

**Title** THERMAL DISTRIBUTION PERFORMANCE OF NPCM:  
NaCl, NaNO<sub>3</sub> AND KNO<sub>3</sub> IN THERMAL STORAGE  
SYSTEM

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### ABSTRACT

The experiment on thermal distribution in the thermal energy storage system with non-phase change materials (NPCM): NaNO<sub>3</sub>, KNO<sub>3</sub> and NaCl in the range of 25-250°C. The cylindrical storage system made of stainless steel with 25.6 cm-diameter and 26.8 cm- height that was contained of these NPCM. There was one pipe for heat transfer fluid (HTF) with 1.27 cm-diameter that manipulates in the storage tank and submerges to NPCM. The inner pipe was connected to the 2.27cm - diameter outer HTF tube. The tube was further connected to the thermal pump, heater and load. The pump circulates the synthetic oil (thermia oil) within the pipe for heat transferring purposes (charging and discharging). An electric heater is used as the heat source. The limitation of the charging oil temperature is maintained at 250°C with the flow rates in the range of 0.58 to 1.45 kg/s whereas the inlet temperature of the discharge oil is maintained at 25°C. Thermal performance of TES (thermal energy storage) such as charging and discharging times, radial thermal distribution, energy storage capacity and energy efficiency have been evaluated. The experimental results show that the radial thermal distribution of NaCl for TR inside, TR middle and TR outside were optimum of temperature down to NaNO<sub>3</sub> and KNO<sub>3</sub> respectively. Comparison of NPCMs with oil flow rates for NaCl were charging and discharging heat transfer than

$\text{KNO}_3$  and  $\text{NaNO}_3$ . The thermal stored of  $\text{NaCl}$  was lain from 5,712-5,912 kJ,  $\text{KNO}_3$  was lain from 7,350-7,939 kJ and  $\text{NaNO}_3$  was lain from 6,623-6,930 kJ respectively. The thermal recovered and stored for the experimental results well with at the  $\text{KNO}_3$ ,  $\text{NaNO}_3$  and  $\text{NaCl}$  respectively. The thermal energy efficiency of  $\text{NaCl}$ ,  $\text{KNO}_3$  and  $\text{NaNO}_3$  were in the range 66-70%.

