



CASE STUDY

Camp Pendleton

Third-Party Field Demonstration Study Verifies a 30% Energy Savings with the Implementation of Viking Cold's Thermal Energy Storage System at Camp Pendleton

In 2016, third-party engineering firm, ASWB, was selected by San Diego Gas & Electric (SDG&E) Emerging Technology Program (ETP) to conduct a Measurement and Verification (M&V) analysis of Viking Cold's phase change material (PCM) technology. The purpose of the study was to determine the effectiveness of passive PCM in cold storage freezer applications and Camp Pendleton, San Diego County, CA, had just recently installed the Thermal Energy Storage (TES) solution inside its mess hall, making the base an ideal testing site.

PCM is designed to melt and freeze at a specified temperature based on the specific needs of a particular freezer. By increasing the thermal storage capacity of the freezer, refrigeration load is able to shift to periods where energy is cheaper, while simultaneously improving system efficiency.

The Challenge:

The Marine Corps Base Camp Pendleton hosts a self-sustaining water supply, sewage treatment plants, telephone, and electrical systems for its 125,547 acres and 2,600 buildings. With a daytime population of more than 70,000, Camp Pendleton must maintain its self-sustaining capabilities while complying with a strict energy and water strategy.

“Our mission and ability to sustain mission readiness depends on vital energy and water resources. Marines must value these resources to maintain our expeditionary edge.”

Marine Corps Energy Strategy Statement

To meet their energy requirements, Camp Pendleton is committed to the installation of renewable energy systems across the base and their mess hall was no exception. The TES strategy for the mess hall was to optimize and complement the existing refrigeration system through the use of controls, sensors, and increased thermal capacity to reduce the energy consumption without modifying refrigeration system hours of operation.

The Solution:

The Viking Cold team installed its turnkey energy-management solution in Camp Pendleton’s walk-in freezer, located inside the mess hall. The PCM cells are arranged in modules that were installed on the top beam of the racking system where the supply air fans freeze the PCM after the stored product melts the material via convection when the evaporator fans are not operational. Once the thermal capacity is reached, the evaporator fans operate and return the PCM back to its solid—or frozen—state.

The Field Demonstration Study Results:

ASWB conducted pre-installation monitoring to establish baseline data. During this period, the average daily kWh usage including defrost energy was approximately 74 kWh. In the post-installation monitoring period, the daily average kWh dropped to approximately 52 kWh, which indicates a 30% reduction in energy use.

This energy reduction can be attributed to the following:

- Reduced compressor run time
- Operating at slightly warmer average evaporator temperatures (made possible by the effect of the PCM cells), the effect of which is to increase the capacity of the refrigeration system as well as reducing heat conduction through the freezer’s exterior envelope
- Much lower thermal resistance (R-Value) of the PCM cells compared to stored food product, allowing for faster heat transfer
- Significantly less time spent in defrost mode, resulting in less heat being added to the freezer by the defrost heaters, and consequently less refrigeration required to recover from those defrost periods

“The benefits of the technology include reduced refrigeration equipment run time and increased product safety during power emergencies due to the thermal storage capabilities of the solution.”

