# "How Dry I Am"

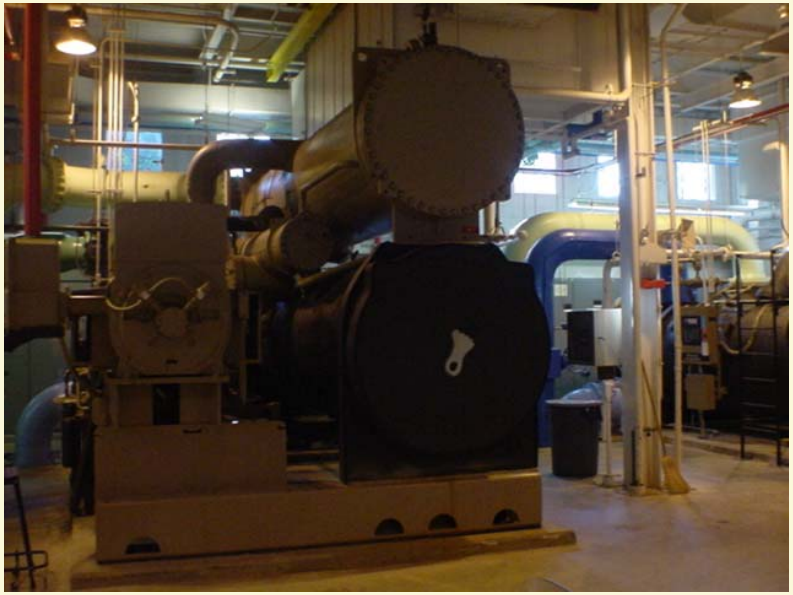
## Solutions for the Pharmaceutical Industry To Meet the new NC Water Restrictions

Speakers:
Mauri Galey and Dan Grzesik

Nalco Company

# Water Conservation Training

Conserve>>Re-Use>>Recycle



- Presented By: Nalco Company
- Dan Grzesik and Mauri Galey

# Agenda

- Purpose, Process, Payoff
- Some Quick Basics
- Cooling Towers
- Closed Loops
- Steam Systems
- Reclaim Water
  - Municipal
  - Industrial or Waste Water
- Other Areas – irrigation, domestic

# Purpose, Process, Payoff

- Purpose
  - To provide ideas and potential paybacks for various water conservation and reclaim ideas
- Process
  - Review water and energy consumption basics
  - Review impact of water use ideas at towers, closed loops, steam boilers and other areas
- Payoff
  - Leave with and understanding of where one stands with respect to conservation

# Reclaim and other streams

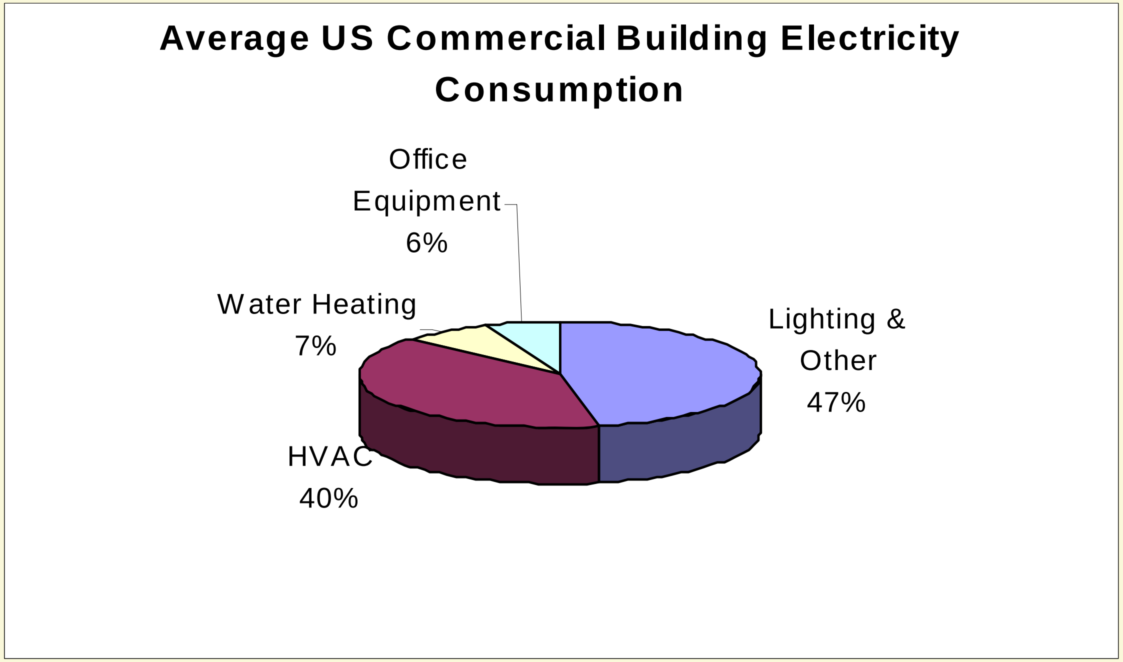
## How do various streams compare to city make up?

