

MUELLER® MaximICE® ICE SLURRY APPLICATIONS



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

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®

THERMAL STORAGE SYSTEMS

Techno-Mart 21 Seoul, Korea

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



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.



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.



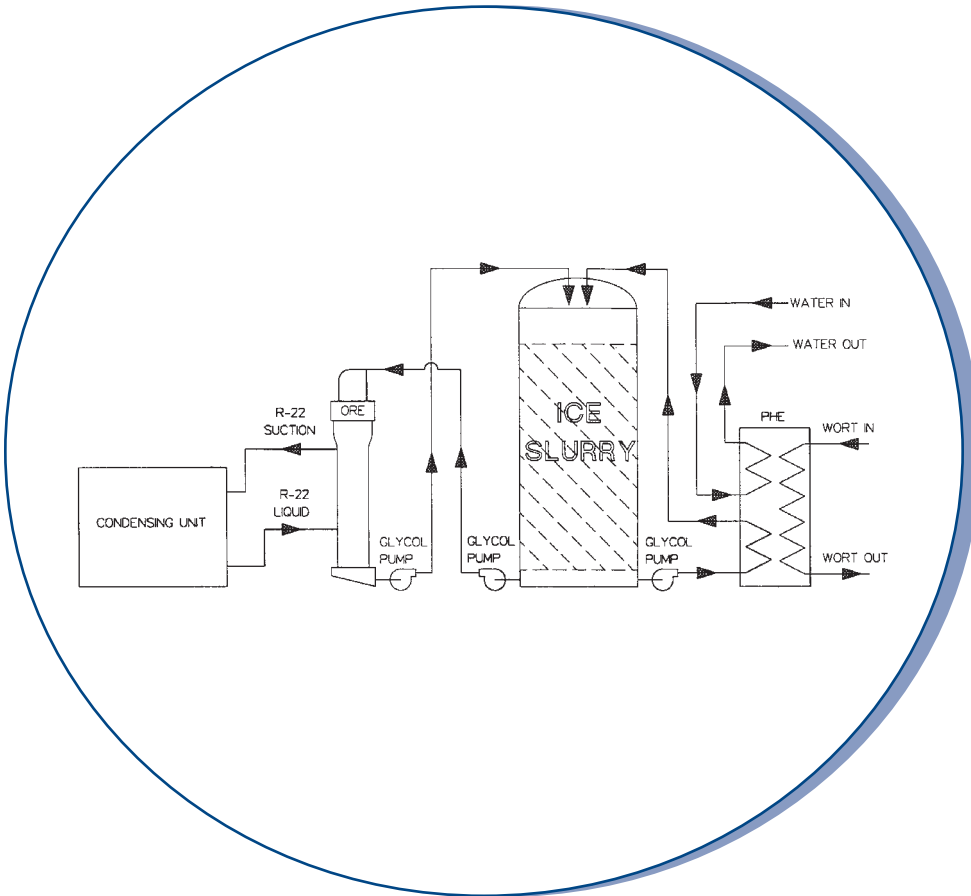
Inside the 36,000 ton-hour storage tank. Spray nozzles are shown along the top of the tank which will hold about 0.9 million gallons of 7% glycol solution.



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.

Typical Micro-Brewery Schematic:

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.



Springfield Brewing Company Springfield, Missouri

Project Scope:

- Installed a 3-ton ice slurry generator
- Installed a refrigeration heat recovery system
- System designed to minimize energy consumption
- System start-up December 1997

Springfield Brewing Company Springfield, Missouri

Project Description:

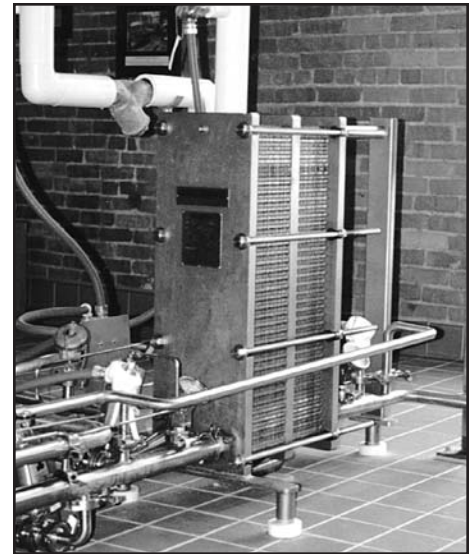
- A 3-ton ice slurry generator
- A process cooling application
- Payback in less than two years



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.

