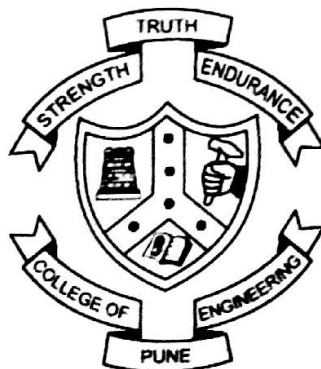


A
Dissertation Report
On
**Evaluation of Heating and Cooling Trend of Solar Salt in Heat
Exchanger Behaving as a Thermal Storage**
Submitted in partial fulfillment of the requirements of the degree of
Master of Technology
In
Process Metallurgy

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ABSTRACT

Use of solar thermal energy without its conversion into other forms is most efficient. Several other methods requires conversion of thermal energy to electrical energy which is further converted to chemical energy in battery or is converted to potential or kinetic energy through pump or motor . Inefficiencies in thermal to electrical energy conversion are compounded by inefficiencies that may exist in the conversion of stored energy to usable energy.

Major drawback of solar energy is variation of solar intensity with time and weather condition. To minimize this drawback and to extend the solar generation period when solar is not available thermal energy storage coupled with heat exchanger is must.

Solar thermal applications with integrated energy storage operate for longer duration and increase reliability to the system. Performance and size of thermal storage depends on efficiency of heat exchanger to transfer maximum heat from receiver to thermal storage using heat exchanger and proper selection of material for thermal storage.

For thermal energy storage a non-eutectic molten salt mixture consisting of 60 wt % sodium nitrate (NaNO_3) and 40 wt % potassium nitrate (KNO_3) is most suitable. Advantages of molten salts are the high thermal stability, relatively low material costs, high heat capacity, high density, non-flammability and low vapor pressure. Due to the low vapor pressure pressurized vessels are not required. Compared to organic heat transfer fluids the melting point of molten salts is higher.

The project aims towards design and fabrication of innovative heat exchanger which acts as a thermal storage. Instrumentation with cluster of thermocouple to observe the heating and cooling temperature of salt bath at different depth and location at regular interval of time with and without insulation.

It was observed that thermal energy storage capacity is increased with insulation and solar salt can retain heat at higher temperature for maximum duration. Peak rise in temperature of solar salt is greater than without insulation. At the same time the temperature distribution with insulation is more uniform throughout the salt bath.