| Stream | Microbiological | Corrosion | Scale | Fouling |
|---|---|---|---|---|
| RO Reject<br>Softened prior to RO | H<br>Generally no chlorine in stream | H<br>Softened, elevated Cl, SO4 | H<br>Elevated CO3, HCO3 | S to L<br>Prefilters |
| RO Permeate<br>Softened (Wifi) | H<br>No chlorine | H<br>Softened, no HCO3, CO3 | L<br>Pure water | L<br>Prefilters |
| RO Reject<br>PH adjusted | H | H<br>Elevated Cl, SO4 | H<br>Elevated Ca, Mg | L<br>Prefilters |
| Municipal<br>Reclaim | H<br>This can be mediated w chlorine, UV | H<br>Elevated Cl, SO4 | H<br>Generally higher anions | H<br>Due to suspended solids |
| Well Water<br>Limestone basis | S<br>Some have down hole chlorination | S | H<br>Limestone = Ca, CO3<br>May have SiO2 | S to L |

H = higher chance for issues, S = same chance for issues, L = lower chance for issues

City water in the triangle is moderate with respect to hardness, alkalinity, silica and other key components. We can often run 6 to 10 cycles without pH control.

# Water and Energy Basics




- Here we see what we do to conserve water must no offset the HVAC or cooling bill

# Water and Energy Basics

**Make Up Water (Gallons/Year)**

| Tonnage | Cycles of Concentration | | | | |
|---|---|---|---|---|---|
| | 1.1 | 1.5 | 2 | 3 | 4 |
| 50 | 6,859,080 | 2,057,724 | 1,371,816 | 1,028,862 | 914,544 |
| 100 | 13,718,160 | 4,115,448 | 2,743,632 | 2,057,724 | 1,829,088 |
| 200 | 27,436,320 | 8,230,896 | 5,487,264 | 4,115,448 | 3,658,176 |
| 500 | 68,590,800 | 20,577,240 | 13,718,160 | 10,288,620 | 9,145,440 |
| 1000 | 137,181,600 | 41,154,480 | 27,436,320 | 20,577,240 | 18,290,880 |
| 2000 | 274,363,200 | 82,308,960 | 54,872,640 | 41,154,480 | 36,581,760 |

**Energy Increase from Condenser Evaporator Scale**

| $/kWH | 0.01 inches | 0.02 inches | 0.03 inches | 0.04 inches | 0.05 inches |
|---|---|---|---|---|---|
| | causes +10% | causes +20% | causes 30% | causes +40% | causes +50% |
| $0.04 | $10,512 | $21,024 | $31,536 | $42,048 | $52,560 |
| $0.06 | $15,768 | $31,536 | $47,304 | $63,072 | $78,840 |
| $0.08 | $21,024 | $42,048 | $63,072 | $84,096 | $105,120 |
| $0.10 | $26,280 | $51,060 | $78,840 | $102,120 | $131,400 |

Calculations based on 0.6 kW/ton, 500 tons, 24 hour/day, 365 day/year operations.

