

MemPower

Decentral Cogeneration of Power and Fresh Water

From Low Grade Heat and Seawater (Waste Water)



MemPower is a new concept for decentral cogeneration of power and fresh water. It is based on the harvesting of the capillary energy during membrane distillation (MD). This allows the simultaneous production of electricity and fresh water from sea water (waste water) and low grade heat (waste heat, geothermal, solar). Power densities exceeding those of others Water & Energy technologies

WATER & ENERGY

Drivers:

- Water and energy (power) are interconnected
- All water production methods need electricity
- Positive effects on climate change and water scarcity

MEMPOWER

Characteristics:

- MD processes (like TNO's Memstil®) are driven by low-grade heat and need power for pumping, etc.
- MemPower produces pressurized distilled water.
- Pressure is converted into power (to drive pumps, etc)
- Surplus power remains.
- Power density > 10 (W/m² membrane) is aimed at.
- MemPower Patent: WO2012118369

PRINCIPLE

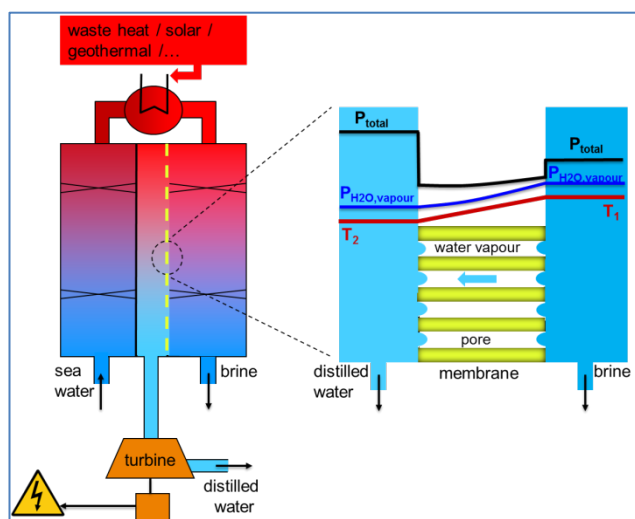


Fig. 1: Principle of MemPower. Power is produced in membrane distillation by throttling of the distillate product causing the hydraulic pressure P_{total} to increase towards the breakthrough pressure. Power is harvested by a turbine: $power = distillate\ flow * pressure$.

POTENTIAL

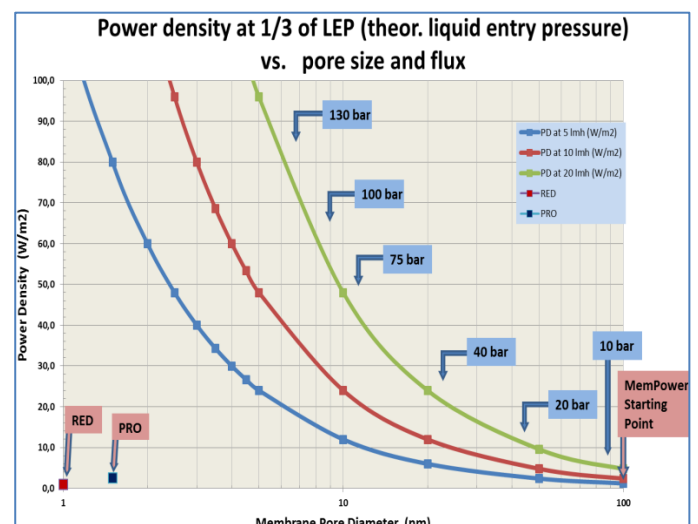


Fig. 2: Perspective of MemPower. Possible electricity yields (W/m² membrane) for three values of the distillate flux (5, 10 and 20 L/m².hr) at a distillate pressure of (1/3) * LEP (with LEP = Liquid Entry Pressure) and as a function of the pore size.

MARKET OPPORTUNITIES

MemPower is a potential cross-sectoral breakthrough technology for the water and energy markets.

It offers numerous potential applications:

- Lower-cost CSP-Water plants,
- PV-T Power / Water plants
- Water cogenerating power plant
- Stand-alone desalination plants,
- Water/energy plants in rural areas
- Water – heat motors
- Geothermal heat conversion
- Etc.

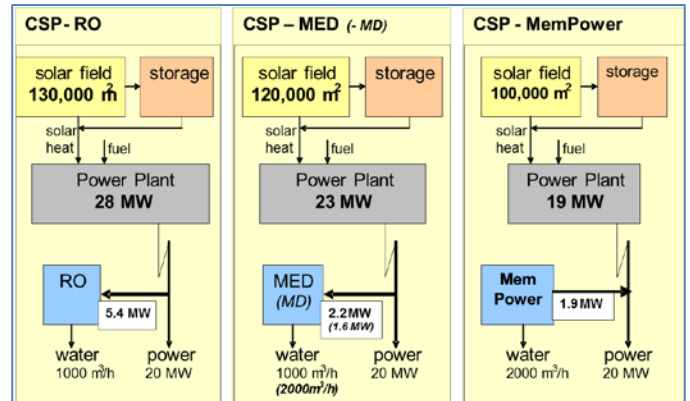
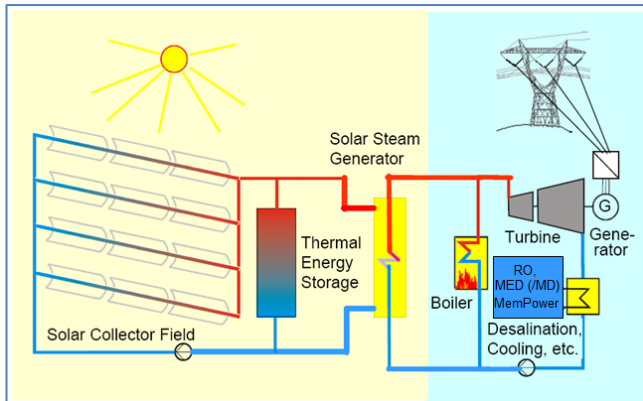


Fig. 3. MemPower vs. reverse osmosis (RO) and multi effect distillation (MED) in integrated CSP-Water plants.

PROOF OF PRINCIPLE (2012-2013)

First experimental results:

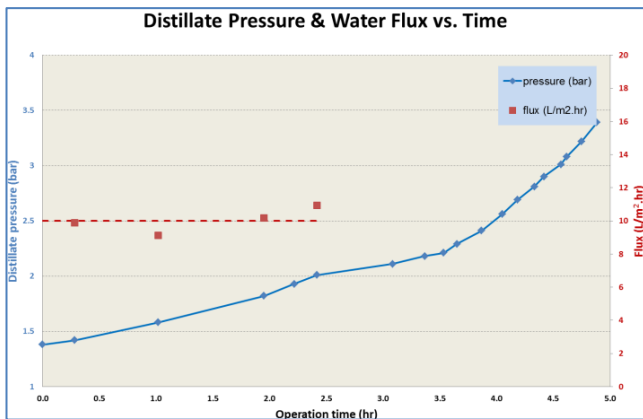


Fig. 4: Distillate pressure and fresh water flux as function of time.

PROOF OF CONCEPT AND DEMO (2013-2016)

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