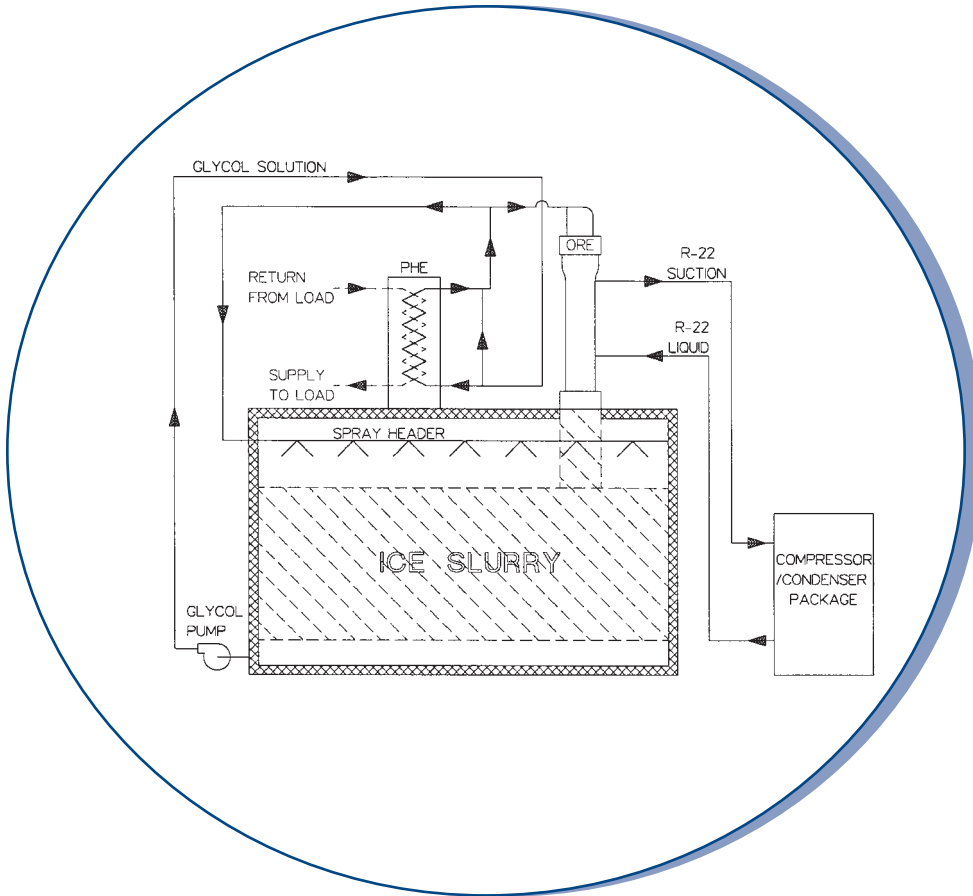


The ice slurry is pumped into the top of the storage tank. Note the spray ball which distributes the warm return solution over the ice.

Project Schematic:

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.



Techno-Mart 21 Seoul, Korea

Project Scope:

- Generating capacity of 4,000 tons of ice slurry

- Ten-story merchandise mart

- Thirty-nine story office tower

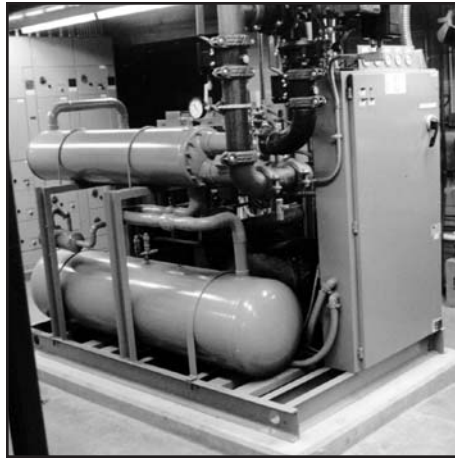
- 2.8 million square feet (total)

