

EFFICIENT AND SUSTAINABLE REFRIGERATION FOR COLD STORAGE WAREHOUSE

CLIENT

Amound World is a cold storage warehouse located in Madera, California. It was built by Origo Investments and provides 500,000 ft² for up to 100 million pounds of storage for almonds, pistachios, walnuts, and grapes.



CHALLENGES

A warm wind rushes through an almond orchard in the Central Valley of California. John, an almond farmer and the son of one, hears the leaves fluttering in the wind as a whisper, foretelling a plentiful harvest. John reaches up to pull a branch down for a closer look at his crop. His cheeks lift unconsciously as he remembers watching his father plant this tree. Then he looks toward some trees his grandfather planted and takes a deep breath before gently exhaling.



The almond industry established itself in the Central Valley at the turn of the 20th century. The valley provides a climate like that of the tree's origin in the Mediterranean. Currently, 80% of the world's almonds are produced in California. This amounts to around 2.6 billion meat pounds (weight of shelled nuts) annually. But with a narrow window of harvest from August to October, farmers like John worry about storage for the rest of the year.

The price of crops is at its lowest after harvest and at its highest before the next harvest. Farmers receive payment only after the delivery of their shipment, which incentivizes them to sell immediately after harvest. Selling after harvest also protects crops from insects, mold, loss of freshness, and water loss during storage. Lack of proper storage can lead crops to lose 10–15% of their water weight in the first 30 days, reducing the farmer's return. Farmers currently fumigate crops stored outside to prevent some crop loss, but this does not prevent the loss of freshness. Maintaining a consistent price, keeping their crops fresh, and meeting demand throughout the year is a goal for farmers.



Genesys[™]
natural by



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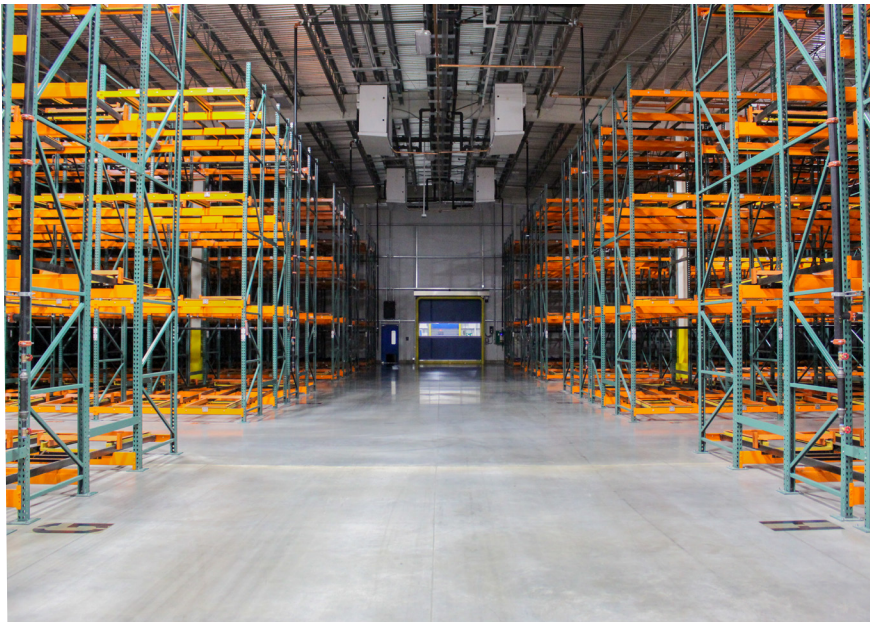
SOLUTIONS

Origo Investment decided to provide a solution for farmers by commissioning the construction of Amond World, a cold storage facility. Origo's goal was to ease the supply-demand bottleneck by creating a large-scale, 24/7 industrial temperature and humidity-controlled FDA-compliant cold storage facility.

