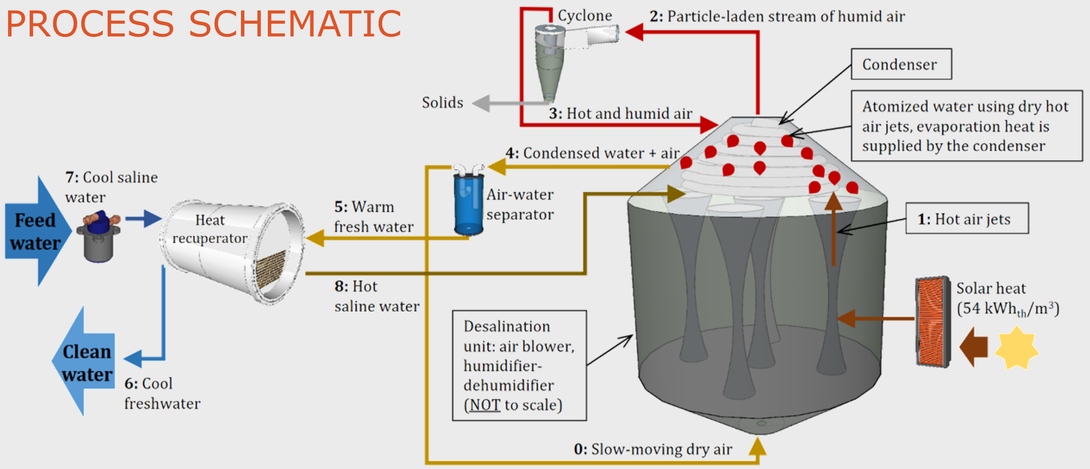
- Freshwater makes less than 2% of the world water reserves.
- Water desalination is a must.
- Current technologies are energy intensive and expensive.

THE NEED OF SPRAY EVAPORATION MEASUREMENT

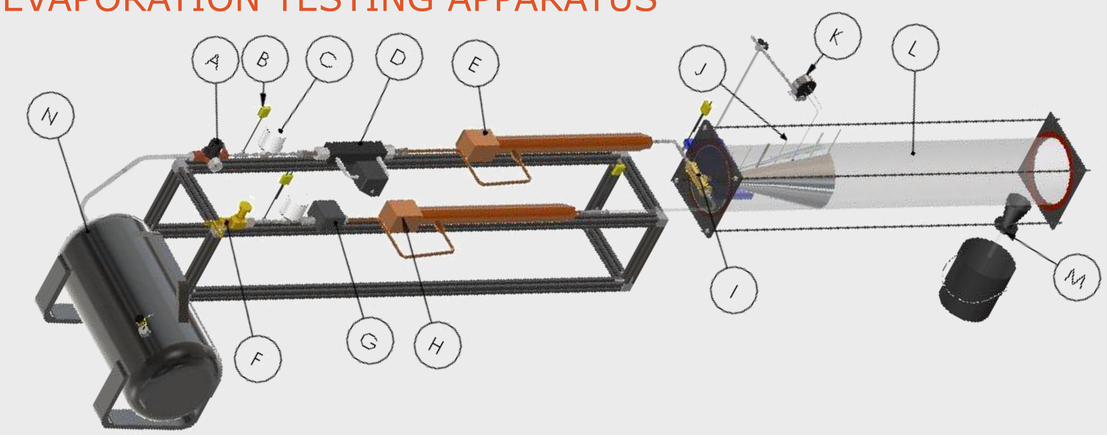
- In humidification-dehumidification desalination, spray is evaporated to spray salt from water.
- The spray evaporation research in literature is very limited.
- The need to quantify the evaporation profile for different inlet conditions to efficiently design the process.



PROCESS SCHEMATIC



EVAPORATION TESTING APPARATUS



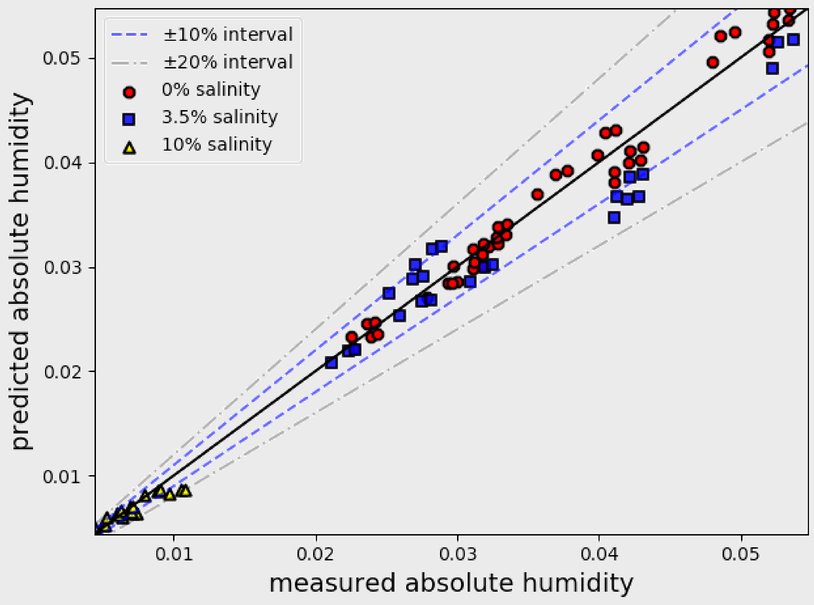
OUTCOMES AND IMPACT

- A portable and modular system will be designed and constructed.
- The desalination cycle is based on the principle of Humidification-Dehumidification.
- Low pressure and temperature operation.
- Minimal fouling rates because of the continuous salt extraction.
- Reliance on low grade thermal energy and extensive heat recuperation.
- Dynamic design platform verified to within 10% of the experimental data.
- The process specific energy consumption will be more efficient than a modern large RO installation at \$1.52/m³ levelized cost of water.
- A 2000 m³/day unit using this technology can provide freshwater to 5000 - 6000 American or 70,000 Africans for 25 years ahead.
- Different parts have been manufactured and tested.

NOVEL EVAPORATION MODEL

- A novel evaporation empirical model was developed.
- Based on inlet conditions.
- Describes the spatial evaporation profile along the flow pathway.

$$\omega = 2.10 \times 10^{-5} \times \left(\frac{\dot{m}_a}{\dot{m}_w}\right)^{-0.56} J^{-0.22}\, Re_D^{0.19}\, Le^{-1.20} \left(\frac{x}{D}\right)^{0.04} \left(1 - S^{6.04}\right)^{1.78\times10^6}$$



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