



CO2 Transcritical



Cold Food Storage Facility

CO2 Refrigeration System for Meal Kit Fulfillment Center

Comprehensive services for a groundbreaking design - build project.

CoolSys made a noteworthy contribution to the rapidly growing field of sustainable buildings and natural refrigeration with a unique design-build refrigeration and controls project that utilizes one of the largest transcritical CO2 installations in U.S. history. The experts at CoolSys provided full building MEP and Refrigeration engineering design, handled energy management system design and installation, procured equipment, installed refrigeration systems and managed the refrigeration and control/EMS process for a new, 325,000 square foot, first of its kind facility for processing, cooking, freezing and shipping high quality meal kits.

Located in Goodyear, Arizona, the facility is not only notable for its massive CO2 refrigeration system but for housing one of the largest industrial kitchens in North America. The project was a highly complex undertaking, with about half of the square footage consisting of refrigerated storage space and the other half a sophisticated food preparation area.

The Facility Houses One Of The Largest Industrial Kitchens In North America.

Project Challenge: Going Sub-Zero in the Desert

One of the greatest challenges CoolSys faced in both design and implementation for the facility was its location. Until recently, it was considered folly to attempt a transcritical CO₂ refrigeration system capable of reaching -10°F — and particularly one the size of this project — in the inhospitable climate of the Arizona desert, where summertime temperatures can reach 120° or more. It was widely believed to be impossible to create an energy-efficient transcritical CO₂ system in such a hot climate. Those assumptions, however, have been proven wrong.

80°

TEMPERATURE VARIATIONS



In contrast to the extreme summer heat, winter temperatures in the Arizona desert can drop to near freezing, requiring equipment that can handle outside temperature variations of 80° or more.

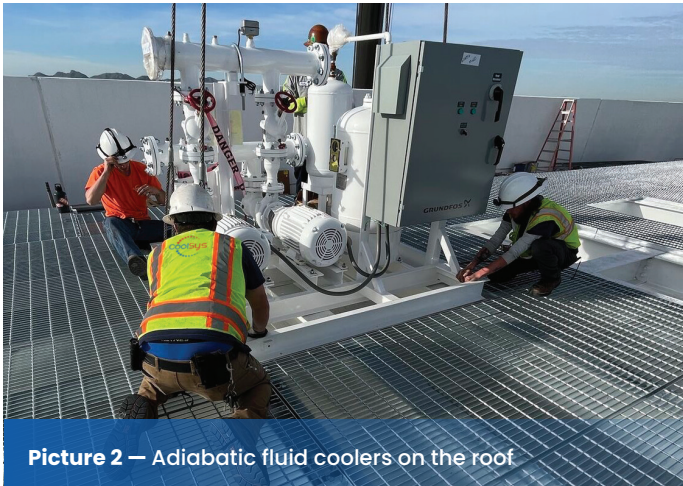
CoolSys Solution: A Refrigeration System That Beats the Heat

In order to keep 18 rooms comprising approximately 160,000 square feet of refrigerated space in the massive facility at the required temperatures, CoolSys procured and installed four transcritical CO₂ rack systems, totaling over 16,000 MBH of compressor capacity, in the building's machine room. Each of the four racks utilizes a rooftop adiabatic gas cooler to reject heat. In total, the system supplies refrigeration for 78 evaporator coils in the refrigerated sections of the building as shown in [Picture 1](#). CoolSys recommended adiabatic gas coolers for this project to enable efficient refrigeration performance in the desert. Adiabatic systems also use much less water—a precious resource in the harsh Arizona climate—than more conventional evaporative condensers.



Picture 1 — Four gas coolers.

The team also installed two adiabatic fluid coolers on the roof as shown in **Picture 2** that provided condenser water to condensing units for eight blast chillers in the food preparation area of the facility. The pump skids that circulate water to each condensing unit are in the foreground as shown in **Picture 3**.



Inside the building, CoolSys installed 78 evaporator coils that supply refrigeration for about half of the 352,000-square-foot facility as shown in **Picture 4**.

In addition to the rooftop systems and evaporator coils, CoolSys installed dedicated, packaged CO2 condensing units and associated piping for two food processing spiral chillers, as well as stainless steel piping, a building control system—including complete refrigeration system energy management—and leak detection in each refrigerated space.



Project Challenge: Balancing Quality & Economic Considerations

Due to ongoing worldwide economic and supply-chain challenges—as well as the size and scope of the project—the customer was, understandably, conscious of staying within budget while maintaining its high standards for quality and safety.



Project Solution: Flexible Options & Increased Savings



\$1 MILLION
IN SAVINGS

CoolSys worked closely with the client's project managers to understand and meet its needs for equipment, budget and so forth. As with all of its customers, CoolSys sourced equipment from a wide variety of highly regarded manufacturers to get the best-performing components for each job at a price that fit within the client's budget.

The result was a groundbreaking project that came in on-spec and successfully fulfilled the client's expectations. In addition, value engineering activities during the design phase of the project resulted in \$1 million in savings compared with the original design.



Flexible & Scalable Design-Build Services

CoolSys is known nationwide for its broad range of design-build services for a wide variety of client needs, from the massive, single-site build-out in Arizona to coordinated, simultaneous work in hundreds of sites across the country and everything in between. The company offers end-to-end design-build for refrigeration projects, professional project management (with or without equipment purchasing) and national refrigeration programs—including refrigeration conversions.

Project Highlights

Impressive results from
a job well done.

- ☒ Sustainable building design
- ☒ End-to-end project management
- ☒ On-spec delivery and budget
- ☒ Client expectations successfully met

325,000 SqFt
TOTAL FOOTPRINT

160,000 SqFt
REFRIGERATED SPACE



Unlike most of its competitors, CoolSys has its own engineering division, CoolSys Energy Design (CED) and its own energy optimization division, CoolSys Energy Solutions (CES). The team offers standalone services and also works in tandem with other CoolSys divisions on engineering and design-build projects. In addition, CoolSys is recognized nationwide as a leader in transcritical CO₂ technology in the U.S., with more than 500 of its technicians trained in CO₂ technology and more than 250 CO₂ projects completed around the country.

**ONE OF THE LARGEST
TRANSCRITICAL CO₂
SYSTEMS IN THE U.S.**

\$1,000,000+
CAPITAL COST AVOIDANCE



64,000+ CFM
KITCHEN EXHAUSTS



85,000+ CFM
OUTDOOR AIR



18 ROOMS



40 PACKAGED HVAC UNITS



78 EVAPORATOR COILS