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Solar Pond: Some Issues in Their Management and Mathematical Description

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Abstract : The management of a salt-gradient is investigated with respect to the interaction between the solar pond and its associated evaporation pond. Issues considered are the impact of precipitation and the operation of the flushing system with particular reference to the case in which the flushing fluid is pure water. Results suggest that a management strategy based on a flushing system that simply replaces evaporation losses of water from the solar pond and evaporation pond will be optimally efficient. Such a management strategy will maintain the operational viability of a salt-gradient solar pond as a reservoir of cheap heat while simultaneously ensuring that the associated evaporation pond can feed the storage zone of the solar pond with sufficient saturated brine to balance the effect of salt diffusion. Other findings are, first, that once near saturation is achieved in the evaporation pond, the efficacy of the proposed management strategy is relatively insensitive to both the size of the evaporation pond or its depth, and second, small changes in the extraction of heat from the storage zone of a salt-gradient solar pond have an amplified effect on the temperature of that zone. The possibility of boiling of the storage zone cannot be ignored in a well-configured salt-gradient solar pond.

Keywords : aqueous sodium chloride, constitutive expression, solar pond, salt-gradient
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