

R-290 in Commercial Refrigeration

- It is a safe choice for a sustainable future in the Food sector**
- It has a very low GWP and a 0 ODP, lower environmental impact;**
- It grants low energy consumption and high efficiency.**



Commercial refrigeration installation, operation and maintenance (Water loop System- R-290) at Royal Duty-Free-Subic

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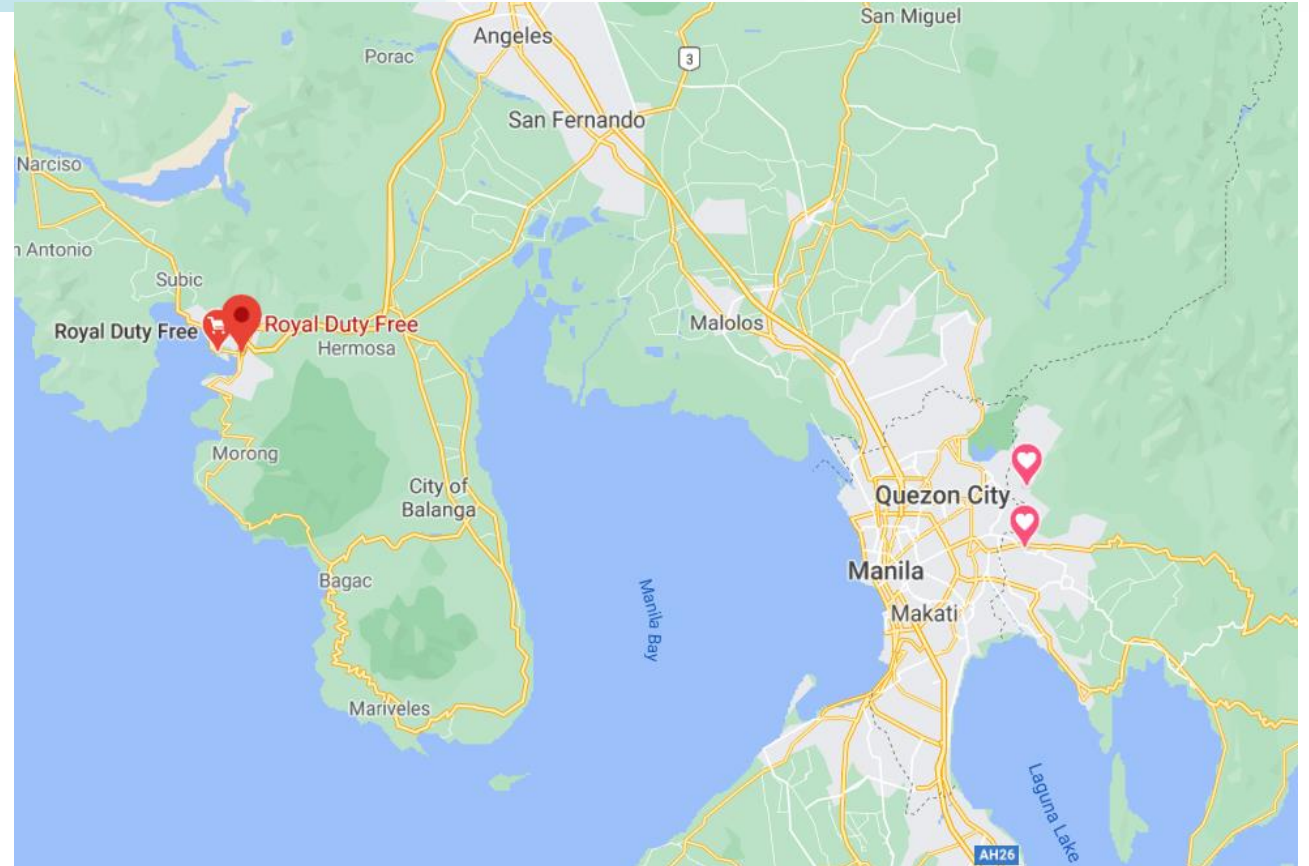
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14 September, 2022



