Diffusion-Gap Distillation

Andrew Lowenstein

AIL Research

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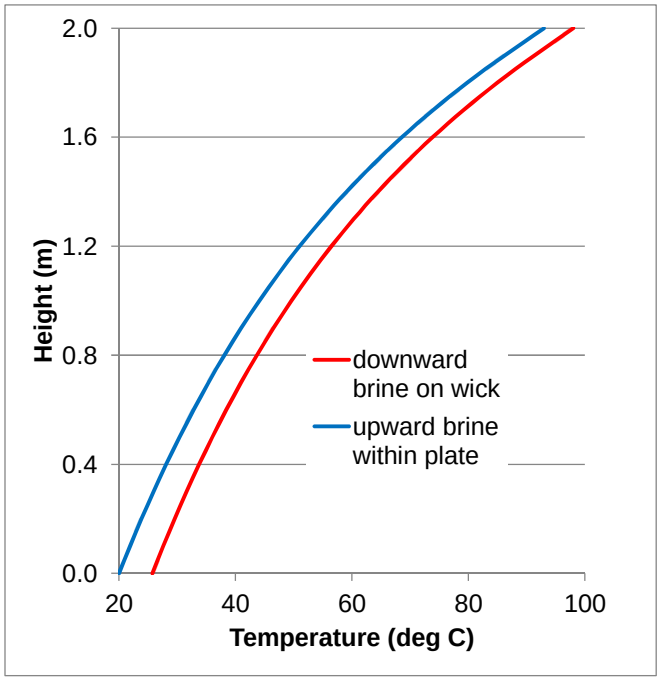
Why Develop Diffusion-Gap Distillation?

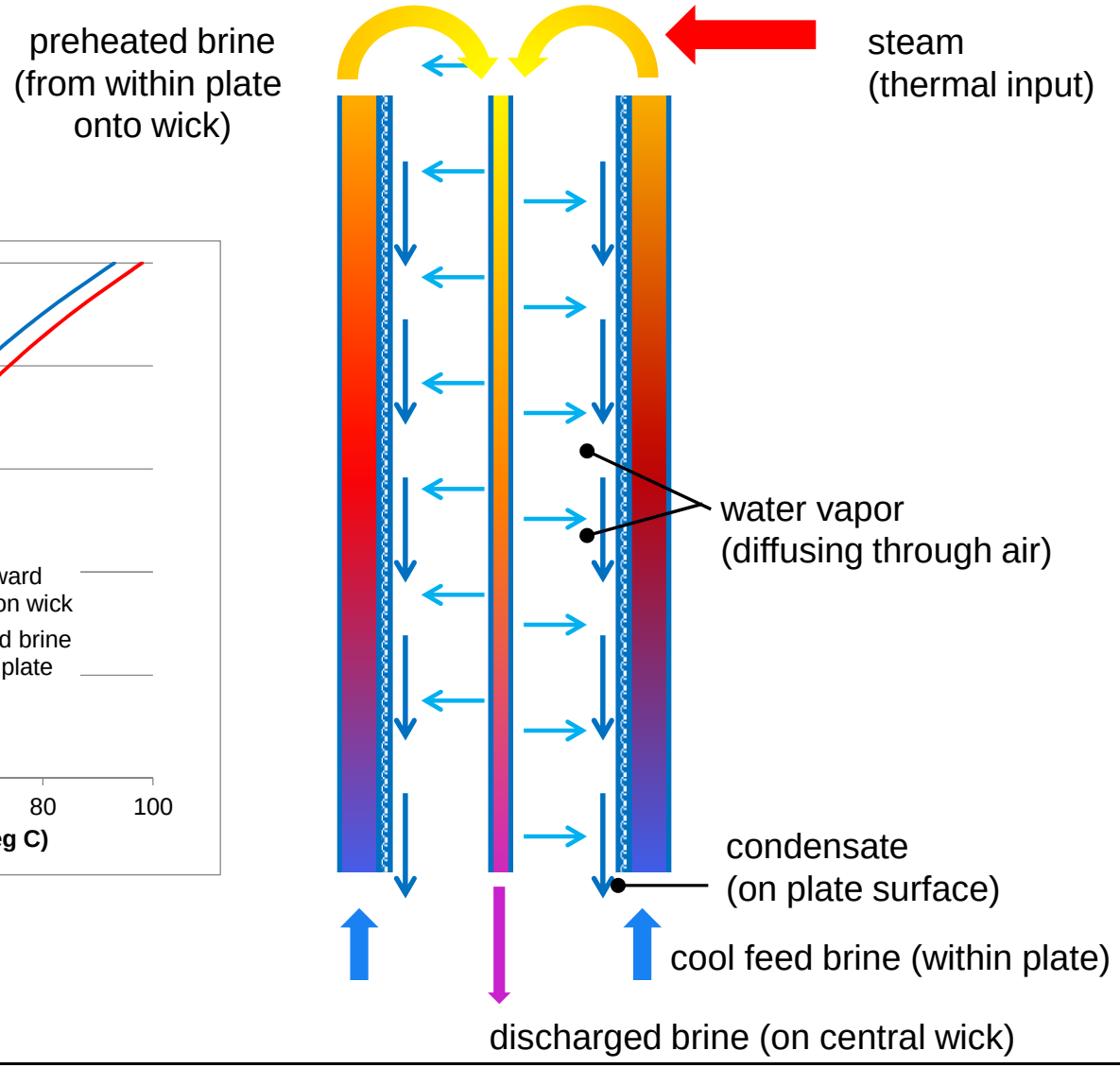
- Meet the need to purify highly challenged water
  - High salinity seawater as found in the Persian Gulf
  - Wastewater streams from O&G operations
- Provide a low maintenance technology for water purification in remote and rural locations
- Provide water with extremely low levels of impurities
  - Meet the needs of applications such as boiler feed water
  - Pretreatment for process that produce ultrapure water
  - Eliminate toxic elements such as boron that pass through membranes
- Offer a lower cost, more efficient alternative to the technologies that now dominates thermal desalination