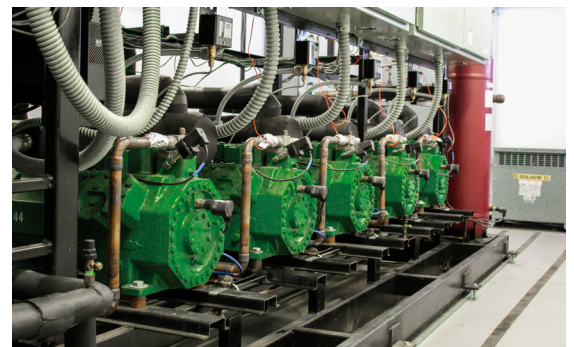
Origo designed Amond World to be one of the most energy, water, and operationally efficient cold storage facilities on the West Coast. A rooftop solar array and battery energy storage take advantage of the abundant sunlight in the Central Valley. Natural gas generators are on standby should the need arise. The site also features exterior connections that allow generators to be brought in to ensure power remains uninterrupted. To meet their efficiency and sustainability goals, Origo chose to refrigerate Amond World with a Zero Zone Genesys™ Natural Refrigeration system. Zero Zone Genesys™ uses CO2, an environmentally friendly, efficient, and inexpensive refrigerant. The low-cost, reliable, environmentally sustainable, and easy-to-use means of storing crops provide farmers with peace of mind that their investment will be protected.

REQUIREMENTS

Amond World needs to maintain a constant temperature of 35°F at 60% humidity 24/7 to preserve the freshness of the crops farmers store in the facility. Most farmers currently store their crop outside while waiting for distribution, which could lead to crop loss by insects, mold, fungus, and water loss. Amond World also needs to remain FDA certified.



The company needed a refrigeration system efficient enough to run on an off-grid microgrid while maintaining a precise temperature of 35°F and a humidity level of 60%. The refrigeration system also needed to be compliant with the California Air Resources Board 150 GWP limit for refrigerants.



ZERO ZONE GENESYS™: THE NATURAL CHOICE

This Zero Zone Genesys™ system uses electronic controls with remote access for monitoring and making adjustments. The components of the system are responsive to demand, making them energy efficient. CO₂ is a natural refrigerant with a GWP of 1, satisfying local regulations.

System Components

- **Staged and modulated compressors** vary their speed based on system demand, reducing usage and overall energy consumption.
- **Adiabatic gas coolers** remove heat from the compressors to make them run more efficiently. These coolers also use 75% less water than standard coolers, with little to no water waste.
- **Vestibules** are used to cool a glycol system for air conditioning in the mechanical centers.
- **Reheat Coils** in the evaporator are used to control humidity. On its way to the condenser, the hot gas from the coils dries the air from the evaporator coil.
- A **Charge Saver** increases efficiency and reliability by maintaining the pressure of a system during a power outage or rack shutdown during maintenance.
- **Electronic Expansion Valves** provide only the required amount of refrigerant based on system demand.
- **Microprocessor controls** track the temperature and moisture level of the facility for users to check remotely in real time. These controls also allow the system to be adjusted remotely to ensure the precise temperature is kept.
- **Refrigerant leak detectors** send an alert to the user if a leak is detected. The alert will trigger a rapid response to repair of the affected components of the system and limit the amount of refrigerant lost.

ZERO ZONE IS BUILDING A SUSTAINABLE FUTURE WITH A LEGACY OF RELIABILITY

Origo sought energy efficiency, reliability, and sustainability for Amond World. Zero Zone Genesys™ system was designed with electronic controls and remote access for precision and reliability. The variable speed of the compressors, adiabatic gas coolers, glycol air conditioning system, and humidity control work together to provide an efficient and dynamic system. Zero Zone Genesys™ Natural Refrigeration Solutions are designed with the future in mind. Building systems that use environmentally friendly refrigerants and energy-efficient products ensure future generations will inherit a healthy world.

For more information about this Case Study, contact:

Zero Zone, Inc.

zz_sales@zero-zone.com

800-247-4496



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CASE & SYSTEMS • 800-247-4496
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