- Cycles of Concentration = make up use/blowdown use
  - You may often use system conductivity divided by make up conductivity
- Deposits in machines, condensers or boilers increase energy consumption

# Cooling Towers

Some Notes

- Often the biggest consumer of water in the physical plant
- They dissipate heat via evaporation
- Save water in proportion to load vs. once through
- E in gpm =
  - (tons)x3x(delta T)x0.001
  - MU=E+(cc/cc-1)

# Conserving Water by Cycling Up

## Cycles: example 6

- Cycle up to save water
  - Evaporation rate is determined by load
  - Cycles impact mu
- Tower cond. = 900
  make up cond. 150
- Over cycling creates scale

Evap = 5 gpm at 3 cycles=5

MU = 6 gpm

At 3 = 7.5

BD = 1 gpm

At 3 = 2.5

# Indices

Langelier Saturation Index

LSI = pH-pHs

LSI>0, water has scaling tendencies

Ryznar Stability Index
RI = 2pHs-pH
R1>6, corrosive
R1<6, scaling

These can give you an idea of the water's usability.

If you do not understand these you will this:

# We do not want this, scaled systems are not energy efficient, biofouled systems are even less efficient

# Step 1 Equipment - Track

Make up meter

- Records water used
- May allow for evaporation credits

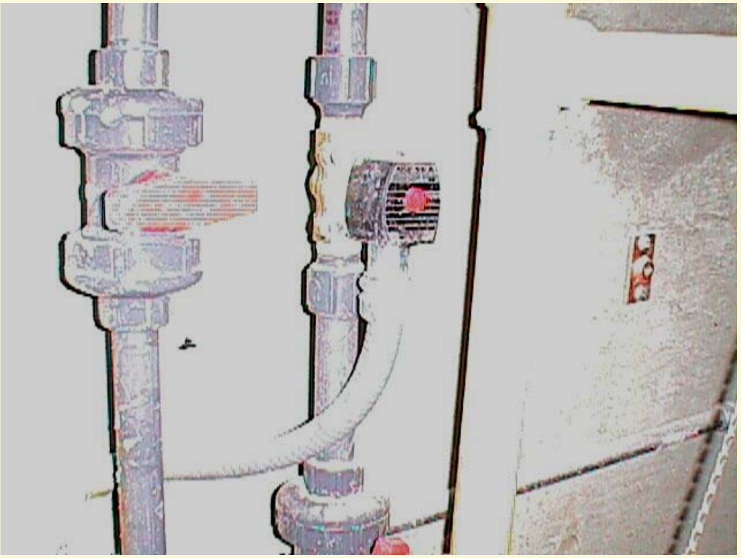
Why would we also meter blow down?

How much water do you use each day ?

# Step 1 Equipment - Track

Blow Down Solenoid

- discharges saturated water to prevent scale



# Step 2 – Automate start to cycle up

Open loop

Conductivity Controller

(TDS = total dissolved solids)

- Controls Conductivity
- Records data
- Feeds biocide
- Interlocked with flow
- Can be integrated with BES

