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Construction and commissioning of a large area solt gradient solar pond at Palatupana salterns in southern Sri Lanka,,

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Solar ponds are large-scale solar energy collectors with integrated thermal energy storage. The concept of collecting and storing solar energy using non-convective salt gradient solar ponds has been known for some time. We report here the details of construction and commissioning of a large-area solar pond built at Palatupana salterns in Southern Sri Lanka. A rectangular pond with dimensions 70 m x 35 m could retain a maximum water capacity of ~ 5000 m^3. The pond can be filled to a maximum height of 2 m.

The initial controlled filling of the pond to a total depth of 60 cm with a 30 cm layer of high-density brine led to formation of the three-layer stability with a maximum bottom temperature of 52 oC. Destruction of the pond stability was observed with the increase of wind speed over the pond. About three months later with the monsoon rain, the pond bottom recorded a maximum temperature of 69 oC with the reestablishment of three-layer stability at a total depth of 110 cm. The observed salinity and temperature profiles show the usual three-layer configuration, but with relatively thick upper convective zone. This situation could arise due to wind mixing of layers to a depth of about 30 cm. It is remarkable to observe that the uncontrolled natural conditions raised the bottom temperature of the pond to a maximum of 69 oC. Our results indicate wind is the major cause for mixing of layers which prevents storing of solar energy at the bottom layers of the pond.

The commissioned solar pond could be used for wind control mechanism studies and controlled filling mechanisms to optimize different layers of the pond to obtain maximum bottom temperatures.