

This presentation premiered at WaterSmart Innovations

watersmartinnovations.com



Supermarkets are
Everywhere - Secure
Phenomenal Water Savings

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AGENDA

The DISCLAIMER

How do Evaporative Condensers work?

Cycles of Concentration – the key to water conservation

Potential Water Savings

Scale

24/7 monitoring

Disclaimer

- The Service Provider in this presentation is not being endorsed by the Los Angeles Department of Water and Power. The service provider came to us with projects in mind for water treatment in the supermarkets, and we provided the rebates. Any evaporative condenser owner is urged to get quotes from a number of service providers before moving forward with these type of projects.

How did we get these projects?

- U.S. Water Services contacted us and suggested a water treatment program a large supermarket chain could undertake
- 24/7 monitoring equipment would be installed on a 6-store pilot basis
- Installs completed September 2013: savings 719,824 gallons/per store/year, average 25% of overall water usage per store.
- In the last few months 49 more stores have been retrofitted! (total 55)

A Evaporative Condenser (EC) removes the heat from inside of the compressors to the outside air

- It moves the heat from the refrigerant inside of the compressor to the outside of the building
- It uses water to cool the refrigerant and a good portion of the water in the EC evaporates

What does the Evaporative Condenser do?



Compressor
Rack



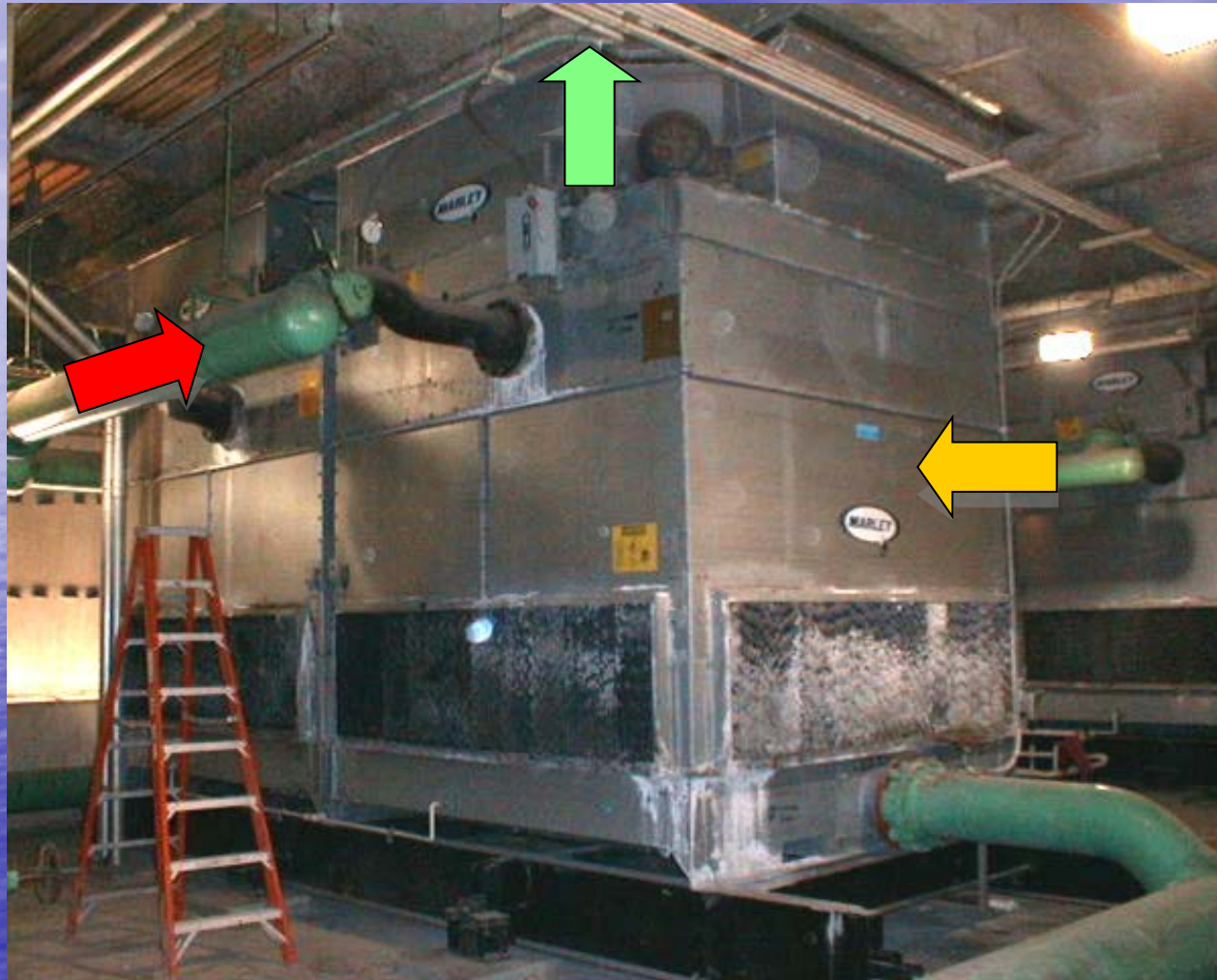
Evaporative
Condenser

Hot refrigerant gas



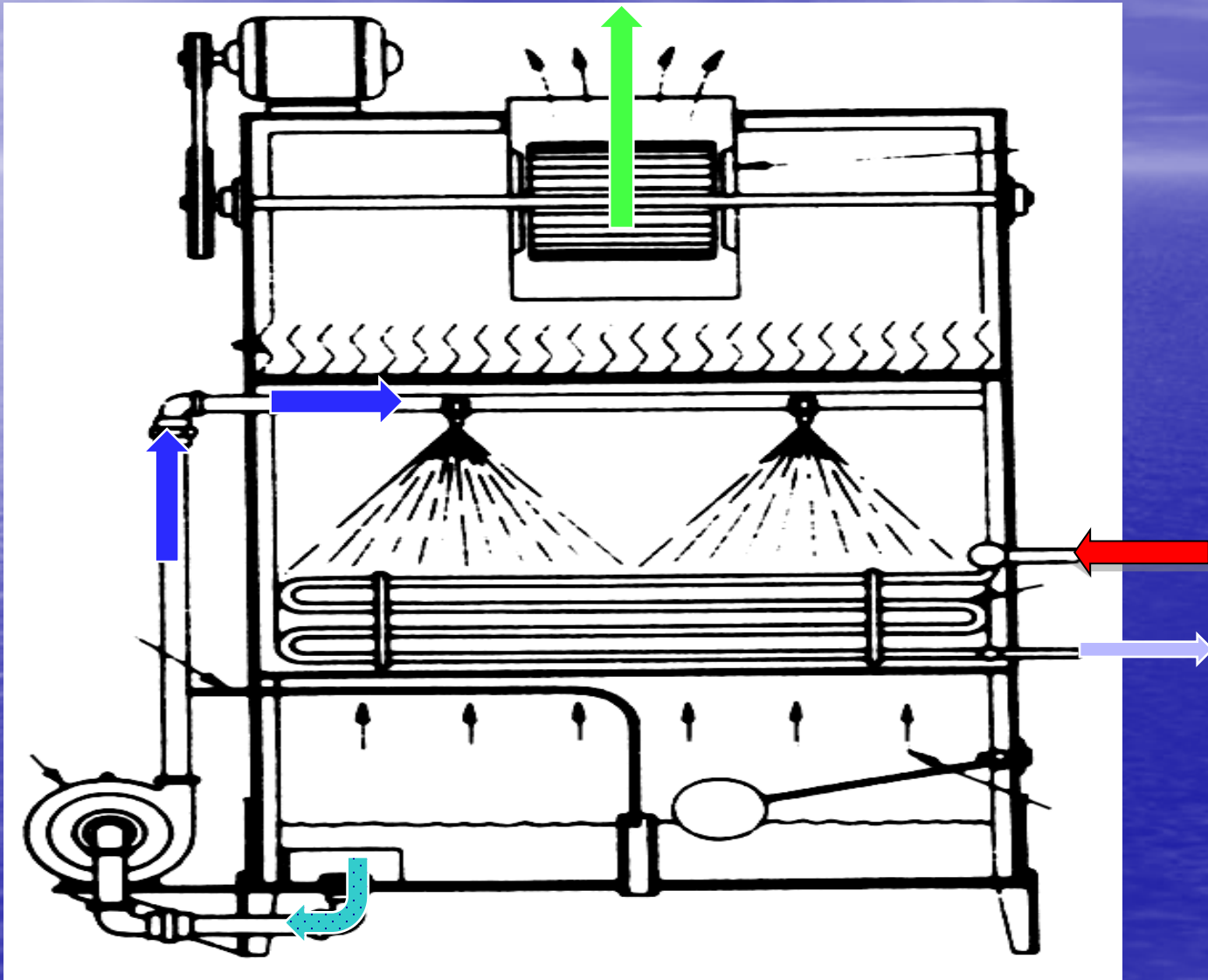
What does the EC do (continued)?

