Cooling Tower Water Treatment Presentation

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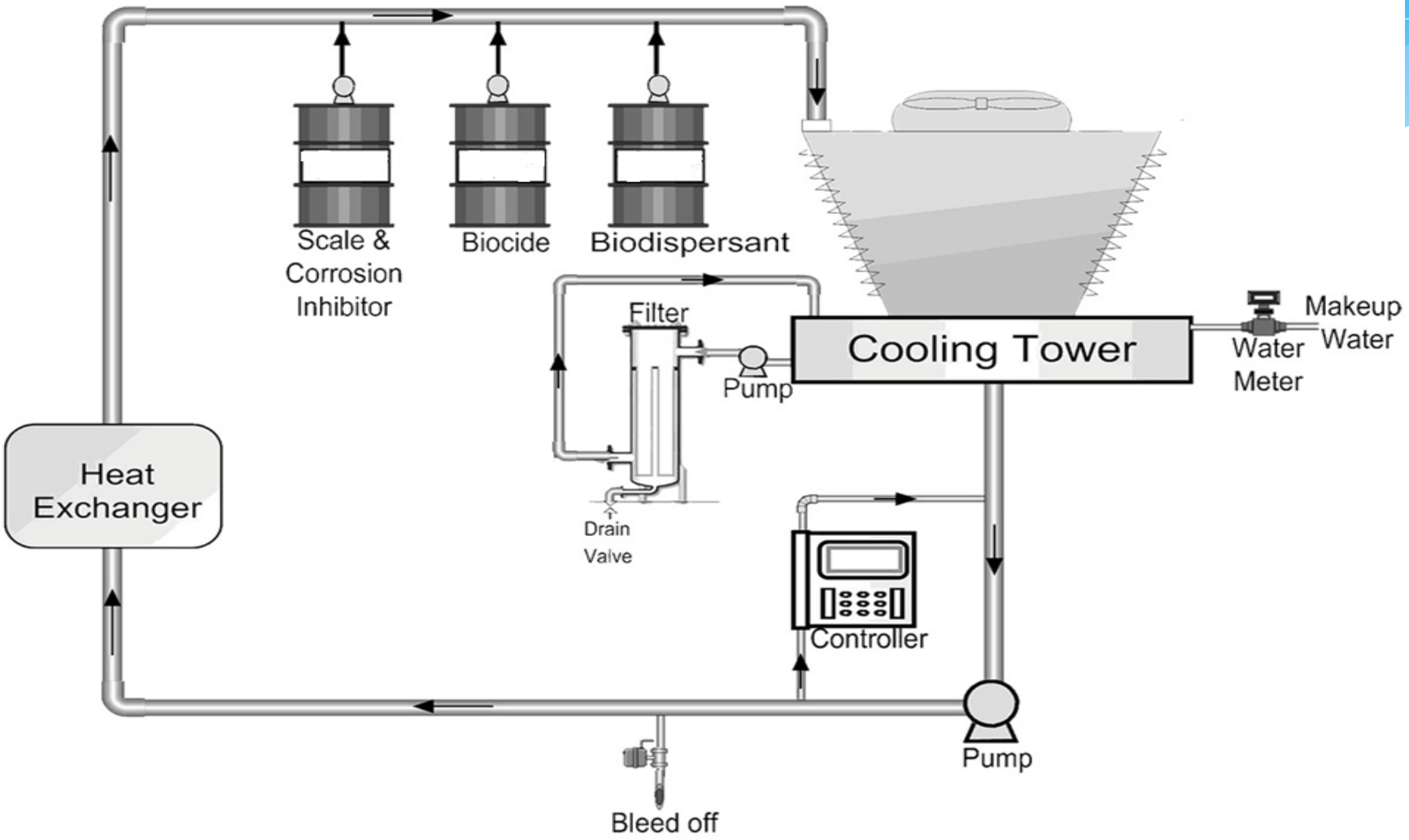
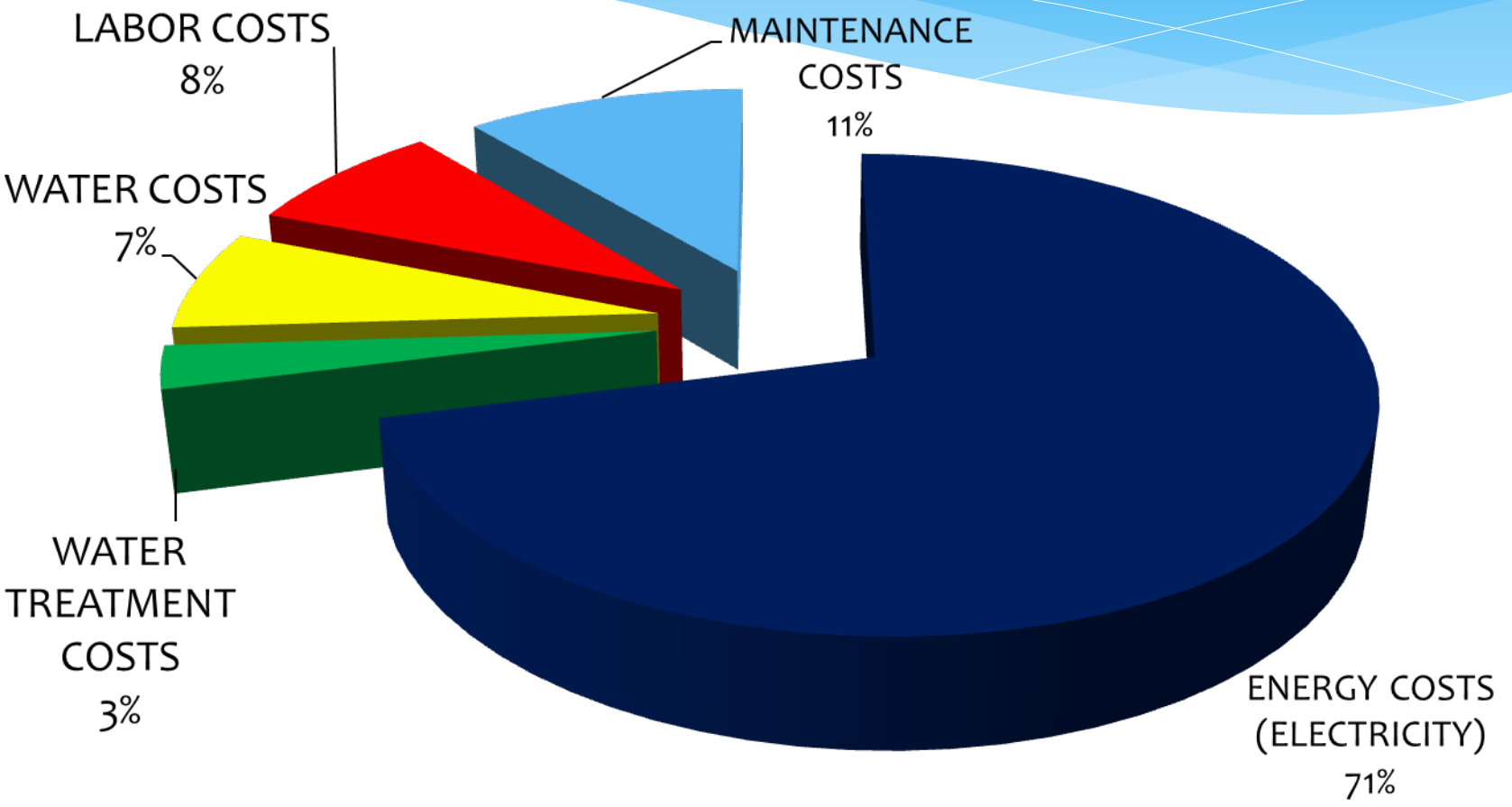
Cooling Towers
Open Condenser Systems



