Designing a Novel Self-Sustained Solar Powered Desalination Apparatus to Produce Thermoelectricity, Using a Fresnel Lens and Thermoelectric Generators

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From the vast 71% of the earth that is covered with water, a staggering 96.5% is saltwater, only a minute area of which is potable. Desalination-plants that use phase-change techniques waste a large amount of heat at the hot-side of the distillation set-up. This irony drove us to find ways to harvest this wasted-heat. Our goal was to utilize renewable natural-resources to create a dual-purpose device that generates electricity while desalinating water. The hot-end of the desalination-apparatus was heated by a Fresnel-lens, which concentrates solar-heat onto a focal-point in the salt-water. We placed graphene into the heating, due to its excellent thermal and conductive properties, along with this a steel sponge was used as a heating filament. Both of these materials enhanced the temperature of the hot-end. The saltwater evaporates into solar-steam. Solar-steam has many industrial uses. We condensed the solar-steam to generate potable desalinated-water. In order to harvest the waste-heat, we used thermoelectric generators (TEGs) between the hot and cold end of the device for voltage generation. We programmed a sun-finder to automatically move the Fresnel-lens towards maximum sunlight. One of our goals was to use the voltage generated by the TEG to power the automatic-sunfinder, thus making it a self-sustained device. Even though the TEGs did not generate sufficient voltage to power the sunfinder, they able to charge batteries. On average, 0.38 V of electricity was produced when TEGs were arranged in parallel. We still believe that if used at a large-scale, using more efficient and higher number of TEGs, this device could generate sufficient voltage to sustain itself, and to power other devices. This was a good concept to deal with energy wastage in the industry.

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