- System start-up April 1998

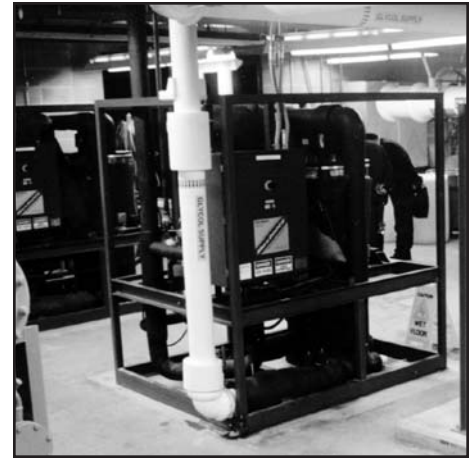
Mid-American Energy Sioux City, Iowa

Project Description:

Replaced an existing swept-surface ice harvester system with a **Mueller** ice slurry system



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.



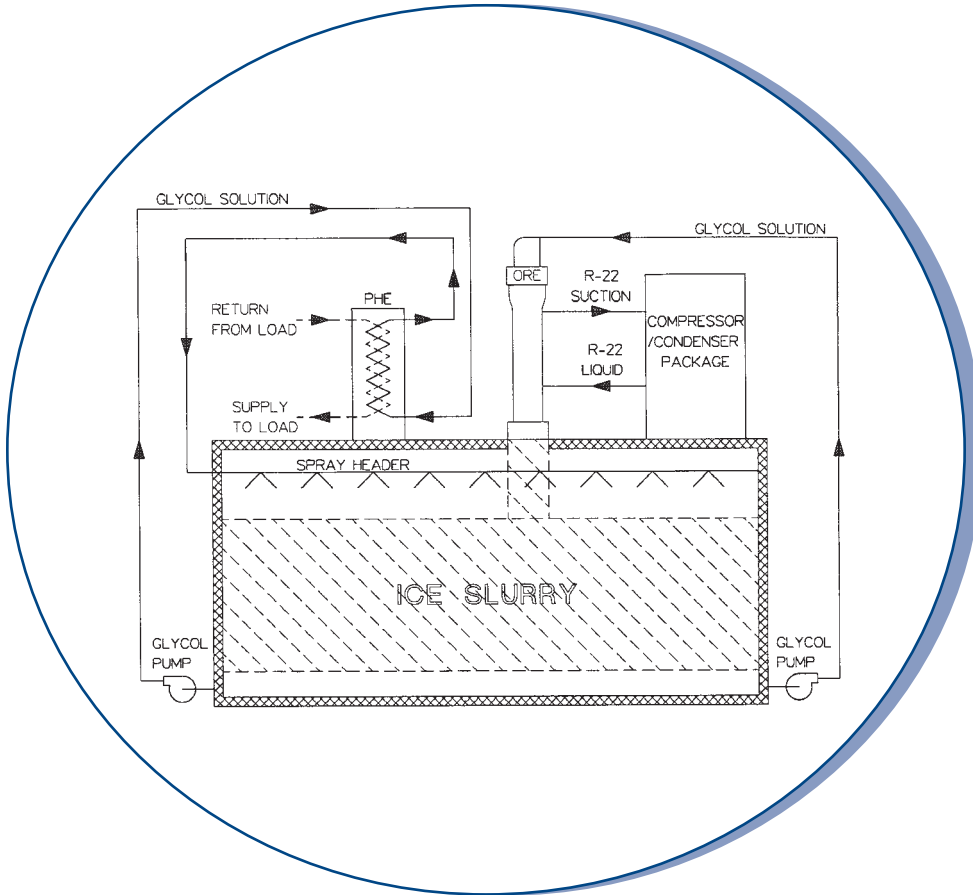
Mr. Rick Book of Mid-American Energy demonstrates the ice slurry system to visitors from China.



