

GENESYS® SUBCRITICAL CO₂: MAXIMIZE ENERGY EFFICIENCY



MARKET OVERVIEW

PHARMACY

Pharmacies serve as essential providers of prescription medications, over-the-counter drugs, and various health care products. Additionally, they offer a selection of snacks and household essentials for customer convenience. To maintain the quality of certain medications, snacks, and beverages, a cooling system is required. Given that these establishments are typically small-format retail stores, utilizing less than 25,000 square feet, the refrigeration system must be compact and capable of performing multiple functions beyond cooling the refrigerated areas.



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CLIENT

Walgreens is one of the United States' largest pharmacy chains. It has more than 8,500 locations across the United States. Its locations are small-format retail stores with an average size of 14,500 ft².

REQUIREMENT

Replace an existing system during a comprehensive refresh of a store in Evanston, IL, with a focus on energy efficiency.



CHALLENGES

- Energy Efficiency
 - The store in Evanston, IL, uses wind turbines and solar panels to limit energy purchased from the city. The chosen refrigeration system needed to be efficient enough to ensure that the energy produced by the solar panels and turbines exceeds what is used by the store.
- System Size
 - The previous system served multiple functions beyond cooling the freezer and walk-in cooler. It was connected to geothermal pumps to reclaim heat for use within the store. The reclaimed heat is used to warm the store during cooler months and to heat domestic water year-round. During the warmer months, a cold water loop for the store's air conditioning is cooled by the system. In addition to fitting into the existing connections of the previous system, the new system needed to fit within a footprint of 3 feet wide by 7 feet long.



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SOLUTION

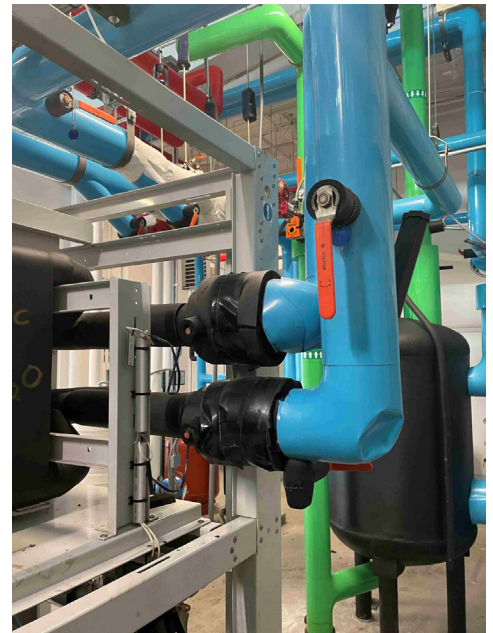
A Zero Zone Genesys™ CO₂ system met the needs for comprehensive refresh. CO₂ systems operate at peak efficiency in cooler climates. This site typically remains below CO₂'s critical temperature of 87.8°F year-round, which is the most energy-efficient mode for these systems. Since CO₂ remains in a liquid state for most of the refrigeration cycle in subcritical mode, the overall system pressure is lower, reducing the workload on the compressors.

Heat reclamation is an innovative process that enhances energy efficiency by reusing excess heat for other purposes. In a refrigeration system, refrigerant absorbs heat from areas that need cooling. This heat is typically removed by the condenser, which releases it into the environment. However, with heat reclamation, this 'waste heat' is captured and repurposed.

This Genesys™ CO₂ system utilizes heat reclamation to heat domestic hot water and the building during winter, thereby eliminating the need for a separate water heater or furnace. This approach not only reduces energy consumption but also lowers operational costs and environmental impact.

During the summer, this system uses a cold water loop to circulate cooling for the store's air conditioning system. This process eliminates the need for a separate HVAC system, ensuring efficient and cost-effective cooling.

Although the Zero Zone Genesys™ CO₂ system has a standard platform, we specialize in custom-engineered refrigeration solutions. Zero Zone designed, built, and installed this Genesys™ CO₂ system to fit the same footprint and connections as the previous system. We are committed to working closely with you to understand and be responsive to your specific needs.



SITE FEATURES

Viewable through the second-floor windows, this system is color-coded to show the different sides to this system. The orange pipes carry the heat for the hot water, the red pipes highlight the store heating system, and the green is for the geothermal system. The blue pipes highlight the refrigerated portion for the store's air conditioning system. This fully functional retail store serves as a model for utilizing renewable energy while educating the public on its practical applications.



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SYSTEM FEATURES

- **CO₂ as a refrigerant** is environmentally friendly and energy-efficient.
 - CO₂ can be up to 20% more efficient than traditional HFC systems.
- **Waste heat reclamation** captures waste heat to repurpose it for heating spaces and water.
 - On average, the energy savings achieved through heat reclamation technology are 15-20%.
- **A geothermal heat pump** stores heat energy for later use.
 - Zero Zone engineers custom-tailored this Genesys™ CO₂ system's waste heat for use within the site's underground geothermal heat storage system.
- **An E3 Supervisory Control Panel** reduces the complexity of system operation and management.
 - This Zero Zone Genesys™ Natural Refrigeration Solution uses an advanced E3 controller. Not only does this controller have a touch-screen display, but it also has a web-accessible interface. This allows the user to remotely monitor and control the entire system. The controller allows this Genesys™ system to optimize its energy usage through advanced refrigeration algorithms and building control strategies. This new controller provides faster response times should any problems be detected.



SPECIALIZING IN CO₂ REFRIGERATION

Natural refrigerants are becoming the standard as the industry moves away from systems that traditionally use hydrofluorocarbons (HFCs). Zero Zone offers a training course in CO₂ systems to prepare current and next generation-technicians for the future of refrigeration. Visit our website at <https://www.zero-zone.com/co2-training/> to see our current openings and register for a class.

Although CO₂ systems are appearing more often now, they are not new. Genesys™ Natural Refrigeration Solutions made its debut over a decade ago, and Zero Zone has standardized a platform for CO₂ systems. Zero Zone became the first to offer 90-bar rated CO₂ display cases in September of 2024.

To learn more about 90-bar and its application, visit our webpage: <https://www.zero-zone.com/90-bar/>.



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ZERO ZONE IS COMMITTED TO SUSTAINABILITY

Zero Zone is committed to designing and implementing energy-efficient and sustainable refrigeration systems. By using environmentally friendly refrigerants, we reduce the negative impact refrigeration can have on the environment. Incorporating advanced controls paired with components that respond to system demand further decreases environmental impact by using only the required energy to run the system. Zero Zone has always been green; we believe that a sustainable future relies on innovation, and we continually advance our systems with modern technology to create refrigeration solutions that are not only environmentally friendly but also cost-effective.

For more information about this Case Study,
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