TYPICAL COOLING OPERATING COSTS



Cooling Tower Water Treatment

A cooling water treatment program must meet three criteria to be successful.

1. Prevent scale and deposition in the condenser or heat exchanger, tower and piping.

2. Provide corrosion protection to all system metal surfaces.

3. Provide microbiological growth control throughout the system.

Cooling Tower Water Treatment Scale & Corrosion Inhibitors

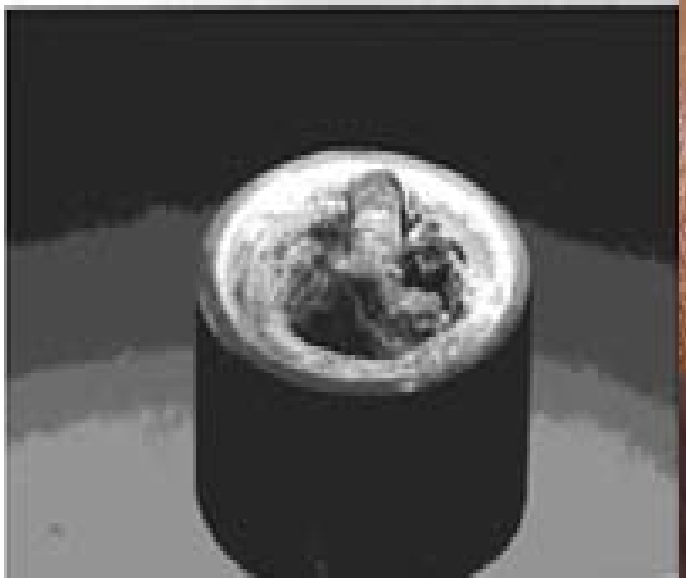
-A good cooling water scale inhibitor functions by maintaining the cooling water hardness salts in solution. If no hardness precipitates, no scale will form.