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.

Project Schematic:

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.



Mid-American Energy Sioux City, Iowa

Project Scope:

- Installed two ORE-50 **MaximICE** ice slurry units

- Installed two compressor condenser skids

- Daily TES cycle

- Existing ice storage tank used

- Existing baseload chiller used

- Fully automated, unmanned TES installation

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

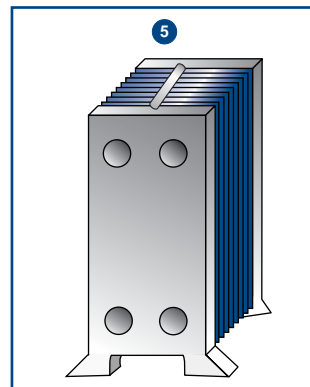
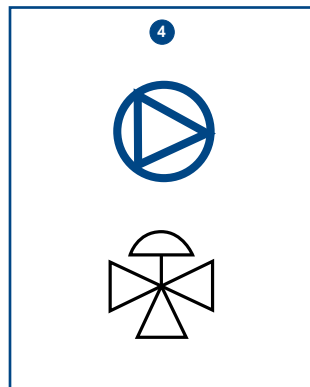
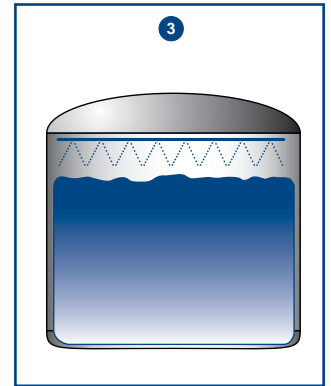
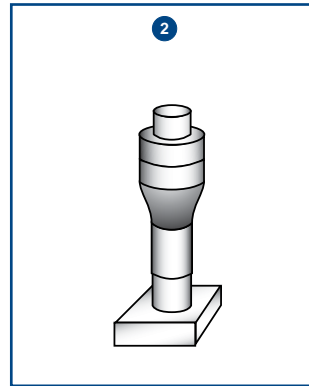
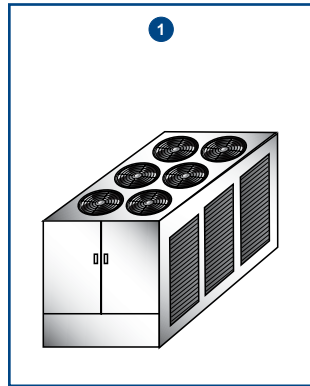
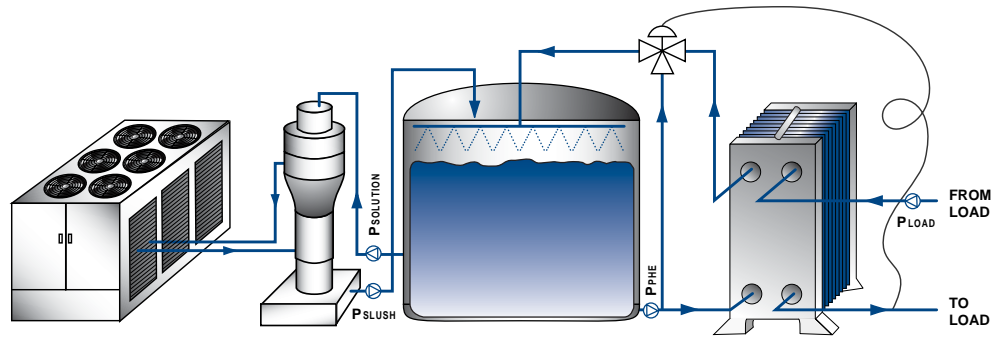
Load Control Pump and Valve
controls the supply temperature (TS)
to the load.

5

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

Project Load
Defined by client.

7



Ice Slurry Generator Standard Production Sizes

Model	Tonnage	Model	Tonnage
ORE-3	3	ORE-200	140 to 200
ORE-25	15 to 33	ORE-300	265 to 390
ORE-50	35 to 65	ORE-400	400 to 520
ORE-100	70 to 130		

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