



CASE STUDY

Sweet results: BAC's ice thermal storage reduces energy costs and improves reliability at Penn State Berkey Creamery

OVERVIEW

The Penn State Berkey Creamery implemented a BAC's ice thermal storage solution to reduce energy costs, maintain consistent process temperatures, and improve system reliability for its batch refrigeration operations. Installed in 2024 at Penn State's main campus in State College, Pennsylvania, the system delivers measurable electrical cost savings while ensuring uninterrupted cooling for critical ice cream production processes. By leveraging off-peak electricity and using stored thermal energy during peak demand hours, the creamery achieved a more efficient, resilient, and flexible refrigeration system, tailored specifically to its unique operational needs.

BACKGROUND

Founded in 1865, the Penn State Berkey Creamery is the largest university-run creamery in the United States and has long been an integral part of Penn State's Food Science program. Now operating out of the Food Science Building constructed in 2006, the facility produces ice cream and dairy products using batch processes that require precise and reliable cooling. The creamery experiences high peak refrigeration loads during batch production periods, followed by off-peak periods that make it an ideal candidate for ice thermal storage. Additionally, rising utility costs and peak-demand charges from the local utility drove the need for a solution that could reduce electrical demand without compromising product quality or uptime.

"Penn State used the original installation in 2006 as an opportunity to install an ice thermal storage unit, effectively eliminating an entire compressor and downsizing the refrigeration equipment in the engine room."

—Brendan McNamara, IRESCO, BAC local representative

Penn State sought a modernized system that could:

- Handle peak energy demands efficiently
- Maintain a constant low-temperature supply for food processing
- Integrate seamlessly with existing ammonia refrigeration infrastructure
- Provide operational redundancy in the event of power interruptions



Selection:

TSU-235E



CASE STUDY

SOLUTION

The installed solution features BAC's ice thermal storage unit, model TSU-235E, designed for external melt operation and ideal for batch refrigeration processes requiring a constant low supply temperature. This was in part selected due to the use of ammonia, already employed elsewhere in the creamery. BAC's TSU offered superior thermal conductivity, faster ice formation, colder melt-out temperatures, compact design, and overall improved energy efficiency compared to alternative plastic or glycol based storage systems. The system uses ammonia to build ice around the stainless steel coils, then melts the ice using warm process water to produce 34°F "sweet water" to cool the ice cream mix tank jacket during pasteurization and production.

Key system details include:

- **Cooling capacity:** 214 ton-hours (753 kWh)
- **Ice storage capacity:** 17,826 lbs. of ice
- **Refrigerant:** Pump-recirculated ammonia (18.1°F)
- **Ice build time:** Approximately 12 hours during off-peak periods
- **Installation location:** Rooftop mounted for layout flexibility

CUSTOMER NEEDS & EXPECTATIONS



**Reliability
and redundancy**



**Reduced energy
costs**



**Layout
Flexibility**

CONCLUSION

This project demonstrates how external melt technology provides a consistent 34°F supply temperature, ensuring reliable product quality and repeatable batch processing. The integration of ice thermal storage allows the facility to maintain operations during power outages and peak demand, preventing downtime and product loss. By leveraging off-peak energy, ammonia-based ice production, and BAC's proven technology, the creamery achieved lower operating costs, improved reliability, and greater operational flexibility, highlighting ice thermal storage as a practical solution for managing fluctuating refrigeration loads.

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BAC's TSU ice thermal storage solution made sense for this application because it checked all the boxes. It fit the available space, integrated well with the existing ammonia system, and gave Penn State a reliable way to manage peak loads without adding unnecessary equipment. From an installation and performance standpoint, it was a smart, efficient choice for the Creamery.

Justin Stone

Regional Service Manager, DeVault
(Contracted project partner)

About BAC:

BAC is proud to be the world's cooling partner. Since 1938 we have been creating sustainable comfort cooling, process cooling, and refrigeration solutions for the most essential and demanding environments on earth. From pioneering evaporative cooling products to leading the industry toward a better tomorrow, BAC innovates for the future, so we can all advance together.