



EcoThermics
CORPORATION

Natural Refrigerant Heat Pump Technologies

Heat Pump Technology Case Study

Washington, DC

June 12, 2012

Agenda



- **Introductions**
- **EcoThermics Corporation, Peoria, IL USA**
- **Case Study: Country Maid, West Bend, IA USA**
 - **What?**
 - **Where?**
 - **How?**
 - **Why?**
 - **Results?**
- **Q&A**

EcoThermics Mission



**Building a sustainable business --
providing high value compressors
for CO₂ heat pumps.**



CONFIDENTIAL

EcoThermics AT54M



**EcoThermics AT54M
Compressor**



**w/ 10hp
Motor**



Semi-hermetic Compressor

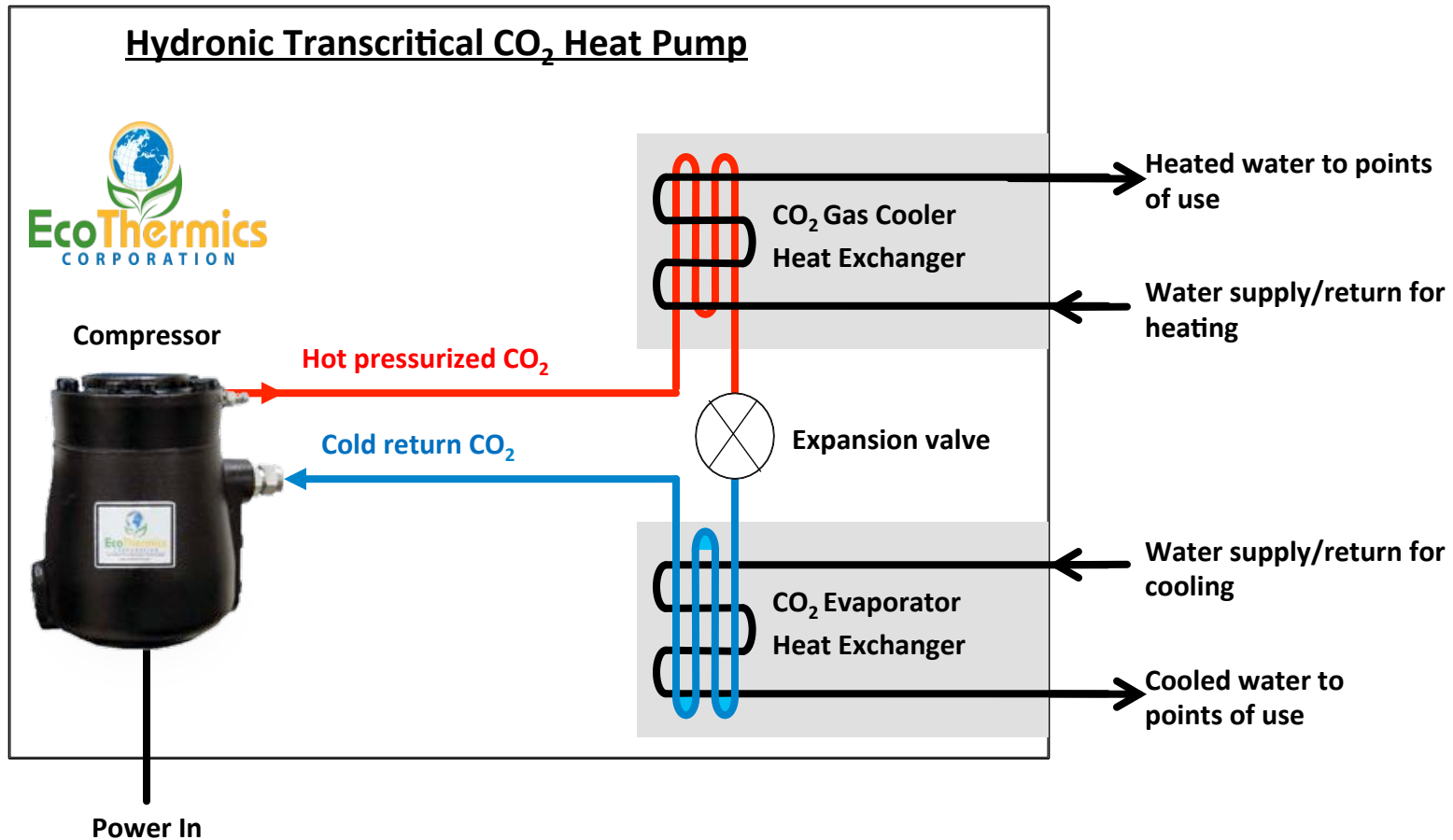


Eco2Boost Heat Pump



L = 28 in. D = 19 in. H = 30 in.

