OPEN ACCESS Freely available online

Journal of Thermodynamics & Catalysis

ISSN: 2157-7544

Short Communication

Efficiency of Thermal Energy Storage in Industrial Sustainability

Hamdy Hassan*

Department of Energy Resources Engineering, Egypt-Japan University of Science and Technology, Alexandria, Egypt

DESCRIPTION

Sensible heat thermal energy storage is a mechanism that preserves heated or cooled liquid for a subsequent energy exchange in a tank using the internal energy change of a liquid going through a temperature change without changing phase. Concentrated Solar Power Plants (CSP) is merely one of the numerous industrial uses for liquid Thermal Energy Storage (TES).

In boiling molten salt tanks, solar heat from the day is stored. The hot molten salt is then used to power turbines in a steam generator to produce electricity on demand, and the cooled molten salt is ready to be heated up again to complete the cycle. Storage tanks in current CSP systems may be large enough to provide generation for up to 15 hours [1].

The two most common types of CSP plants with storage either use heliostat mirrors to heat molten salt to 565°C in a central receiver, just like in power tower plants, or use parabolic trough mirrors to heat a collector with thermal oil Heat Transfer Fluid (HTF) to about 400°C and transfer this heat to either steam for generation or molten salt for storage. CSP facilities were only competitive with and complementary to PV, wind, and even fossil fuel power generation thanks to the seamless integration of thermal storage [2].

There are primarily two varieties of liquid TES designs in use currently. Two-tank and Single-tank thermocline designs.

For many applications, two-tank TES designs are the most widely used and widely supported systems. The hot and cold fluids are maintained in separate tanks in these designs. Two-tank systems have the benefit of being very straightforward in their design and achieving less thermal deterioration.

In single tank thermocline systems, the hot and cold fluids coexist in the same tank and are thermally stratified by density differences, creating a thermocline between the hot and cold fluids. Instead, a thermocline can be stabilized with a floating separator baffle or a filler material in dual-media thermocline TES [3].

Thermal storage systems

The dual-tank thermal storage system, which utilizes molten salt as the thermal storage medium, and steam thermal storage, which directly stores and extracts steam, are two thermal storage methods now used in commercial Concentrating Solar Power (CSP) plants [4].

The price of thermal storage tanks may increase significantly if the thermal storage capacity of steam thermal storage is increased. Steam thermal storage is therefore not suitable for long-term, large-capacity, high working parameters, and affordable thermal storage. The dual-tank thermal storage system, which employs molten salt as the thermal storage medium, is currently the most extensively used and mature thermal storage method. It is utilized mainly as an indirect thermal storage system for parabolic trough power plants that use synthetic oil as the thermal-absorbing and heat transfer fluid, as well as a direct thermal storage system for tower power plants that use molten salt as the thermal storage medium for both systems. A molten-salt dual-tank indirect thermal storage system cost 50-80 US dollars/kWh (thermal) in 2018, whereas a dual-tank direct thermal storage system cost 30-50 US dollars/kWh (thermal).

CONCLUSION

With a global share of 37%, industry is one of the largest energy users. More than 80% of this demand is fulfilled by fossil fuels. Most industrial operations can utilize the sun's heat to replace fossil fuels. Integration of a thermal energy storage system is required for industrial solar heat sustainability. Currently, only 741 solar thermal industrial plants with a total solar collectors of 662,648 m^2 (567 MWth) are operational, accounting for a very tiny portion of total world capacity. The development of thermal energy storage methods and materials that can supply this energy at a realistic economic value is one of the problems of enhancing the cost-effectiveness of solar heat applications. Sensible thermal energy storage, the oldest and most developed, has subsequently received interest due to rising need for energy sustainability. Sensible thermal energy storage systems and materials that are utilized in solar industrial applications with a specific attention

Correspondence to: Hamdy Hassan, Department of Energy Resources Engineering, Egypt-Japan University of Science and Technology, Alexandria, Egypt, E-mail: hamdy.aboali84@aun.edu.eg

Received: 02-Jan-2023, Manuscript No. JTC-23-21792; **Editor assigned:** 06-Jan-2023, PreQC No. JTC-23-21792 (PQ); **Reviewed:** 20-Jan-2023, QC No. JTC-23-21792; **Revised:** 27-Jan-2023, Manuscript No. JTC-23-21792 (R); **Published:** 03-Feb-2023, DOI: 10.35248/2157-7544.23.14.313

Citation: Hassan H (2023) Efficiency of Thermal Energy Storage in Industrial Sustainability. J Thermodyn Catal. 14: 313.

on sustainability. The purpose is to provide information for future research and development that will make solar heat a cost-effective technique of meeting the industrial sector's rising energy need.

REFERENCES

1. Jacob R, Belusko M, Fernández AI, Cabeza LF, Saman W, Bruno F. Embodied energy and cost of high temperature thermal energy storage systems for use with concentrated solar power plants. Appl Energy. 2016;180: 586-97.
2. Hoffmann JF, Fasquelle T, Goetz V, Py X. A thermocline thermal energy storage system with filler materials for concentrated solar power plants: Experimental data and numerical model sensitivity to different experimental tank scales. Appl Therm Eng. 2016;100: 753-61.
3. Hänchen M, Brückner S, Steinfeld A. High-temperature thermal storage using a packed bed of rocks–heat transfer analysis and experimental validation. Appl Therm Eng. 2011;31(10): 1798-806.
4. Guo F, Yang X, Xu L, Torrens I, Hensen J. A central solar-industrial waste heat heating system with large scale borehole thermal storage. Procedia Eng. 2017;205: 1584-91.