This presentation premiered at WaterSmart Innovations

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Supermarkets - Part Deux

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AGENDA

- How do Evaporative Condensers work?
- Supermarket project
- Water treatment for Evaporative Condensers
- Water Savings

Disclaimer

- The vendor in this presentation is not endorsed by the Los Angeles Department of Water and Power. They came to us with the projects in mind for water treatment and we provided the rebates. Any cooling tower owner is urged to get quotes from a number of vendors before contemplating these type of projects.

How did we get these projects?

- A water treatment vendor contacted us and suggested a water treatment program a large group of facilities could undertake
- 24/7 monitoring equipment would be installed
- 6 stores completed September 2013 and another 49 by August 14

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 in that process

Moving the heat with an EC

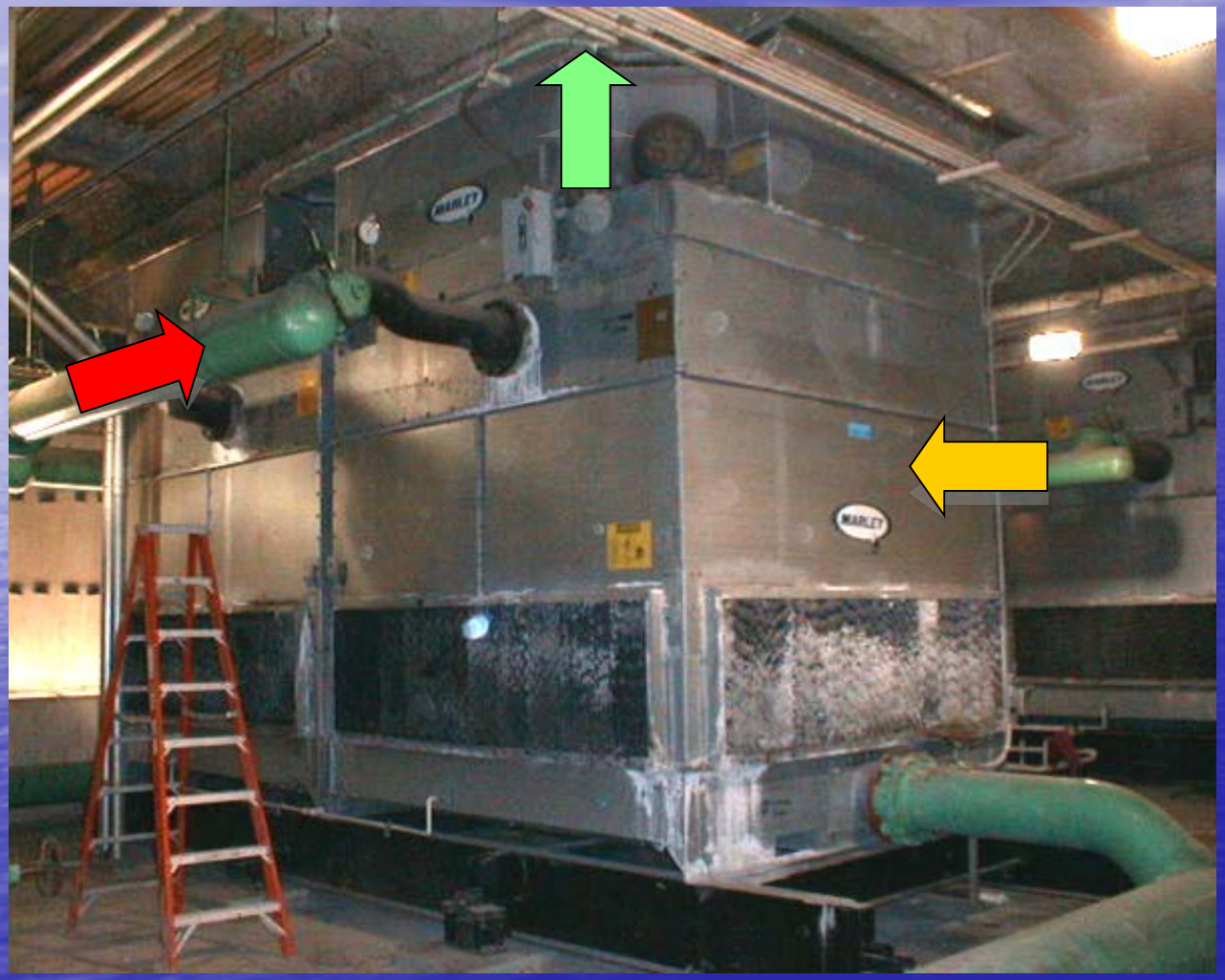
Evaporative Condenser

Compressor Rack

Hot refrigerant gas

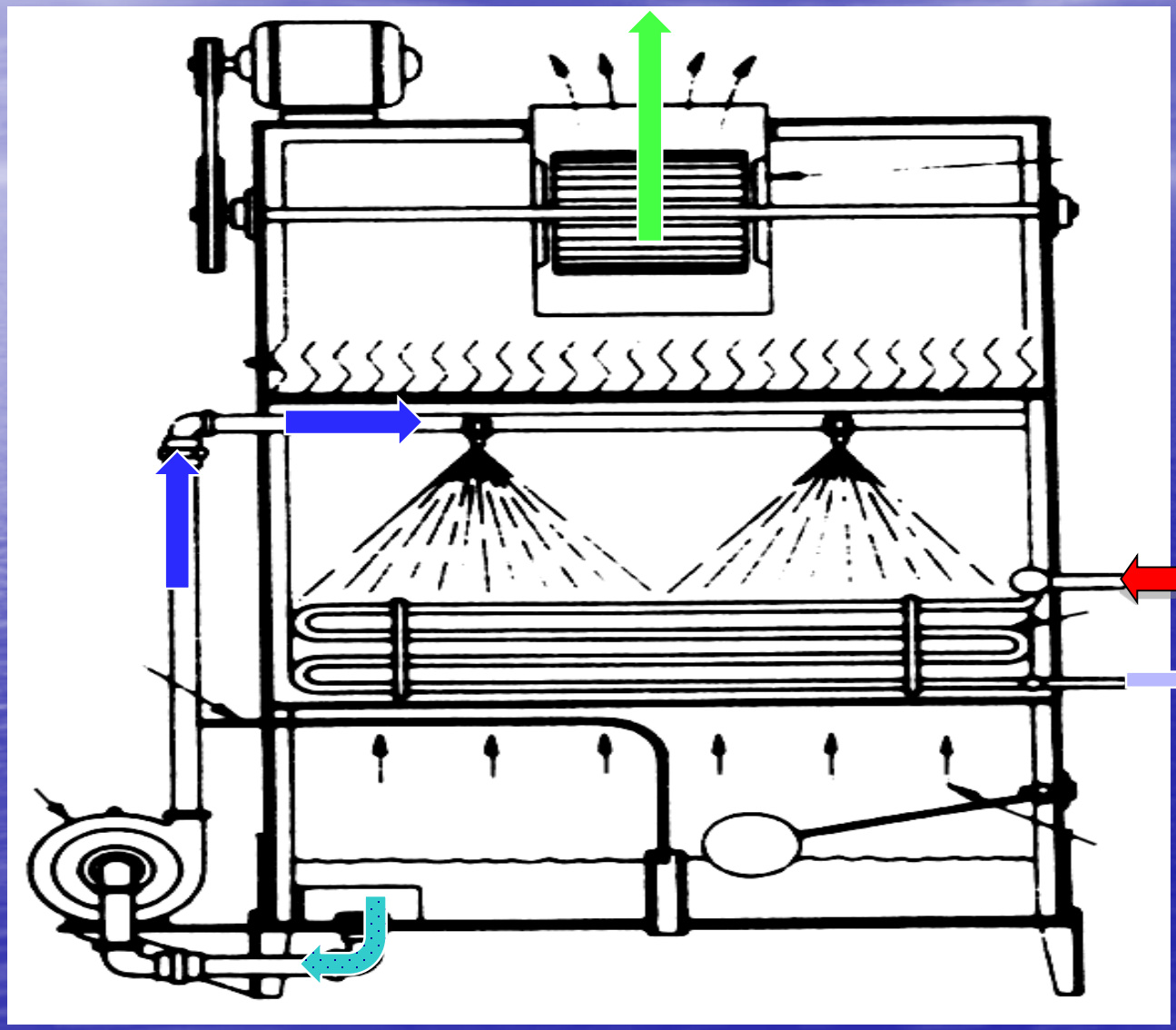
What does the EC do (continued)?

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 (micromoles).
- Example: Incoming LADWP water is 700 µmhos. Dissolved mineral concentration in evaporative condenser 2,100 µmhos. So, EC water is 3Xs that of incoming city water (700 µmhos), then this is 3.0 Cycles of Concentration (COC).

Controllers

- A controller is used to monitor the cycles of concentration.
- Whenever the EC water reaches 2,100 µmhos the bleed valve opens and some of the water goes to drain (sewer).
- Fresh 700 µmhos water is added (see float in next slide), and this dilutes the EC water.
- Most ECs are in the range of 2-3 COC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Why is COC controlled?

- If you don't control the COC you may have to deal with the following EC problems:
  - Corrosion (rust)
  - Scale
  - Slime (microbiological contamination)

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 2.5 - 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

Why treat the water in an Evaporative Condenser?

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

Why treat the water in an Evaporative Condenser? (continued)

- 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) outside of pipes (inside for cooling towers)
- 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

Slime in Evaporative Condensers

This is what slime looks like as scale is forming on top of it on the copper tubes

Scaled EC tubes

What clean copper tubes look like

HOW to Keep Copper Tube bundle clean: Supermarkets used partial pH Control – to prevent scale

- Adding sulfuric acid to bring pH below 8.6.

  Scale (Calcium Carbonate) will not adhere to copper tubes in this pH range with scale inhibitors added.


