Materials Today: Proceedings xxx (xxxx) xxx

Contents lists available at ScienceDirect

Materials Today: Proceedings

journal homepage: www.elsevier.com/locate/matpr

Analysis on unsteady heat transfer and fluid flow through sensible heat storage system

Sasikumar C [a], Sundaresan R [b], Rajaganapathy C [c], Nagaraja M [d], Radha Krishnan Beemaraj [e,*]

[a] Mechanical Engineering, Bannari Amman Institute of Technology, Sathyamangalam 638401, India
[b] College of Applied Industrial Technology, Al Haque, Jazan University, Saudi Arabia
[c] Mechanical Engineering, Government College of Engineering, Srirangam, Trichy 620012, India
[d] Mechanical Engineering, PSNA College of Engineering And Technology, PSNACET, Dindigul 624622, India
[e] Mechanical Engineering, Nadar Saraswathi College of Engineering and Technology, Theni 625531, India

ARTICLE INFO

Article history:
Available online xxxx

Keywords:
Energy storage
Thermal energy
Conversion
Cored brick heater

ABSTRACT

The future of energy management will hinge on the development of effective and affordable energy storage devices. This conversion determines the storage mechanism utilized to store the accessible form of energy. In order to store solar energy, the most straightforward method is to convert solar radiation into thermal energy. Heat is transported from the collector to the storage medium in a thermal energy storage system, which is highly helpful and convenient. In the lack of solar radiation, an energy storage device is therefore needed. Waste heat from industrial operations or geothermal energy is an alternative source of thermal energy storage. Brick heaters with cores are used as thermal energy storage systems in solar air heaters, hypersonic wind tunnels, regenerators, and similar applications.

Selection and peer-review under responsibility of the scientific committee of the International Conference on Latest Developments in Materials & Manufacturing

1. Introduction

An economy's social and economic growth is heavily influenced by energy. As a metric of economic progress, energy consumption per capita has become an essential indicator for sustainable development worldwide. However, the oil crisis of the early 1980s prompted the globe to look for other alternative energy sources. As a result of the rapid depletion of petroleum products and their high prices, it is difficult to meet the high energy demands of a large population [8,9]. Apart from their rapid depletion and expensive pricing, traditional energy sources have many environmental effects such as GHG emissions and acid rain. There is an urgent need to explore innovative alternatives to conventional energy sources to meet rising energy needs [1,2]. All the difficulties connected with conventional energy sources may be solved by using renewable energy sources. Renewable energy sources provide greater potential for sustainable development than traditional energy sources [3]. Nature replenishes renewable energy sources such as solar, wind, tidal energy, etc. Thus their supply will not be influenced by consumption rates. Solar technology is a promising renewable energy source owing to its quantitative richness and availability [4].

Solar energy is inherently intermittent and has a low density. India's average solar radiation intensity is around 2000 kWh/m2. Solar collectors are widely used to capture solar radiations, subsequently converted into thermal energy by solar air heaters and solar water heaters. Even if solar energy is ambiguous, it is not constant everywhere. It changes depending on the location of a given area and is extremely time dependant. Solar radiation is only available for 10–12 h per day in most regions of the world, limiting continuous solar energy use. Furthermore, solar radiation is unavailable throughout the wet and cold seasons. As a result, an energy storage unit must store the energy (solar radiations) that falls on it when solar radiations are not there. Because direct storage of solar radiation is difficult, and energy conversion must be performed first [5]. Discovering effective and affordable energy storage devices is just as essential as developing new sources of thermal energy storage, and it will be a deciding element in the future energy management challenge [10]. This conversion is required by the storage mechanism that is used to store the available form of energy. The simplest approach to store solar energy is to convert solar radiation into thermal energy. The energy gained

* Corresponding author at: Dr. PhD. Associate Professsor, Mechanical Engineering, Nadar Saraswathi College of Engineering and Technology, Theni
E-mail address: radhakrishnancadcam@gmail.com (R.K. Beemaraj).

https://doi.org/10.1016/j.matpr.2021.10.018
2214-7853/
Selection and peer-review under responsibility of the scientific committee of the International Conference on Latest Developments in Materials & Manufacturing