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June 18-19, 2014 - San Francisco

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## Introduction of Mayekawa's ECO Cute Water Source Hot Water Heat Pump at Torres De Alba Hotel

- Using the Natural Refrigerant CO<sub>2</sub> -



Troy W. Davis  
Energy Manager  
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# Mayekawa CO<sub>2</sub> Heat Pump Technology

Air Heat Source Heat Pump  
UNIMO



Largest in the market

Hot water at 149 to 194F  
(air heat source)  
Production from August 2006

Water Heat Source Heat Pump  
ECO Cute



First in the Commercial market!

Hot water at 149 to 194F  
+ Chilled water  
(Water heat source)  
Production from October 2008

Hot Air Supply Heat Pump  
SIROCCO



First in the Commercial market!

Hot air at 176 to 250F  
+ Chilled water  
(Water heat source)  
Production from October 2009



# Mayekawa ECO Cute CO2 Heat Pump Installation Torres De Alba Hotel and Suites - Panama City, Panama



**Upscale Hotel and Suites located  
in Panama City, Panama**

- ❑ Existing gas water heaters were inefficient and required constant maintenance. Only LPG.
- ❑ Hotel Owner wanted an efficient electric option
- ❑ High constant cooling load required for Hotel



## **SOLUTION:**

**Mayekawa ECO Cute CO2 Water Source  
Hot Water Heat Pump**

- Combine heating and cooling functions in a single compact unit.
- Low carbon emission solution.
- Increased hot water system efficiency

Project Consultant:

**GreenNRG**

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# Existing Mechanical Equipment

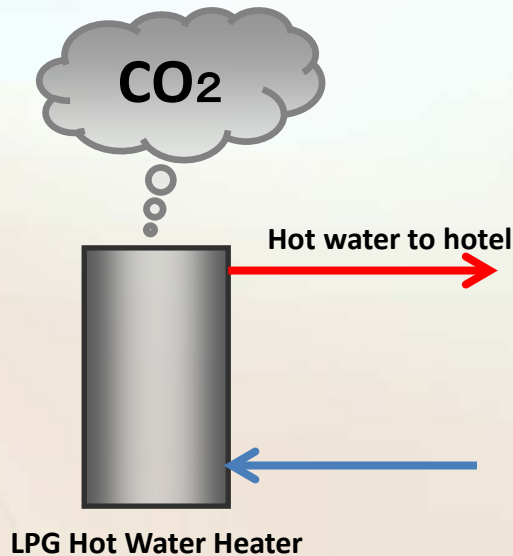
## - Domestic Hot Water Heating and Chilled Water Air Conditioning -

### Simultaneous Heating and Cooling Load Requirement

- Hotel application typically uses separate equipment -
- Potential for Integrated Water Source Heat Pump -