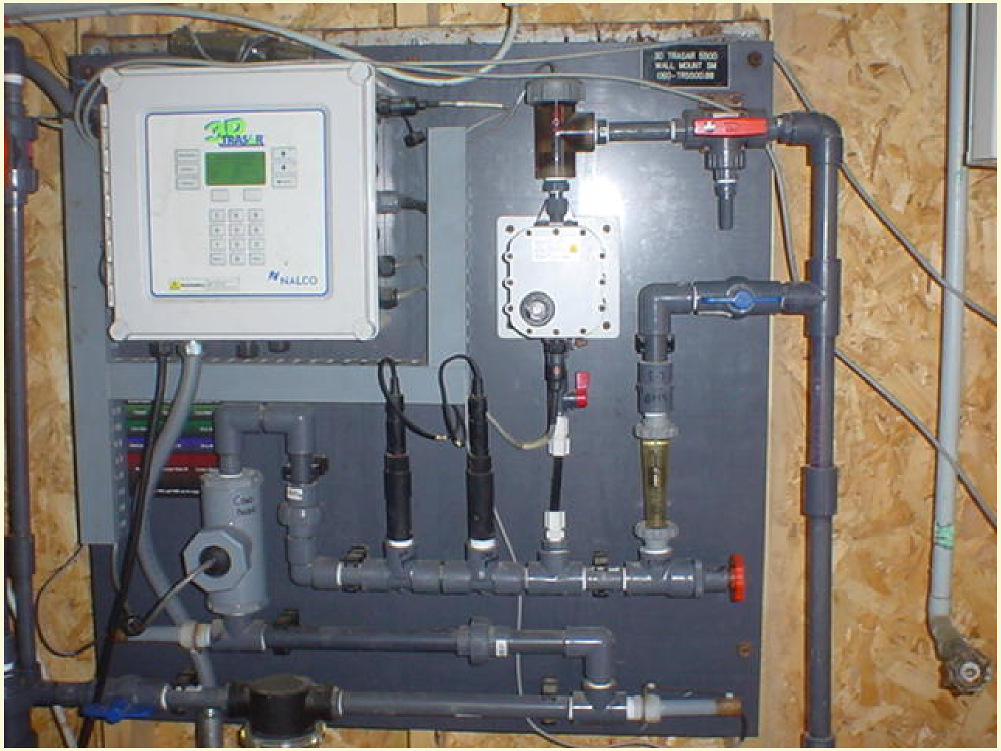
# Step 2 – Automate start to cycle up

Open loop

DON'T FORGET THE Chemistry

Containment too

# Step 3 – start to optimize: with 24 by 7 Control


10 years ago 24/7 controllers were $20k

Today 24/7 controllers are < $10k – and they do more!

# Conductivity, TDS, variation

- Conductivity is micromhos or
  micro siemens/cm
- TDS is total dissolved solids
  - They vary from each other, it is not linear
  - What is in the water can be equally important to how much
- Different Sources incoming may require different set-points
  - One can monitor incoming and adjust
- High conservation, re-use and recycle systems can require
  - Different seasonal settings

| | | |
|---|---|---|
| **Mechanical items to reduce and monitor water consumption:** | | high efficiency fill |
| | | drift eliminators |
| | | meter make up and blowdown |
| | | *plume recovery* |
| | | |
| **Operational items on the water side to reduce water consumption** | | Use automatic controllers to |
| **from the water treatment perspective:** | | ensure tower cycles in |
| Train plant personell | Recapture streams | proportion to load, 3-4 cycles |
| to understand targets | from other areas | |
| | | Use current chemistry to |
| Utilize logs and trends | *Advanced filtration* | gain 5 to 7 cycles |
| to ensure consistency | *techniques* | |
| | | *Use high stress polymers* |
| | | *24/7 control to press cycles up* |

| | **cycles of** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| TOWER | **concentration** | | Evaporation | Make up | Blowdown | PPM Inhibitor | Tons on line | |
| base line | 4 | Gallons/year | 11826000 | 15768000 | 3942000 | 100 | 750 | |
| | | Gallons/day | 32400 | 43200 | 10800 | | | |
| | GPM | GPM | 23 | 30 | 8 | | | |
| | | | | | | | | |
| automated | 6 | Gallons/year | 11826000 | 14191200 | 2365200 | 100 | 750 | |
| | | Gallons/day | 32400 | 38880 | 6480 | | | |
| | GPM | GPM | 23 | 27 | 5 | | | |
| | | | | | | | | |
| best practice | 10 | Gallons/year | 11826000 | 13140000 | 1314000 | 100 | 750 | |
| | | Gallons/day | 32400 | 36000 | 3600 | | | |
| | GPM | GPM | 23 | 25 | 3 | | | |
| | | | | | | | | **Savings** |
| **Payback** | cycles | | | | | | | **in gallons** |
| base line | 4 | Gallons per year on a generic program | | | | | 15768000 | |
| automated | 6 | Gallons per year on a technically correct program | | | | | 14191200 | 1576800 |
| best practice | 10 | Gallons per year on a Top Shelf program like yours | | | | | 13140000 | 2628000 |