Technical Approach

- Replace large vacuum vessels of MSF with plastic heat exchangers operating at atmospheric pressure
- Achieve high efficiency by positioning wicking surface with evaporating seawater/wastewater close to condensing surface
- Drive process with atmospheric pressure steam
  - Solar thermal collectors
  - Extraction steam from power plant
  - Conventional boiler

Process Diagram





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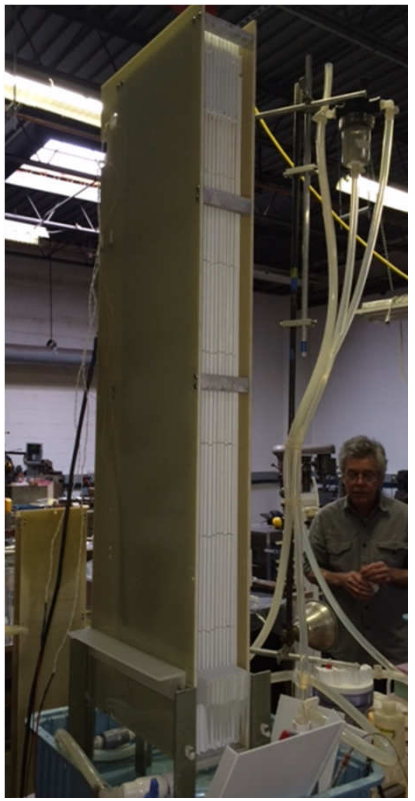
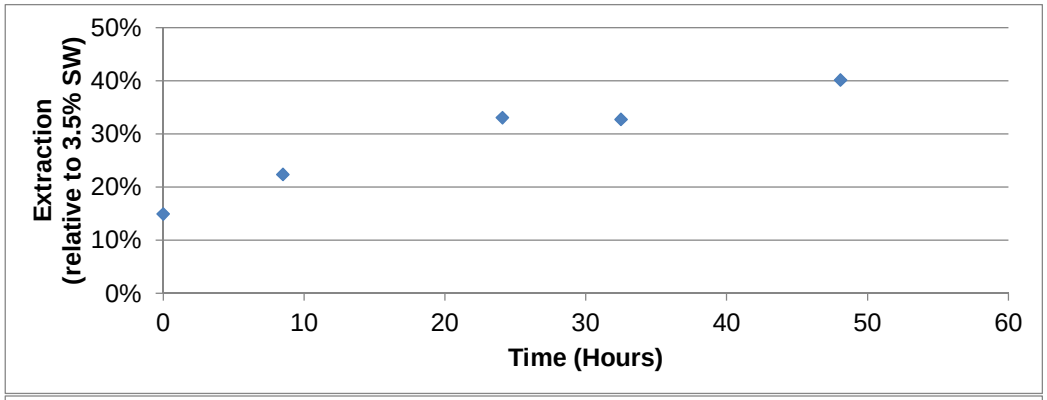
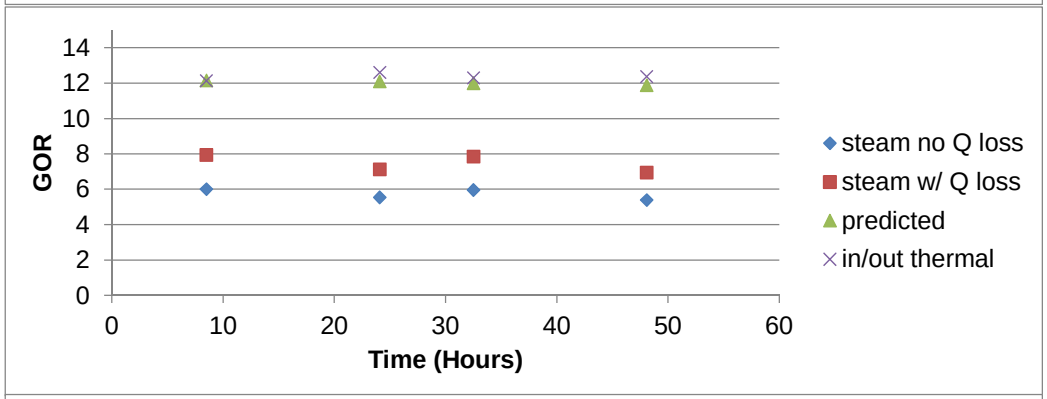
Supporting Data & Scale-up

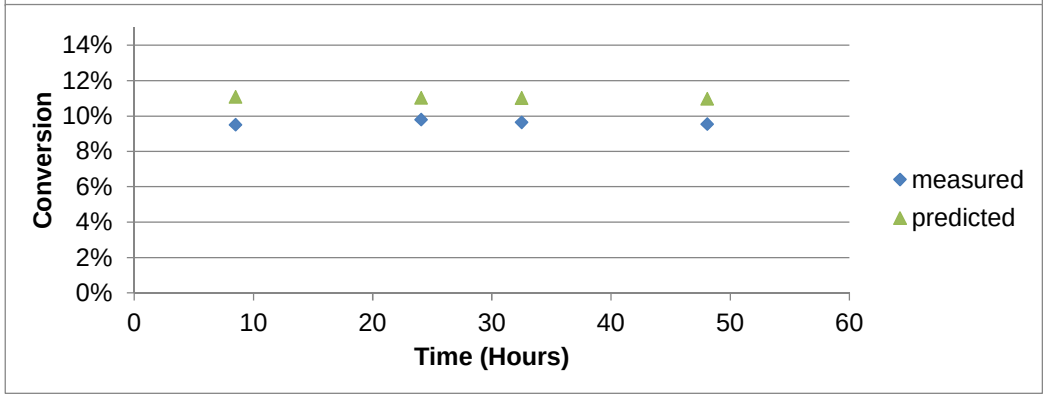
- GOR of 12 achieved in laboratory model
- GOR of over 16 at maturity
- Projected power requirements are less than 0.15 kWh per cubic meter of product