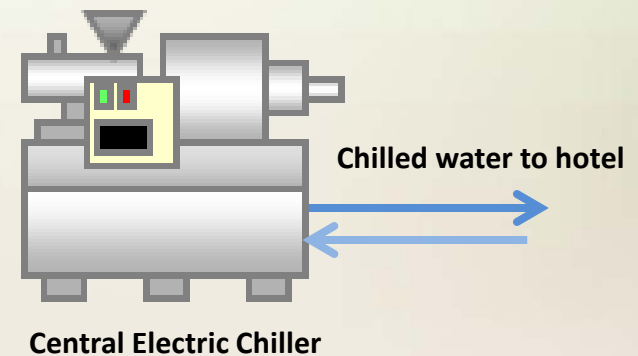
### Heating Process

Scope of work typically provided by  
Plumbing Engineer/Contractor

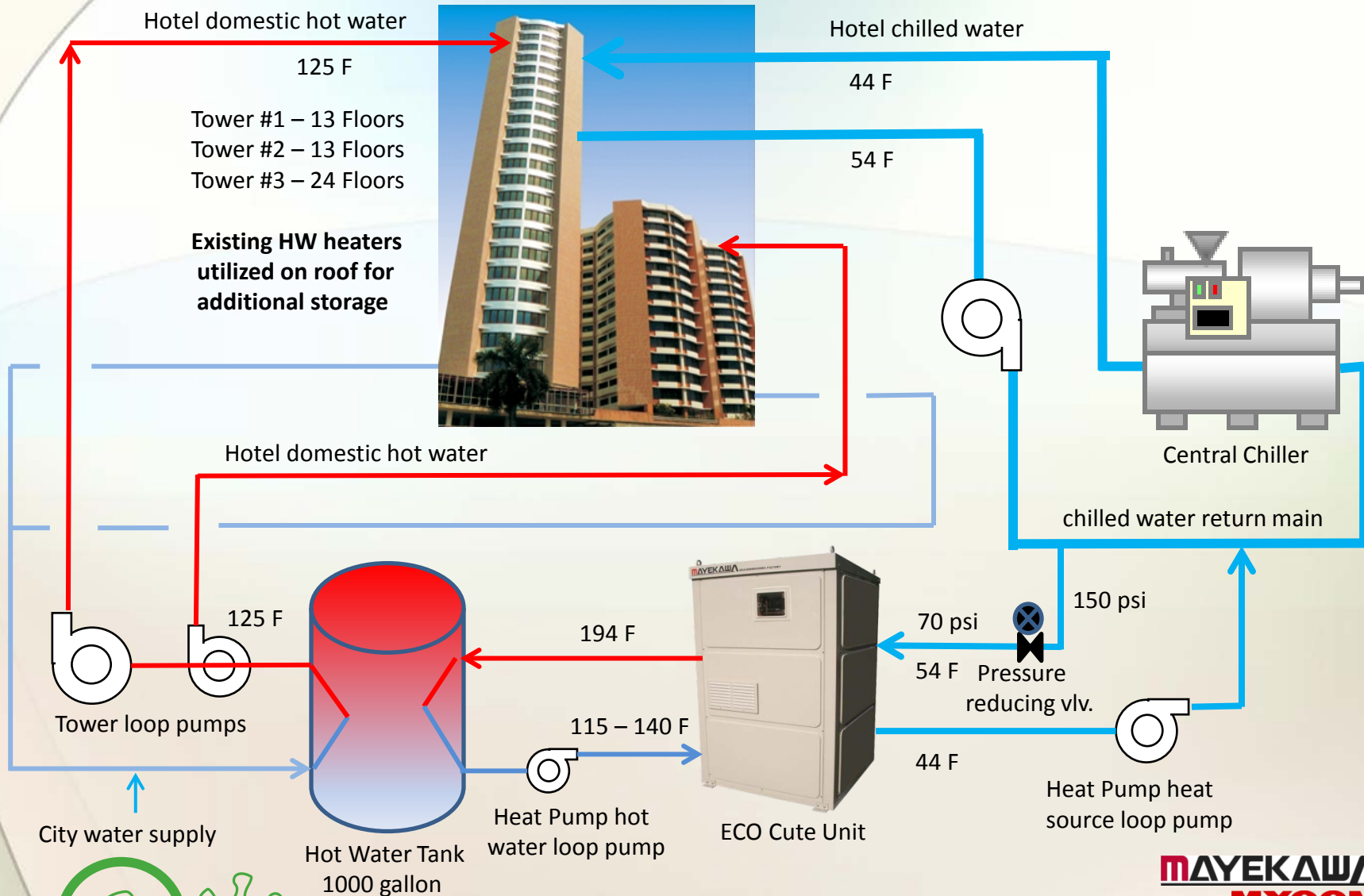


### Heat Removal Process

Scope of work typically provided by  
HVAC Engineer/Contractor



# New Mechanical Equipment Layout with ECO Cute WS CO2 Heat Pump



# New Mayekawa ECO Cute CO2 Heat Pump Installation - Domestic Hot Water Heating and Chilled Water Air Conditioning -



**ECO Cute Unit**



**ECO Cute installed in chiller mechanical room**



**Hot Water Piping**



**Hot Water Storage Tank**



**Heat Source Piping**

**- System Installed April 2013 -**

# Mayekawa ECO Cute CO2 Heat Pump Unit Details - Torres De Alba Hotel and Suites -

Project performance for (1) Mayekawa water source CO2 heat pump unit:

- 74 kW (252,500 btu/hr) heating capacity
- 75 F inlet water / 194 F outlet water (130 F to hotel rooms)
- 51 kW (14.5 TR) cooling capacity
- 44 F chilled water outlet / 54 F chilled water inlet
- 24.9 kW power consumption (460/3/60)

194 F hot water outlet condition:

- Unit heating COP: 2.95
- Unit cooling COP: 2.04
- Unit combined COP: 4.99

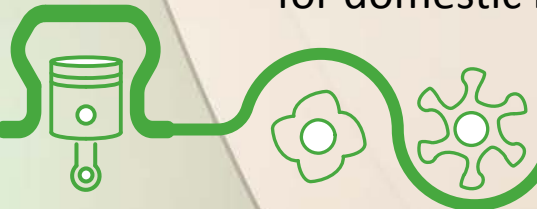
149 F hot water outlet condition:

- Unit heating COP: 3.47
- Unit cooling COP: 2.55
- Unit combined COP: 6.02



# Mayekawa ECO Cute CO2 Heat Pump Project Results - Torres De Alba Hotel and Suites -

- ❑ **Achieved a 29% reduction in overall energy costs. (\$2.90 gal. LPG & \$.14 kWh)**
  - Project ROI result (including LCCA): 2.9 years
  - Includes chilled water electric capacity offset provided by heat pump
- ❑ **Achieved a 42% reduction in overall carbon emissions.**
  - Original carbon emissions with LPG hot water heaters: 283,980 lbs./year
  - New carbon emissions value with CO2 WS heat pump: 164,025 lbs./year
  - **Total carbon emissions reduction for installation: - 119,960 lbs./year !**
- ❑ **Hot water storage capacity is very important when applying a CO2 trans critical hot water heat pump.**
  - Must consider peak hot water demand requirements.
  - Possibility for Retro fit projects to utilize existing hot water heaters/tanks for additional storage and emergency backup.
  - Consider use of high temperature thermal storage tank with mixing valve for domestic hot water loads to increase peak flow rate requirements.





# Mayekawa ECO Cute CO2 Water Source Heat Pump Summary

## North American Target Market for CO2 Trans critical Water Source Unit:

- Current Propane, Fuel Oil and Electric Resistance Hot water end users
- Chilled water/glycol or condenser/cooling tower water heat source
- High temperature hot water end users (150 F to 194 F)

The use of CO2 trans critical water source heat pumps for simultaneous hot water heating and cooling is a well proven technology and has many applications including Hotels/Resorts, Food Processing, Dairies, Breweries, Wineries, Process Manufacturing and even Building systems that have a hot water load and simultaneous cooling load.





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**Thank You!**



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