

Thermal Energy Storage and Molten Salt Technology



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What is Thermal Energy Storage?

- Thermal Energy Storage (TES) is the process of collecting thermal energy and storing that it for later use.
- Many different energy sources.
 - Excess heat, solar, electrically generated, etc.
- Many different storage methods.
 - Water, ice, natural rock formations, molten salts, etc.
- This presentation will focus mainly on molten salt technology.

Types of TES

➤ Sensible Heat:

- Energy stored by changing the temperature of a material.
- Energy is a function of the temperature gradient, the mass of the storage material, and its specific heat.

➤ Latent Heat:

- Energy is stored through a change of state in the material.
- Main advantage of using phase-change materials (PCM) is that they have a higher energy density.

➤ Thermochemical:

- Energy stored through chemical reactions.

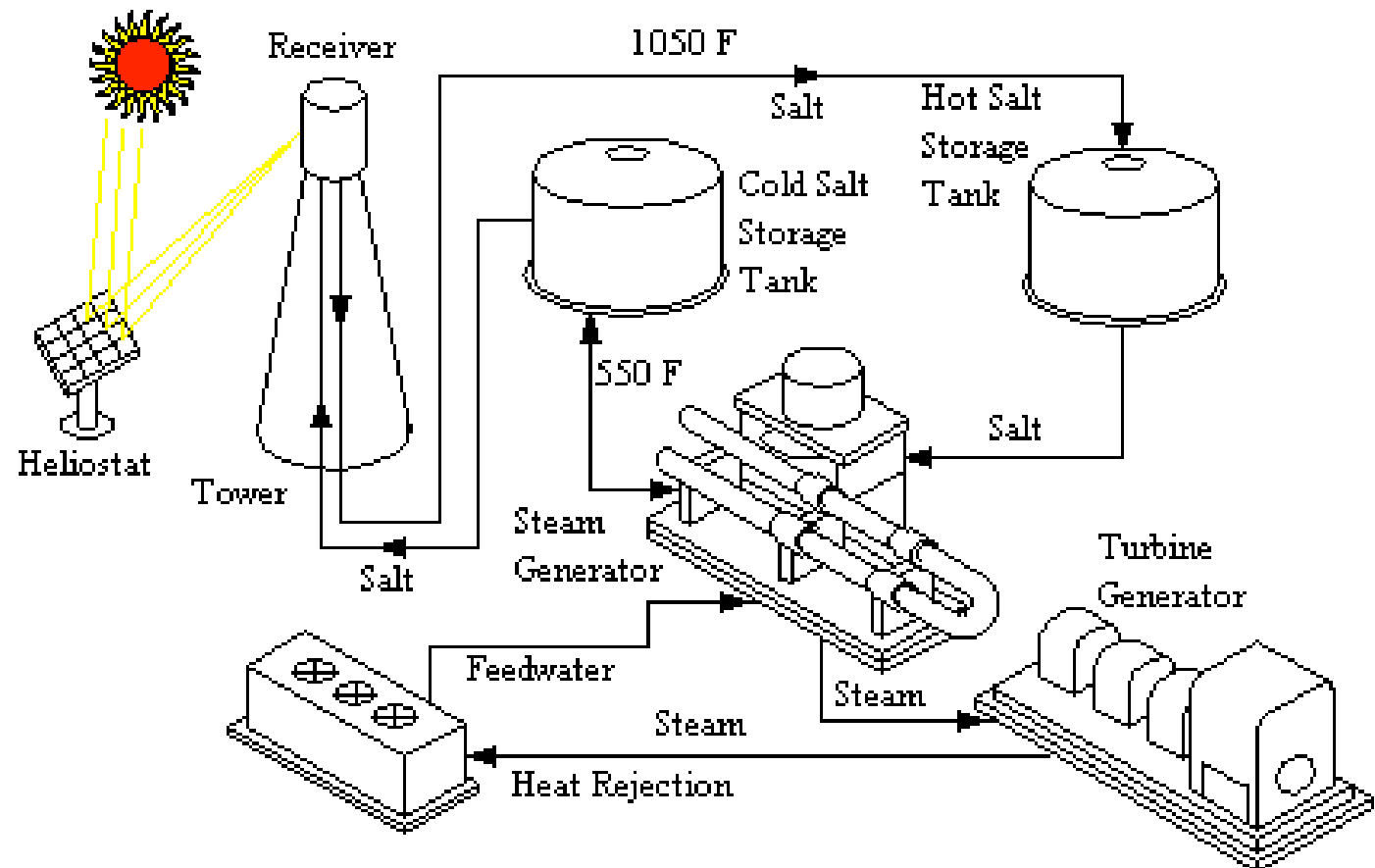
Collection Methods



Advantages of Molten Salt

- Mixture is usually 60% sodium-nitrate and 40% potassium-nitrate, commonly known as saltpeter.
- Molten salt has become standard in solar thermal.
 - Liquid up to 1050° F under atmospheric pressure.
 - Allows for up to 40% steam turbine efficiency.
 - Doesn't require expensive high-pressure piping or pumps.
- Non-toxic and non-flammable.

