MAN molten salt energy storage (MOSAS) is an economical and flexible technology that can be integrated in various applications. It stores the heat of renewable energies directly, e.g. from concentrated solar power (CSP), or indirectly via electric heaters or heat pumps. The heat is later converted into steam to power a turbine and generate electricity when there is no sunshine or wind. Storage systems based on MAN MOSAS achieve excellent efficiency due to the high operating temperature and heat transfer properties of the molten salt.

**Benefits at a glance**

- Makes fluctuating renewable energy dispatchable
- Long-term storage of renewable energy
- Decarbonized power generation
- Retrofitting of thermal power plants, e.g. coal-fired power plants
- Grid stabilization, peak shaving of volatile electricity
- Optimized levelized costs of electricity in combination with CSP technology
Decarbonized energy for the future

Grid stabilization is needed
The energy sector is the main producer of CO₂ emissions. Renewable energies like wind and photovoltaics (PV) can be used to replace conventional power generation fuels such as coal or nuclear. However, increasing the installed capacity of wind and PV inherently leads to supply fluctuations. This makes efficient and economical storage systems like molten salt energy storage essential for grid stabilization.

Molten salt energy storage
MAN molten salt energy storage (MOSAS) uses salt as a storage medium. To begin with, liquid salt is pumped through panels or electric heaters where it is heated up to 570 °C. Then it is sent to a hot storage tank and/or steam generator where the salt is cooled down to 280 °C. The thermal energy is stored in a hot tank until it is needed. The hot molten salt is pumped to the steam generator to produce superheated steam for driving the turbine. Finally, the cold salt is kept liquid in an insulated storage tank. The necessary storage capacity can be controlled by adjusting the salt tank volume and can be customized for every application and location.

MOSAS has the ability to become a key element in the transformation of the energy market. Its main advantages are that it can be used to retrofit conventional power plants and enhance concentrated solar power applications and industrial processes.

General competence
MAN Energy Solutions provides power generation and energy storage technologies like MAN MOSAS that help our clients to reduce their energy costs and carbon emissions and improve their security of energy supply. MAN continuously optimizes all solutions from idea to marketable and production-ready product. MAN DWE is the market leader in molten salt reactor systems and has more than 70 years’ experience in salt systems. Furthermore, we offer full engineering, procurement and construction (EPC) services for MAN MOSAS plants all over the world.

We are certain that, with effective technologies, renewable energy is economically sustainable at a global level. That is why we are continuously developing our technology and looking for new and more advanced storage solutions together with our partners in power generation, industry and science.

System solutions
MAN MOSAS for conventional power plant retrofits
A truly decarbonized future is only possible by changing from fossil energy to renewable energy sources. The energy system must remain dispatchable and it is therefore necessary to store fluctuating energy. Long-term storage systems like molten salt are suitable for retrofits, e.g. by adding electric heaters or heat pumps, storage tanks and salt heat exchangers for steam generation to coal-fired power plants. Such setups allow existing power plant infrastructure like turbines to be kept in use, which reduces the investment costs of the entire system.

MAN MOSAS for concentrated solar power
In combination with concentrated solar power (CSP), MAN MOSAS offers a sustainable way to achieve low levelized costs of electricity (LCOE) in the Sun Belt region. By storing thermal energy in an integrated molten salt energy storage system, CSP plants can keep operating at nighttime or when the sun is not shining.

MAN MOSAS for energy recovery
MAN MOSAS can optimize industrial batch processes with high flue gas temperatures. By transferring flue gas energy to the molten salt storage, the fluctuation is compensated for and continuous energy production is possible, thereby reducing the costs associated with the process.

Key components
- Renewable energy
  Wind or solar energy provides the power for a MOSAS plant.
- Electric heaters
  Electric heaters powered by renewables transform surplus electricity into heat stored in molten salt.
- Heat pumps
  MOSAS in combination with heat pumps leads to further efficiency increases.
- Molten salt storage
  Hot and cold storage tanks are part of the system for adjusting the storage capacity by the tank volume.
- Molten salt heat exchangers
  Heat exchangers provide an efficient and technologically proven way to convert the heat stored by molten salt into steam.
- Steam turbines
  Steam turbines driving a generator transform the heat stored by molten salt back into electricity when needed.
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