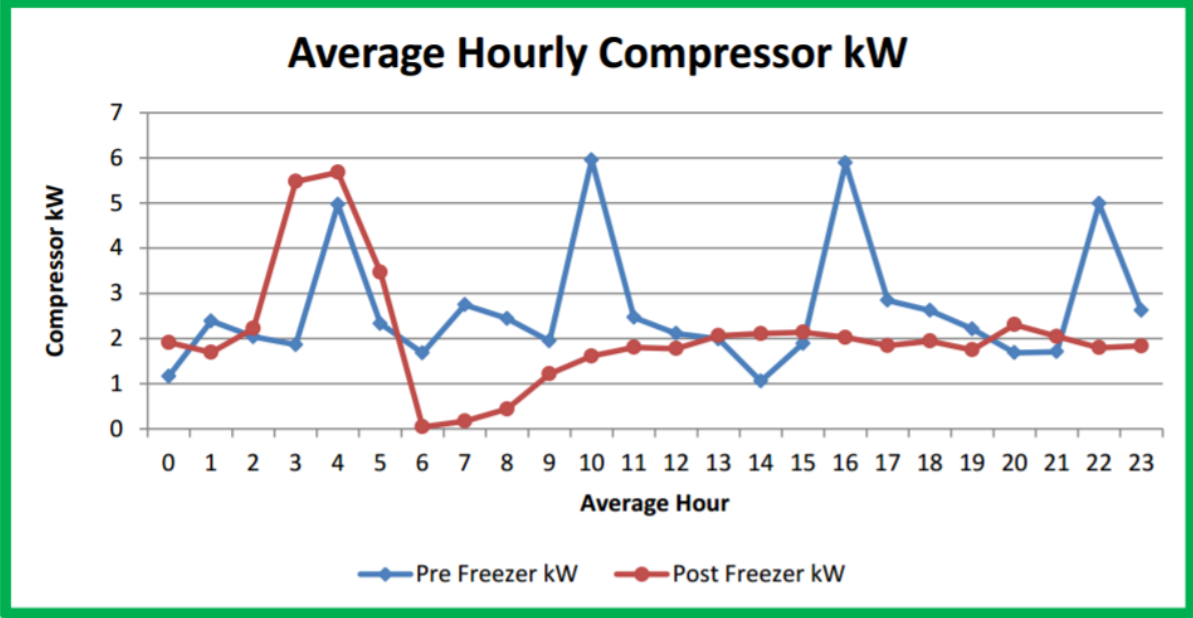
- JOHN BAFFA,

Professional Engineer

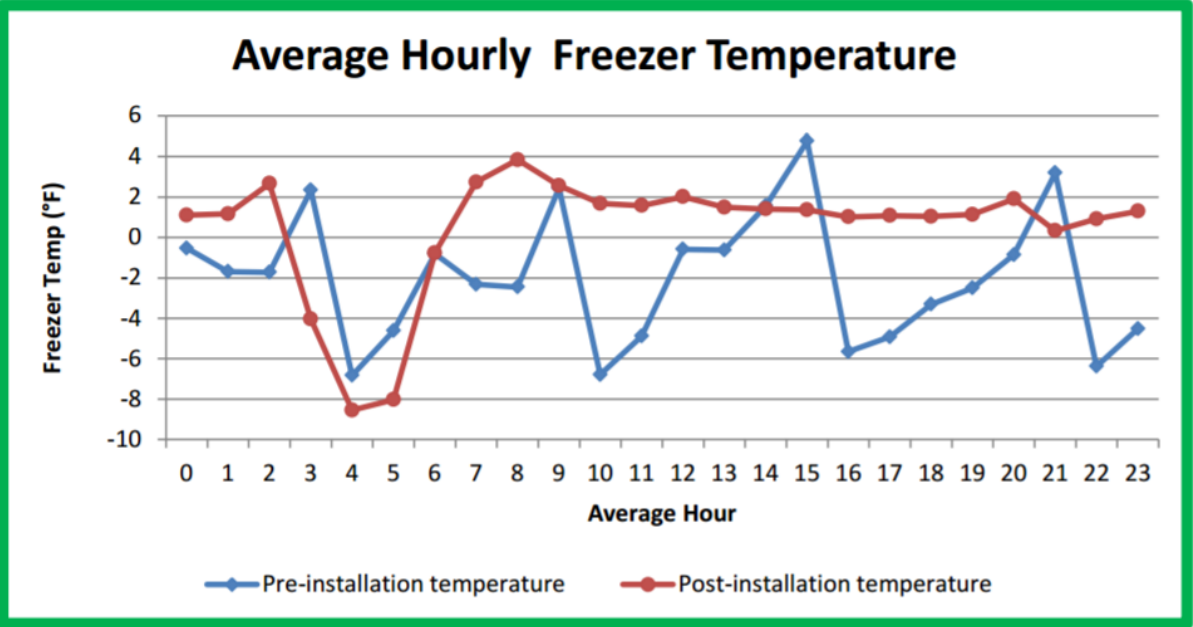
ASWB Engineering



Field Study Results:

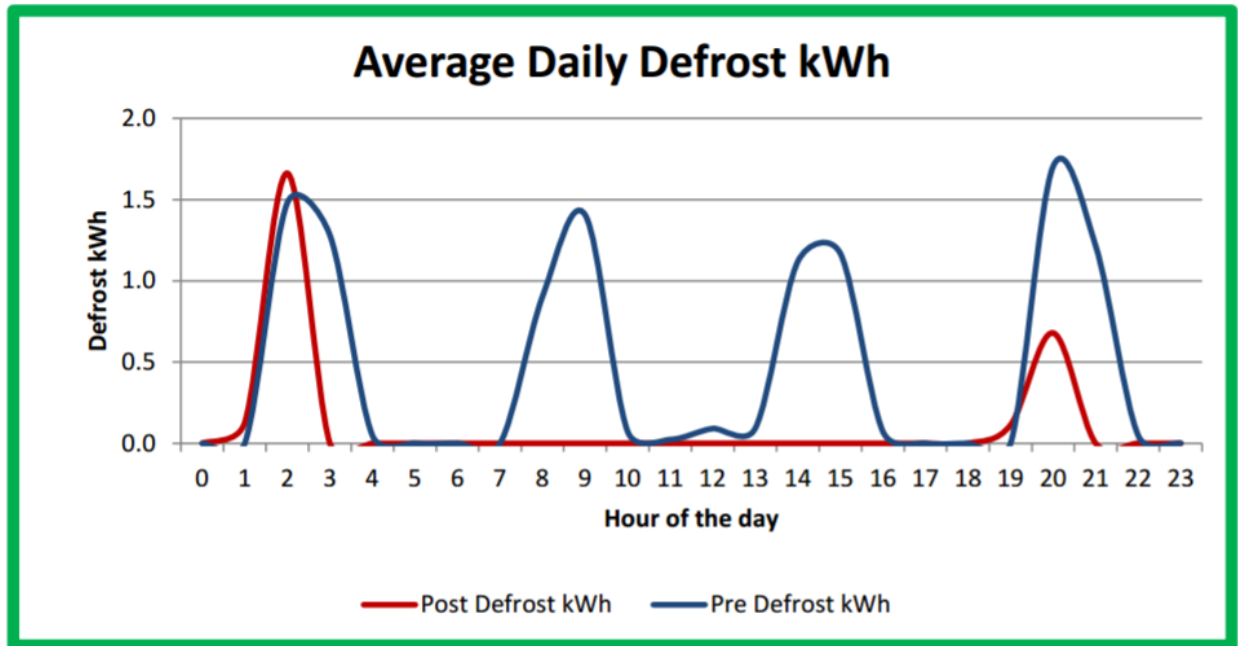


PCM enabled greater system efficiency with less run time.



System enabled slightly elevated average room temperature while maintaining target product temperature.





Significantly less defrost time was needed to maintain a frost-free evaporator.

Upon completion of the field demonstration study, ASWB recommended that the TES system in cold storage freezer applications qualify for California utility incentive programs as part of the California Energy Commission Emerging Technologies initiative.

For Camp Pendleton, in addition to reducing energy consumption with 30%, the marines are also leveraging the monitoring and reporting capabilities of the controls which feature predictive tools and alarms that can provide early detection of potential problems within the system.

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