Performance of 5-plate model support 15 to 20 GOR at large scale







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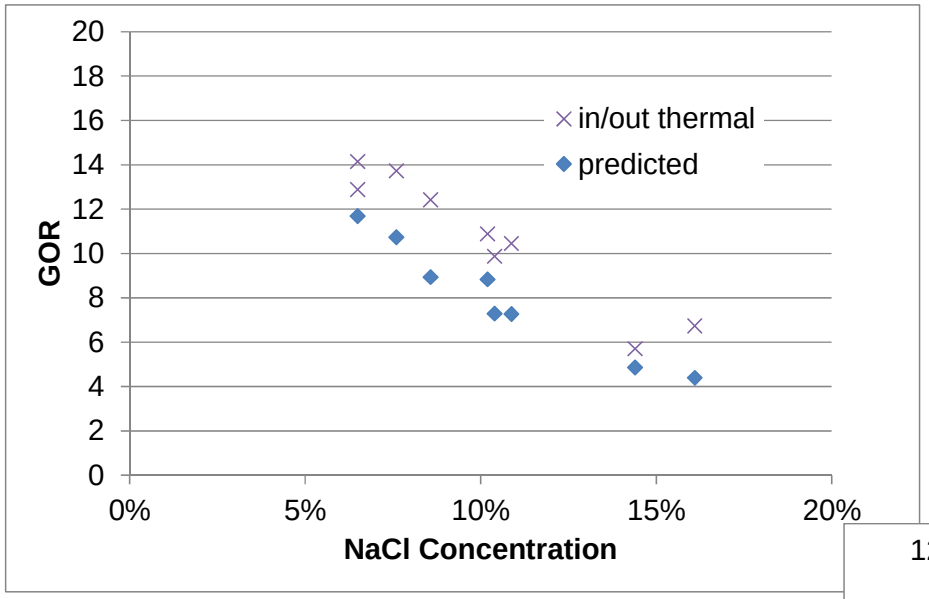
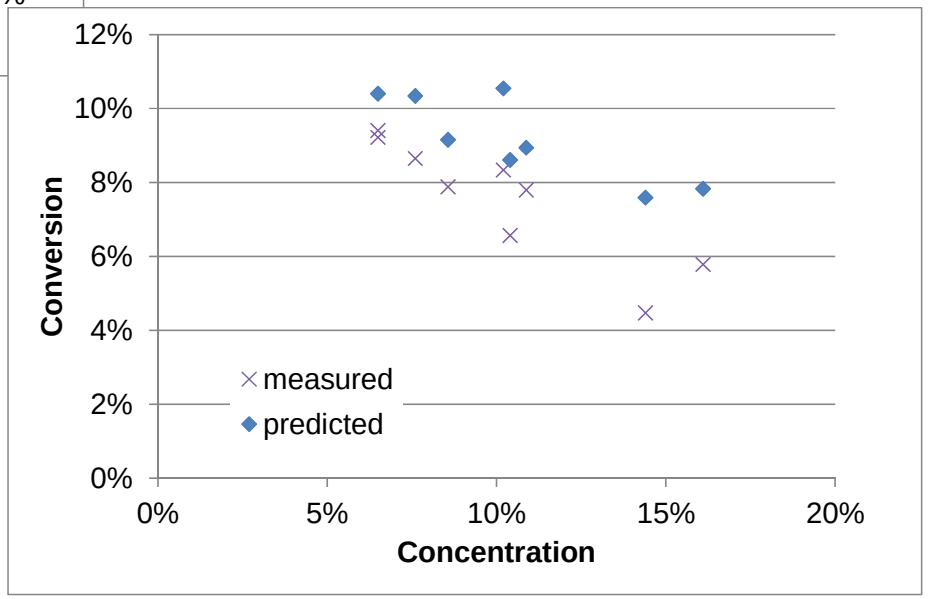
Predictable performance at very high salt concentrations





Cost of Water for Mid-Sized DGD Plant

- Cost to manufacturer core of desalination system at high volume projected to be on the order of $400 per cubic meter ($1.50 per GPD) of daily production
- Cost of water from system driven by solar thermal could be less than $1.00 per cubic meter