Heat Pump System Schematic



Case Study – Dedicated Heat Recovery



- **Overview: Country Maid**
- **System schematic: “Before” CO₂ heat pump**
- **System schematic: “After” application of CO₂ technology**
- **Summary of system changes**
- **Summary of results**
- **Lessons Learned**
- **Next steps**

Who is Country Maid?



Manufacturer of Butter Braid® brand products
West Bend, IA

Who is Country Maid?



COUNTRY MAID

- Founded in 1991
- 80 employees
- 100% employee owned
- Sell products to dealer network in 46 states
- Manufacturer of frozen pastry dough products
- Currently adding a new \$5.1M production line – which will increase hot water usage 2.5x



We Use a Lot of Hot Water!



System Schematic – “Before”



3 Rinnai®
Natural Gas
H₂O Heaters



750 gal tank
145 °F

+



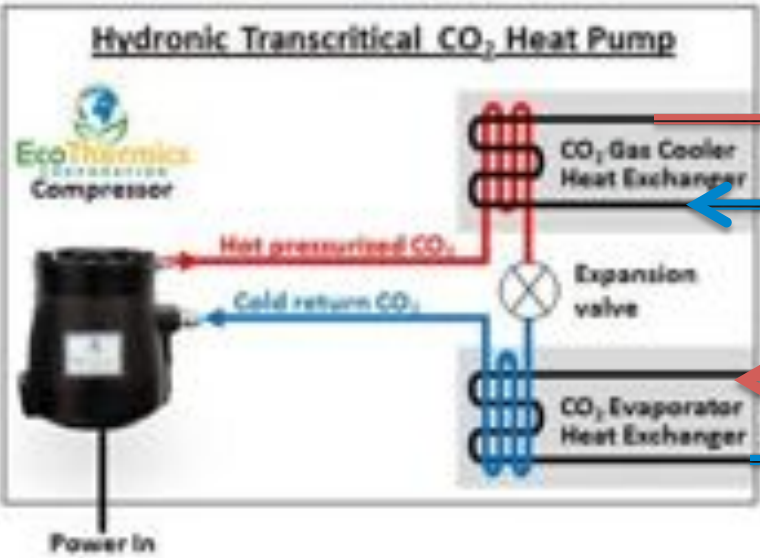
4kW Electric
Heat element



Sanitation &
Process Use

Average usage: 2,200 gallons / day

System Schematic – “After”



145°F H₂O

55°F City H₂O

750 gal tank

4kW Electric Heat element

**DEDICATED
HEAT
RECOVERY
SYSTEM**



6 TON OF COOLING

45°F H₂O

65°F H₂O



Sanitation & Process Use

Summary of System Retrofit



- EcoThermics system becomes the primary (vs. 3 Rinnai water heaters) but totally redundant source of hot water
- EcoThermics system provides simultaneous cooling & dehumidification during hot water production
- EcoThermics system boosts water temp from 55° F to 145 ° F in one pass to tank - no electric element use (4 kW electric element only used to maintain temp during plant shut down)

System Information



- Hot water used/day (145 F): 2200 gal/day
- Number of usage days/year: 230 days
- Heat source: natural gas plus electric boost
- Natural gas cost: \$0.780/therm
- Electric cost: \$0.079/KWH
- City water inlet temperature: 55 F
- Heating BTU: 92,000
- Cooling BTU: 74,000 (Offset A/C purchase)
- Eco2Boost heat pump + installation: \$12,000

Predicted Results



- Heating COP = 3.8
- Cooling COP = 2.9
- COMBINED COP = 6.7
- Energy cost savings = \$3300/year
- BET = 3.5 Yrs. (even with very low energy costs)