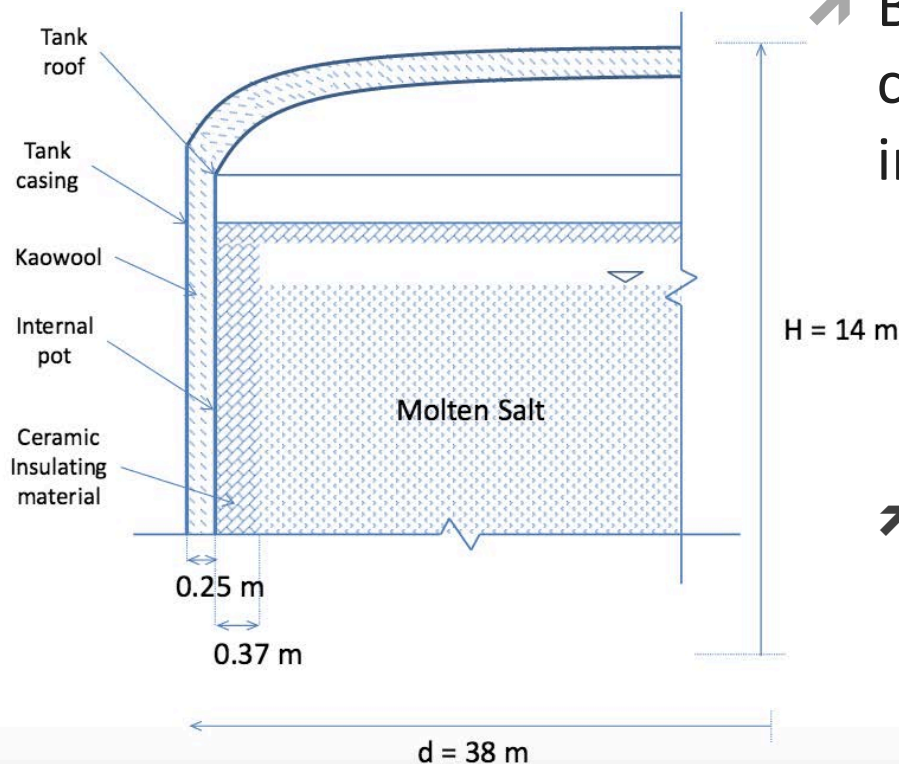
Advantages of Molten Salt



Storage Facilities

➤ Storage tanks are capable of keeping salt at liquid temperatures for up to 2 weeks. (hot tank)

➤ Built using high temperature ceramics and specially designed insulation materials



➤ Kaowool is a brand of high temperature insulation wool, which is spun from ceramic and mineral fibers

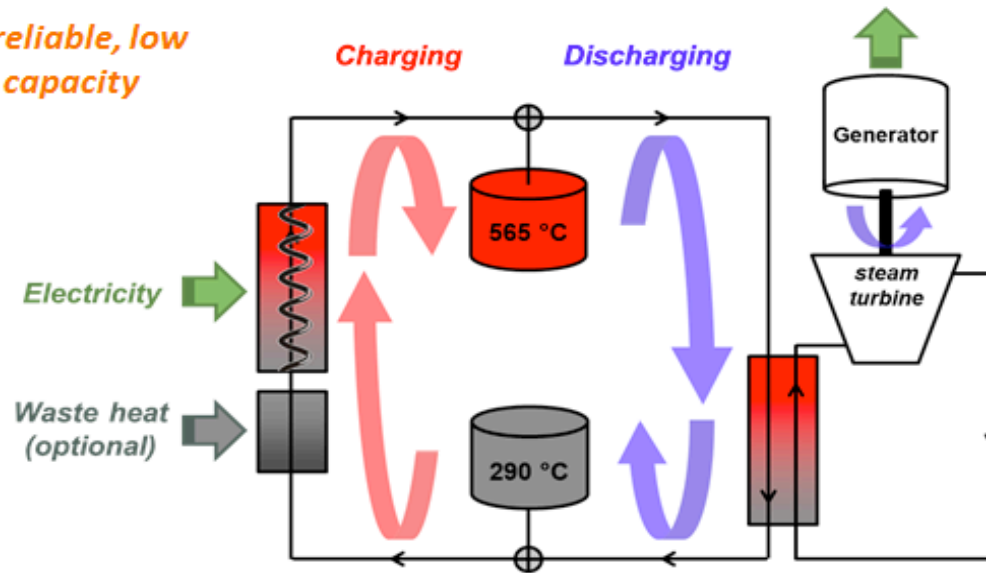
Newer Technologies

➤ Halotechnics

- Start-up company developing new salt compounds and exploring stand- alone applications.
- Plan to develop a storage system as an alternative to large battery systems.
- Currently provide a compound that holds the lowest melting temperature on the market (133 F), this opens possibilities for cost effective lower temp systems.

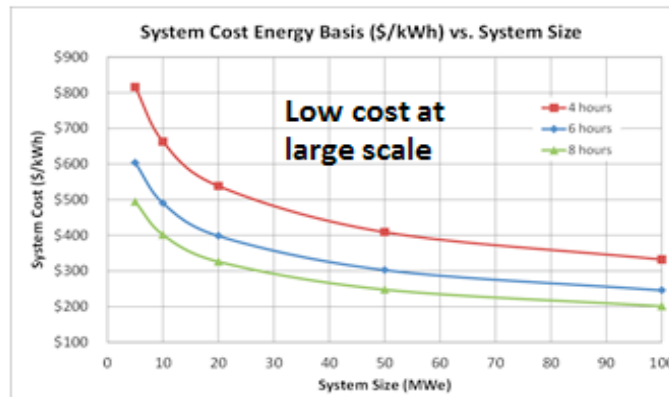
Stand Alone Salt Storage

*For reliable, low
cost capacity*



THE HALOTECHNICS ADVANTAGE

- *Efficient storage at half the cost of batteries*
- *Possible integration with thermal power plants or waste heat*
- *Proven molten salt technology*
- *1 MW pilot under development*
- *Scalable to 10-100 MW plant size*
- *4-12 hours storage output*



Freeze Protection

- One disadvantage of molten salt systems is that if any point in the system is allowed to cool below the melting point it could cause major damage.

- Protection Methods:

- Heavy piping insulation.
- Heat tracing.
- Several layers of redundancy.
- In piping and controls systems.



Sources

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