Sea Salt Production Via Passive Evaporation With A Potable Water By-Product

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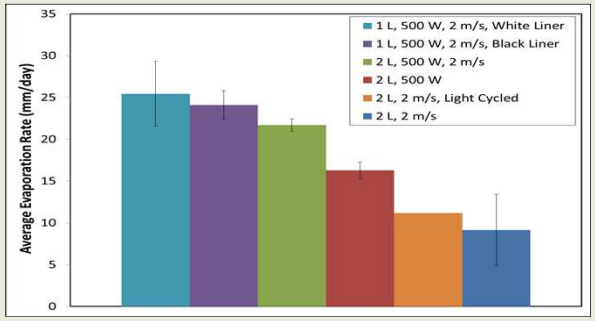
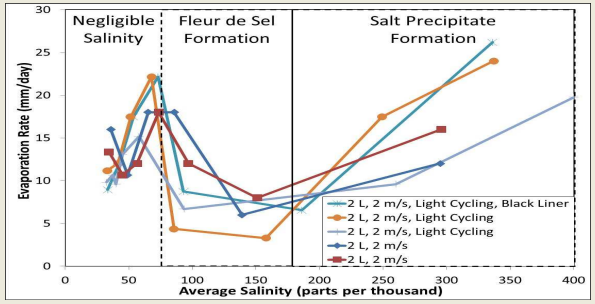
EVOO Cannon Beach
Dinner Shows • Classes • Catering • Culinary Shop

Evaporation depends on:

Salinity, wind speed, relative humidity, and temperature of water and air



Graph 1: Average evaporation rate six configurations where volume, light, wind speed, and liner were varied as indicated in the legend. Error bars for one standard deviation with further analysis to come.



Graph 2: Evaporation rate with respect to salinity for several trials. Fleur de Sel was observed forming from 75 to 175 parts per thousand (ppt), while solid salt precipitated at above 175 ppt. Both regimes are characterized by a change in evaporation rate.

Evaporation Model:

$E = Av[1 - B(T_a - T_w)](p_{sw} - p_a)$ (mm/day)

v = wind speed

T_a, T_w = temperatures of air, water

p_{sw}, p_a = vapor pressure of saltwater, water in air

A, B = empirical constants

Kokya, Bahman A., and Taher A. Kokya. "Proposing a formula for evaporation measurement from salt water resources." *HYDROLOGICAL PROCESSES* 22 (2007): 2005-12. Web. 20 Feb. 2013.

EVOO wants to produce gourmet sea salt for sale at their Cannon Beach cooking school

Figure 1: A selection of the spices currently available through EVOO Cooking School in Cannon Beach, OR

Figure 2: Our sponsor Bob Neroni

The final structure will be located at a local cooperative on the Oregon coast. Potable water by-product will be used to irrigate the community garden

Project deliverables:

- Characterize passive evaporation
- Collection of evaporated water by condensation
- Minimize footprint, energy input and batch time
- Explore effect of tray configuration (flat/stacked)
- Propose final design for on-site implementation
- Produce sea salt with 10-13 %mass water content
- Establish method for removing bitter taste

Future Work:

- Continue model development
- Evaluate scale model parameters
  - Condensation optimization
  - Roof angle
  - Tray spacing and layout
- Develop secondary drying system to remove water from salt product, to achieve desired range (10 – 13 %mass)
- Determine cause of bitter flavor
- Establish method for treating cause of bitter flavor

Bench Scale Testing:

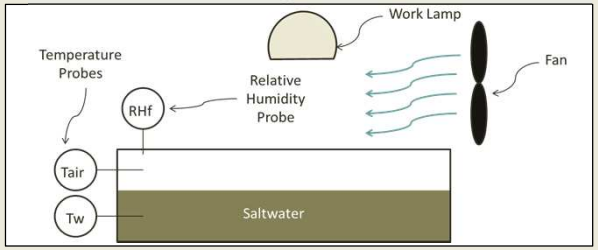


Figure 3: Schematic of the bench scale apparatus used for initial determination of evaporation rate and dependencies on the parameters shown.

Scale Model:

Tray Depth
1.5 inches
Max Batch Size
40 gal
6.1 kg salt
Evaporation Rate
10.5 mm/day
Batch Time
14 days

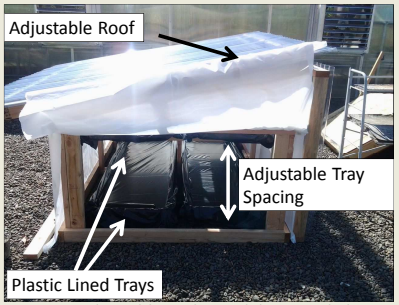
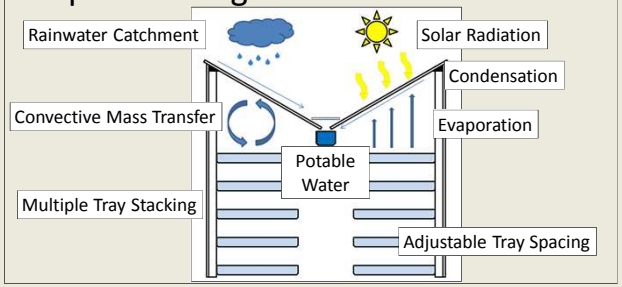


Figure 4: Adjustable scale model currently being used for testing. Structure build by the team.

Proposed Design:



Acknowledgements:
Bob Neroni and Bob Moyer (EVOO Co-sponsors), Dr. Mohammad Azizian and Justin Provolt (Lab Assistance), Dr. Burke Hales and Doctor Fred Prahl (OSU School of Oceanography), Lea Clayton (Accounting), Keith Chandler (Seaside Aquarium Manager), Dr. Phil Harding (Mentor)