Introduction of BrineZero Technology

BrineZero's can achieve the aggressive goal of concentrating brine at under $4.00 per cubic meter through innovations in:

- The Thermal Distillation Process — Diffusion Gap Distillation (DGD) is a commercial-ready technology[1] that separates water from 70,000 ppm brine at a GOR of 14, and 160,000 ppm brine at a GOR of 6. As shown in Figure 1, DGD achieves very high efficiencies for thermal separation by locating hot films of evaporating brine close to cooled films of condensing water vapor—the gap between the two surfaces being between 2.5 mm and 3.5 mm. Similar to Membrane Distillation, DGD recovers the heat of condensation, and it can be viewed as Membrane Distillation without the scale-prone membrane.

- The Solar Array — Under a second license from AILR[2], BrineZero will drive the DGD process with low-pressure steam that is directly produced within the evacuated-tube solar collectors shown in Figure 2.

Technology Assistance Request

BrineZero is seeking assistance to increase the efficiency and longevity of DGD processors that rely on polymer heat transfer surfaces. We also seek assistance in modeling the performance of the steam-generating solar collector. Specific technology needs include:

- Identification of high temperature polymers that resist scaling
- Development of an inexpensive hydrophilic coatings for polymers that encourage film-wise condensation
- Models of complex brine mixtures that predict critical thermodynamic properties such as saturation index and boiling point elevation
- Performance model of a steam-generating solar collector that can be used to optimize the collector's design.

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[1] US Patent No. 9,770,673, "Apparatus for Diffusion Gap Desalination" to be licensed from AILR
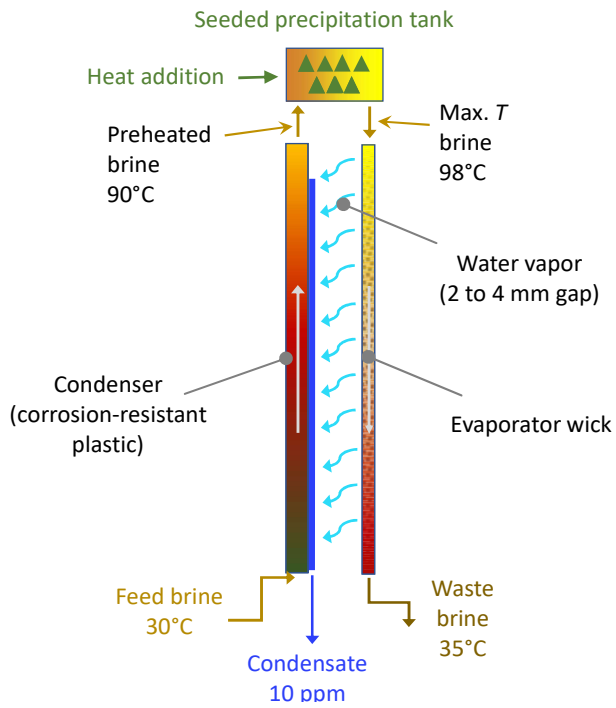[2] US patent No. 8,459,250, "Solar Energy Collection"

Figure 1 - Conceptual drawing of one of the 1,000 plate/wick assemblies in a 5-gpm DGD processor

Seeded precipitation tank

Heat addition →

Preheated brine 90°C

Max. *T* brine 98°C

Water vapor (2 to 4 mm gap)

Condenser (corrosion-resistant plastic)

Evaporator wick

Feed brine 30°C

Waste brine 35°C

Condensate 10 ppm

Selective Coating

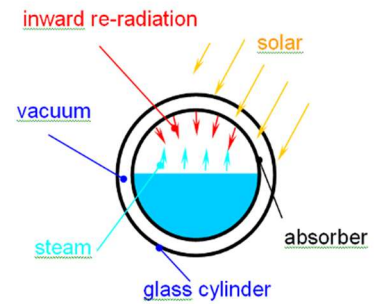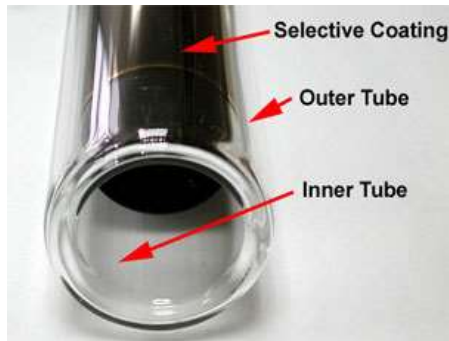Outer Tube

Inner Tube

inward re-radiation

solar

vacuum

steam

glass cylinder

absorber

Figure 2 – Steam-Generating Solar Collector