Mueller Thermal Energy Storage (TES) systems typically involve production of ice slurry during off-peak electrical usage periods (usually at night) using lower cost electricity. This stored energy is then used during on-peak electrical usage periods for air conditioning or process cooling.

Thermal energy storage systems can be sized to operate in a load-shifting or load-leveling strategy. In a load-shifting strategy, the TES system runs during off-peak hours, eliminating electrical demand charges and reducing energy costs. In a load-leveling strategy, equipment is allowed to operate 24 hours a day, therefore, reducing equipment sizes.

Mueller® MaximICE®
ICE SLURRY APPLICATIONS

What’s Inside?

Techno-Mart 21
Seoul, Korea...............1-2

Mid-American Energy
Sioux City, Iowa..........3-4

Springfield Brewing Company
Springfield, Missouri ....5-6

MUELLER MaximICE GIVES YOU A MORE COST-EFFECTIVE WAY TO MANAGE YOUR COMFORT COOLING AND PROCESS COOLING NEEDS.
Project Description:

- Ice slurry TES system installed to provide 100% of air conditioning for a new 39-story office tower, merchandise mart, theaters, and restaurants

- Installation of eight Mueller ice slurry units in a new Korean complex

- Project payback 1.1 years

- Annual energy cost savings of over $500,000 dollars

Each ORE-400 ice slurry unit consists of four ice generators. The units sit on top of the storage tank and drop ice slurry directly into the tank. A total of eight ORE-400 units (each capable of producing 500 tons of ice) are in the project for a total of 32 ice generators.

Inside the 36,000 ton-hour storage tank, spray nozzles are shown along the top of the tank which will hold about 0.9 million gallons of 7% glycol solution.

The ice slurry exiting a generator drops directly into the storage tank. If required, the ice slurry can be pumped to one or more tanks located remotely from the ice generator.

Photograph taken from inside the tank, looking up into an ORE-400 ice slurry generator. Each ORE-400 has a capacity of about 500 tons.
The ice slurry system cools the wort from about 210°F down to 46°F. The 3-ton ice slurry generator can produce (3 tons x 24 hours x 7 days) 504 ton-hours of ice slurry per week.
Project Description:

- A 3-ton ice slurry generator
- A process cooling application
- Payback in less than two years

This 3-ton ice slurry generator and storage tank is used to cool the wort from about 210°F down to 46°F. A small 3-ton ice slurry generator can produce 504 ton-hours per week (3 tons x 24 hours x 7 days) for applications in process cooling and any short-duration load. These units have been installed in multiples for projects needing 6 tons or 9 tons of ice slurry.

These Mueller tanks serve as hot water storage tanks. The hot water is produced by a Mueller refrigeration heat recovery system on the building's roof.

This Mueller plate heat exchanger receives cold solution from the ice tank to cool the wort.

The ice slurry is pumped into the top of the storage tank. Note the spray ball which distributes the warm return solution over the ice.
The ice generator acts both as a chiller and an ice slurry generator. The compressor/condenser package consists of four 1,000-ton screw machines with water-cooled condensers. Design engineers use the Mueller MaximICE ice slurry generator in many different arrangements.
Project Description:

Replaced an existing swept-surface ice harvester system with a Mueller ice slurry system at Mid-American Energy in Sioux City, Iowa.

This is one of two 50-ton screw compressor machines which drive two 50-ton ice slurry machines at Mid-American Energy.

This is one of two 50-ton ice slurry generators installed at Mid-American Energy in 1996.

Mr. Rick Book of Mid-American Energy demonstrates the ice slurry system to visitors from China.

The ice slurry exiting a generator drops directly into the storage tank. If required, the ice slurry can be pumped to one or more tanks located remotely from the ice generator.
The system makes ice slurry as required by the building load. The system automatically checks the ice level in the tank every hour and generates ice slurry as needed.
Mueller MaximICE Schematic of Operation

1. **Compressor/Condenser**
   Supplies refrigerant to the evaporator.

2. **MaximICE Orbital Rod Evaporator (ORE)**
   Uses a water and freeze depressant mixture to produce a pumpable ice slurry. Ice slurry makes MaximICE ideal for use with low-temperature air systems.

3. **Insulated Ice Storage Tank**
   Separates ice manufacturing from ice usage. The tank contains a glycol/water solution which is converted to an ice slurry in the MaximICE evaporator. The slurry melts as the stored ice absorbs the heat of the cooling load.

4. **Load Control Pump and Valve**
   Controls the supply temperature (TS) to the load.

5. **Plate Heat Exchanger**
   Separates the storage tank from the cooling load and prevents cross contamination between the ice-melting loop and the cooling load.

**Project Load**
Defined by client.

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**Ice Slurry Generator Standard Production Sizes**

<table>
<thead>
<tr>
<th>Model</th>
<th>Tonnage</th>
<th>Model</th>
<th>Tonnage</th>
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<tbody>
<tr>
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<td>ORE-200</td>
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<tr>
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<td>ORE-300</td>
<td>265 to 390</td>
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<td>ORE-400</td>
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<td>ORE-100</td>
<td>70 to 130</td>
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