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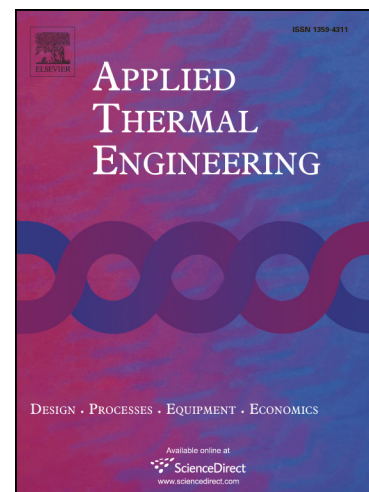
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# Study of economic feasibility of a compound cool thermal storage system combining chilled water storage and ice storage

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## Highlights

- Chiller capacity selection model for cool thermal storage system has been developed.
- Compound cool thermal storage system economic feasibility was investigated.
- Static payback time was used to describe the combined system economic feasibility.
- The suitable storage volume proportion ranges of ice thermal storage were proposed.

**Abstract:** In the present work, a compound cool thermal storage system, which combines chilled water thermal storage and ice thermal storage, has been investigated, and mathematical models for both the chiller capacity selection and the design day operating cost of the compound system are established under optimized control strategy. In comparison to a single chilled water thermal storage system, the chilled water storage percentage ( $\alpha$ ) of a single chilled water thermal storage system, and the ice storage volume ratio ( $R_{vol}$ ) of the compound system are introduced to discuss their impacts on the economic feasibility of the compound system. The results indicated that the designed day operating cost of the compound system was significantly reduced with the increase in  $R_{vol}$ , while the value of  $\alpha$  was kept constant. However, the total initial investment of the compound system increased with the increase in  $R_{vol}$ . Afterwards, the static payback time was adopted to characterize the trade-off between the increased total initial investment and the decreased total operating cost of the compound system. It was found that, for a value of  $\alpha$  of 10%, the most favorable value of  $R_{vol}$  for

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