-Silica, as most people know, is the main ingredient in glass. Scales that contain any significant amount of silica are very hard – almost glass-like – in their consistency.

-Corrosion is the disintegration of an engineered material into its constituent atoms due to chemical reactions with its surroundings.

EFFECTS OF SCALE:

- Acts as insulator, decreasing heat transfer efficiency, increasing fuel/energy use
- Causes overheating of tubes and under-deposit corrosion
  - Tube failure
  - Downtime for repair and replacement
  - $$$$$$$$$



SCALE EFFICIENCY RELATIONSHIP

THICKNESS OF SCALE (INCHES)	LOSS OF EFFICIENCY
1/64 "	4 %
1/16 "	11 %
1/8 "	18 %
3/16 "	27 %
1/4 "	28 %
3/8 "	48 %
1/2 "	60 %

Decreased Heat Transfer = Increased Energy Costs

Example:

500 Ton Chiller System

Operating 24-7-365 days/year

@ 50% Load

With 1/64” Calcium Scale:

9.7% Efficiency LOSS

196,396 KWH/YR increased energy usage

$19,640 increased energy costs per year!!

Cooling Tower Water Treatment Microbiocides

An effective microbiocide program to control the growth of microorganisms involves three steps:

1. The identification of the types and concentrations of microorganisms present in the cooling system.

2. The selection of proper biocides based upon system design, discharge restrictions, and types of microorganisms.

3. Proper application, dosage and control of the selected biocides.

Cooling Tower Water Treatment Types of Organisms

Bacteria - Bacteria represent the largest group of troublesome organisms present in open recirculating cooling water systems.

Fungi - Fungi are most often found on the wooden structures of cooling towers such as the fill or the support members. Fungal attack of the wood usually means a permanent loss of the strength of the wood structure.

Algae - Algae require sunlight to grow so they are found in the open, exposed areas of the cooling tower.

Cooling Tower Water Treatment Microbiocide Treatment

Oxidizing Biocide - An oxidizing biocide attacks microorganisms by oxidizing (an electron transfer reaction) the cell structure, disrupting nutrients from passing across the cell wall.

-Chlorine - Chlorine has been used as a disinfectant since 1846 and is the most widely used control method for microorganisms in industrial cooling systems.

-Bromine - Similar to chlorine, bromine hydrolyzes in water to form hypobromous acid (HOBr), which has the same oxidizing power as HOCl.

-Chlorine Dioxide - Chlorine dioxide (ClO_2) is a powerful oxidizer that is soluble in water, but remains in a gaseous state until it reacts with a microorganism. ClO_2 has more than double the oxidizing capability of chlorine and is not affected by system pH.

Cooling Tower Water Treatment Microbiocide Treatment

- Non-Oxidizing Biocide - This class of chemicals works through various poisoning processes such as interfering with reproduction, stopping respiration, or lysing the cell wall.

- Shot fed to achieve a high enough concentration for a long enough period of time to kill the bacteria, algae, or fungi.

- Isothiazoline
- Gluteraldehyde
- Quaternary Ammonium Salts

Evaporation Credit

* Check with your local municipality about cooling tower evaporation credits.

Example:

* System Tonnage - 200 Tons
* Circulation Rate - 600 gpm
* Cycles of concentration - 3
* Hours per Day - 24
* Days per Year - 365
* Load Factor - 60%
* Evaporation Rate - 5,184 Gallons per Day
* Bleed-off Rate - 2,592 Gallons per Day
* Make-up Rate - 7,776 Gallons per Day
* Sewer Costs - $0.62/100 cu ft = $0.83/1000 gal

Evaporation Credit

- Sewer Reduction - 5,184 gpd x 365 days = 1,892,169 gpy
- Yearly Savings - $1,570
- Water Meter Cost - $325.00 X 2 = $ 650.00
- Water Meter Payback Period - 151 Days
- On-Going Savings - $1,570.00 Annually

CONCLUSION

* KEEP ALL HEAT TRANSFER SURFACES IN COOLING SYSTEMS FREE OF DEPOSITS AND CORROSION AND MICROBIOLOGICAL GROWTH
* PROLONG SYSTEM AND EQUIPMENT LIFE
* REDUCE TOTAL OPERATING COSTS
* OPTIMIZE WATER TREATMENT
* CONSULT AN EXPERIENCED WATER TREATMENT SPECIALIST