Water Evaporates



Evaporative Condenser

The cooling process



Water Conservation in EVs

- To understand water conservation for ECs you have to understand water treatment and how minerals are measured

Evaporative Condenser: *What are “cycles of concentration”?*

- As water evaporates from a evaporative condenser, dissolved minerals concentrate. Minerals measured in μmhos (micromhos).
- Example: Incoming LADWP water is 700 μmhos . Dissolved mineral concentration in evaporative condenser water is 3Xs that of incoming city water (2,100 μmhos) , then this is 3.0 Cycles of Concentration (COC). Majority of Evaporative Condensers kept between 2-3 COC. Done by bleeding (blow-down) water when 2 - 3 COC is reached. Fresh water is added and dilutes the dissolved minerals.

Water Savings: *250-Ton E.C. operating 24 hrs./day, 365 days/yr. – COC 2.5 to 4.5*

| Cycles | Evaporation/day | Bleed/day | Make-up/day | Savings/Day from 2.8 - 4.5 COC | Cost Savings/yr (Water & Sewer in LADWP) from 2.8 COC |
|--------|-----------------|-----------|-------------|--------------------------------|---|
| 2.5 | 4,296 | 2,884 | 7,180 | | |
| 3.0 | 4,296 | 2,166 | 6,462 | 718 | \$2,803 |
| 3.5 | 4,296 | 1,735 | 6,031 | 1,149 | \$4,485 |
| 4.0 | 4,296 | 1,448 | 5,744 | 1,436 | \$5,606 |
| 4.5 | 4,296 | 1,243 | 5,539 | 1,641 | \$6,406 |

Controllers

- A controller is used to monitor the cycles of concentration.
- A basic controller monitors the micromhos, opens and closes the bleed valve, and adds water treatment chemicals.
- An upgraded controller does the same thing but also has 2-way communication with the water treatment service provider!

Why treat the water in an Evaporative Condenser?

- Want to prevent slime and scale on the copper tube bundle where the heat transfer takes place.

Slime in Evaporative Condensers

This is what slime looks like on copper tubes



Slime removal

- Made up of bacteria
- Usually kill it by using Chlorine (bleach) and/or bromine. These chemicals "burn" the bacteria.

Scaling in Evaporative Condensers

- Formation of hard deposits (scale) inside of pipes
- Scale forms when water gets hot and Calcium Carbonate precipitates
- Typical standard water treatment has scaling inhibitor chemicals added but can't go to higher cycles

Scaled EV tubes



Treatment supermarkets did: pH Control (partial pH control) – to prevent scale

- Adding sulfuric acid to bring pH below 8.6.
Scale (Calcium Carbonate) will not form in this pH range with scale inhibitors.







Water
Treatment
Controller:
Performs basic
control
functions plus
fully
automated

Eductor:

Alternative chemical delivery
system that safely dilutes
chemical prior to injection.

Controlled by the pH set point

Gravity Feed System:
Biocide plus anti-
scaling



Compatibility and
pH sensors:
bleed solenoids
and eductor

Ball Valve:

Other benefits to improved water treatment?

- Installs completed September 2013: savings 719,824 gallons/per store/year, average 25% of overall water usage per store.
- Expect that the ECs will last longer because of decreased scaling and corrosion
- If copper pipes are always scale-free then would expect a more consistent heat transfer which could mean energy savings!

Potential Energy Savings – go to panel discussion

- Panel discussion: “Overcoming Barriers to Joint Water-Energy Efficiency Programs” at 9:35 am - 11:05 am on Friday- Sonoma C



THE END

QUESTIONS???