STORE INFORMATION

Project location



ROYAL DUTY FREE SHOPS

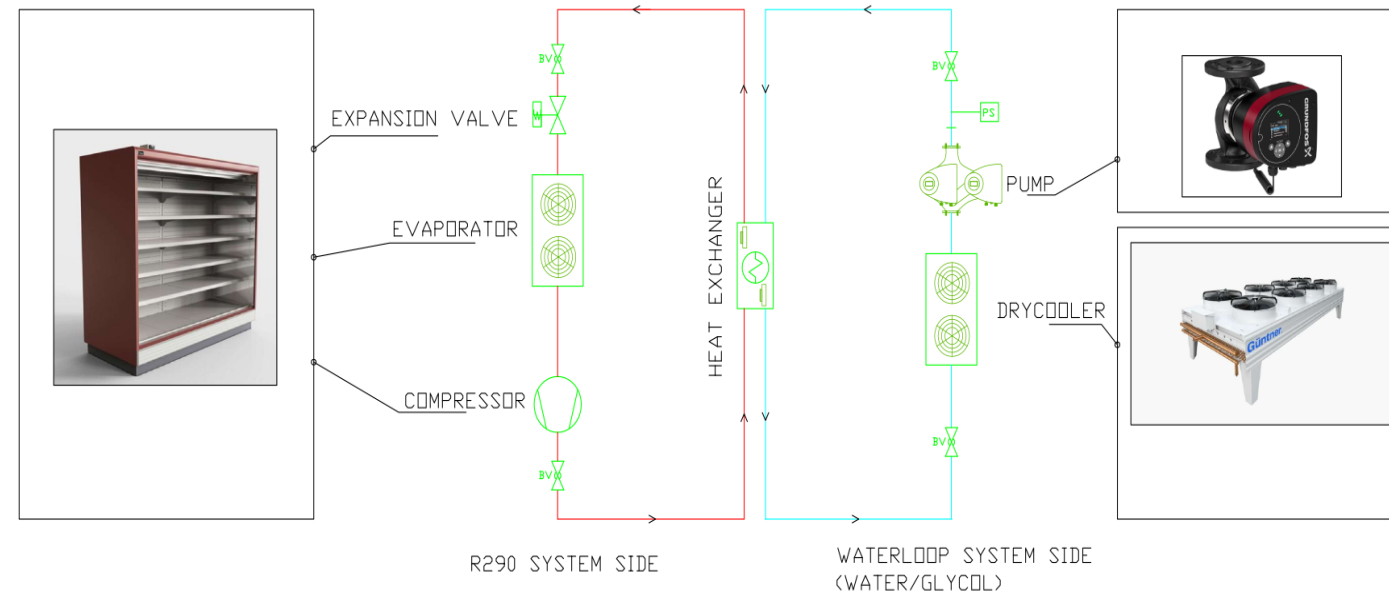
Royal Duty Free, 1109 Palm Street Rizal Hwy, Subic Bay Freeport Zone, Zambales

152kilometer away from Metro Manila, or 2hours 15mins Drive

The first R290 water loop refrigeration system in the Philippines

The R290 water loop refrigeration system consists of all stand-alone plug-in pieces of refrigeration equipment that use R290. The main difference with a water loop system is that the refrigerated shelves and cabinets that line the walls and are used in the meat and deli area are all connected by water loop piping.

The water loop piping system carries all of the exhaust heat that would have been emitted inside the store and rejects it outside via a water pump and dry cooler system located outside of the building.



List of equipment installed

- 1.) *One set 3Fans Outdoor Dry cooler*
- 2.) *One set twin Pump*
- 3.) *Eight Units Upright Chillers*
- 4.) *One Unit Glass Door Freezer*
- 5.) *Seven Units Serve Over Chillers*





*Water loop
connections*



Practical maintenance considerations for the R290 water loop system

R290 refrigeration systems and conventional refrigerant systems have similar maintenance standards. However, the Cold Front team suggests taking the following maintenance considerations into special account for R290-based refrigeration systems.

No oil changes needed: The R290 refrigerated display shelves and stand-alone freezer chests all use completely hermetic compressors that have a maximum of 150 grams of R290 refrigerant charge per refrigeration circuit. Therefore, there is no need for oil changes in the preventative maintenance schedule.

Monthly cleaning: It is important to conduct monthly cleaning of every refrigeration cabinet for sanitation purposes. This is true for both R290 refrigeration systems and conventional refrigeration systems.

Retourquing of electrical connections: It is important to retorque electrical connections to prevent any loose connections that may cause a fire. This is especially important for R290 refrigeration systems since R290 is flammable.

Flameless repair tools: It is important to use flameless tools when conducting repairs on the refrigeration system. This means using crimping tools and copper tubes rather than oxyacetylene welding.

Other important maintenance considerations include proper monitoring of the glycol in the system, cleaning of the wire strainers at the pump station once a year, and cleaning of the dry cooler fins once a quarter.



Analyzing energy consumption data

By replacing its HFC-based refrigeration equipment with natural-refrigerant based equipment, Royal Duty Free Shops has achieved the following outcomes:

- Reduced energy consumption to an average of 741.35 kWh per day (versus an estimated 909.49 kWh per day from R404a equipment)
- Reduced its potential for on-site greenhouse gas emissions to a GWP value of 3 per kg of refrigerant (versus 3,922 per kg of refrigerant for R404a)
- Achieved an electrical energy intensity value of 216 kWh per m² per year (excluding lights, air-conditioning and ventilation systems, etc. More work needs to be done in this area but this figure is approaching industry best practice benchmarks from around the world)

Installing electrical sub-meters

On July 31, 2021, Royal Duty Free Shops completed the installation of 10 sub-meters to measure the kWh energy consumption of all the R290 refrigerated display shelves, stand-alone freezer chests and water loop system.



Electrical sub-meters installed at Royal Duty Free Shops

Thank you very much...



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