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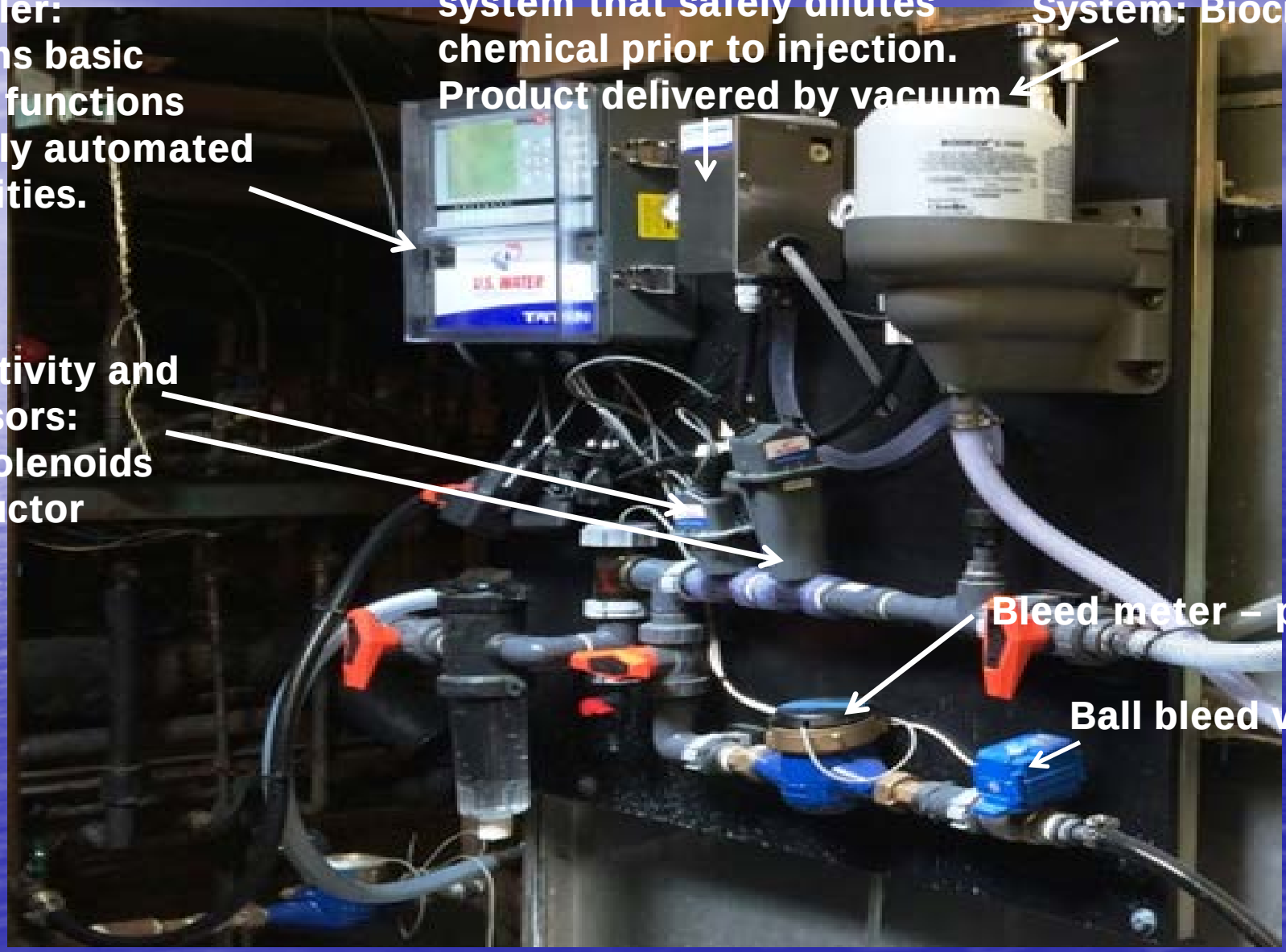
Water Treatment Controller: Performs basic control functions plus fully automated capabilities.
Eductor: Alternative chemical delivery system that safely dilutes chemical prior to injection. Product delivered by vacuum
Gravity Feed System: Biocide
Conductivity and pH sensors: bleed solenoids and eductor
Bleed meter – pulse
Ball bleed valve

Other benefits to improved water treatment?

- 1st 6 stores completed September 2015 (have 2 years post-project usage history):

  512,751 gallons/year/store
- 2nd 49 stores all installs completed September 2014 (have 1 year post-project usage history): savings 316,836 gpsy
- Expected 700,000 gpy
- Expect savings to increase as monitoring does.

LESSONS LEARNED

Not a “set and forget” type of project

Pre-project

- need to have baseline usage from meters on EVs

During project

- Need to make sure that automatic meters are working and that you have access to their reads

LESSONS LEARNED (continued)

During project

- Make sure customer and utility can see all make-up and bleed meter usage at a minimum every month.
- Must be contractual agreement between vendor and customer to fix EC floats and meters when they malfunction.
- Vendor must complete water treatment report every month and send to DWP and customer.

THE END

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