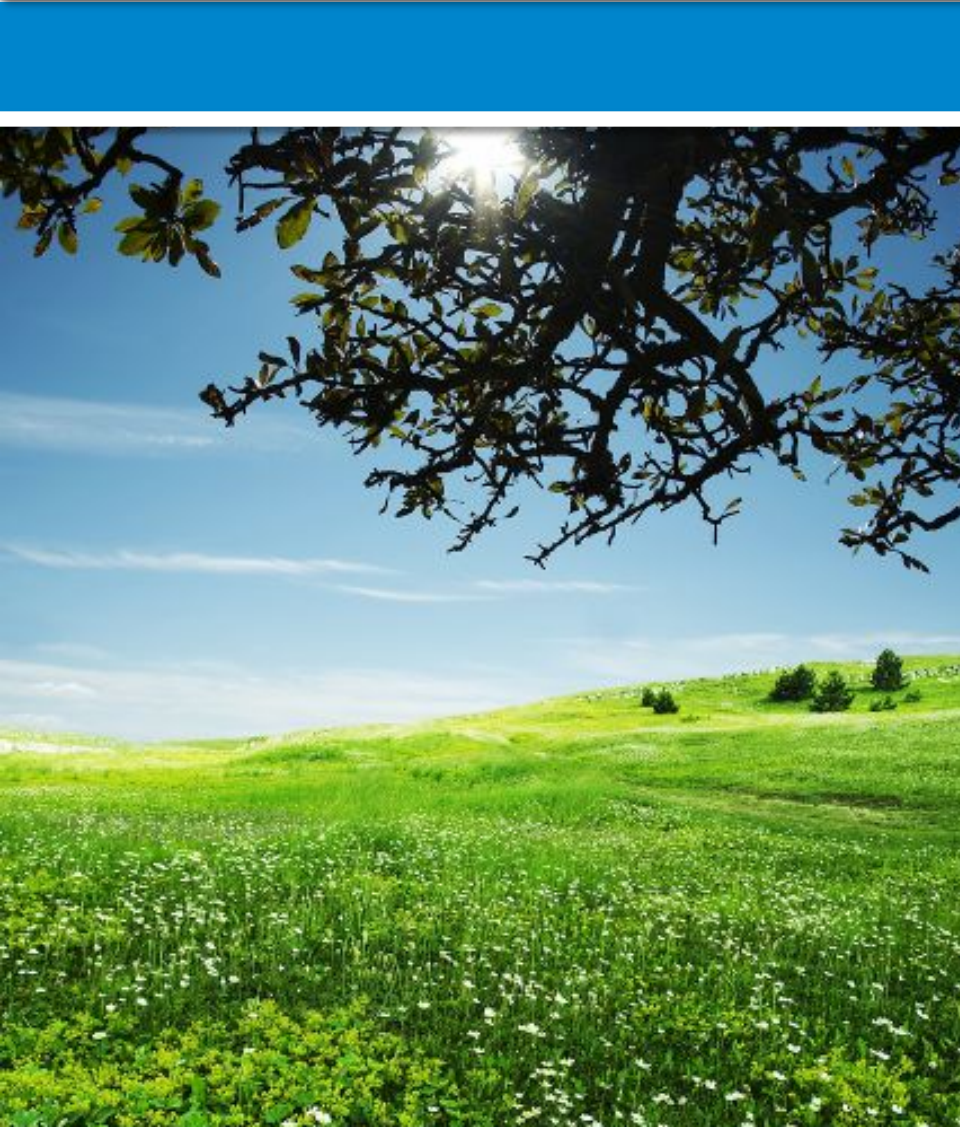
NOTE: If electricity were used instead of natural gas, savings would be over \$8000/yr. and the BET would be around 1.5 years.

Lessons Learned



- **Ensure complete understanding of all application details in advance:**
 - **Costs**
 - **Usage volumes**
 - **Specific conditions (temperatures, flow rates, etc.)**
 - **Variables (per shift, per season, etc.)**
- **Savings (& BET) will usually be realized, but will vary widely based on local/regional utility rates, installation/retrofit costs, etc.**

Thank You



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