# Ideas to Cycle Up

# Some Details

| TOWER | cycles of concentration | | Evaporation | Make up | Blowdown | PPM Inhibitor | Tons on line | |
|---|---|---|---|---|---|---|---|---|
| base line | 4 | Gallons/year | 11826000 | 15768000 | 3942000 | 100 | 750 | |
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| | | | | |
|---|---|---|---|---|
| NOTE: | 2 | gpm stream equals to | 1051200 | gp/year saved |

Know the gains you made and do not reduce them to add make up sources

# Some Details vs. Households

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Data from the Raleigh N and O, taken from Handbook of Water Conservation, Amy Vickers* | | | | | | | | | |
| *Typical single-family home: Standard vs Efficient* | | | | | | | | | |
| | | STD GL/Day | | Eff GL/Day | Percent | | Annual Household Numbers | | |
| Showers | | 11.6 | | 8.8 | Savings | | Days in year | | 365 |
| Clothes Washing | | 15 | | 10 | | | Gallons per day STD | | 69.3 |
| Dishwasher | | 1 | | 0.7 | | | Monthly GL STD | | 2079 |
| Toilets | | 18.5 | | 5.2 | | | Gallons per day EFF | | 42.3 |
| Faucets | | 10.9 | | 10.8 | | | Monthly GL EFF | | 1269 |
| Other | | 12.3 | | 6.8 | | | Daily Savings GL | | 27 |
| TOTAL | | 69.3 | | 42.3 | | | Monthly Savings GL | | 810 |
| Savings | | 0 | | 27 | 39% | | Annual Savings GL | | 9855 |
| NOTE: | 2 | gpm stream equals to | | 1051200 | gp/year saved | | | | |

| | | | | |
|---|---|---|---|---|
| **TOTAL**<br>You are saving by currently applying best available technology<br>and practices >>> | 21024000 | gallons per year | Using the data in the Handbook of Water Use and Conservation, we are saving about<br>843 | households worth of water per yr |

# Drought Recovery Ideas: reclaim and recycle

| | | | | |
|---|---|---|---|---|
| Recovering Water Streams | | | | |
| | Roof Drains | provide water only during rain and just after | Length | 100 |
| | | the amount you recover can be calculated in cubic feet | Width | 200 |
| | | =(surface area x inches rain)/12 | inches of rain | 2 |
| | | =multiply by 7.5 to convert to gallons | Cu FT | 3333 |
| | | be sure to use a tank and the available volume of the | GL | 25000 |
| | | tower to minimize water storage investment | | |
| | | | | |
| | Airhand. Cond. | provide water during the heat and humidity of summer | | |
| | | water is cold, pure, and if coils are clean it is clean | | |
| | | may require biocide in storage tank | | |
| | | can be calculated from air handler capacity and conditions | | |
| | | be sure to check chemistry and not use too much condensate as make up | | |
| | | | | |
| | RO Reject | provide use for the "reject stream" | | |
| | | how much you can use depends on the quality of the effluent | | |
| | | chemistry change may be needed to protect tower loop equipment | | |
| | | | | |
| | Rinse Waters | Rinse water from demin processes, softeners, etc. | | |
| | | | | |
| | Reclaim Water | Municipal Reclaim and Industrial or WW reclaim | | |
| | | | | |
| Advanced Filtration | | can require an investment up front, may be able to get as water service contract | | |
| | Clarifier/RO | can recover up to 10% of make volume | | |
| | Soften | expect $8 to $14 per 1,000 gallons recovered | | |
| | ETC | | | |

# Closed Loops

| | | |
|---|---|---|
| Closed loops generally are not big water users in a plant. | | |
| Closed loops generally do not make up more than 10% of their volume. | | |
| Make up meters and proper testing confirm loop is not leaking. | | |
| | | |
| Clean efficient closed loops ensure maximum heat transfer and thus minimized | | |
| energy and water consumption to do the job. | | |

Examples: chilled loop, hot loop

| | | | | |
|---|---|---|---|---|
| NOTE: | 2 | gpm stream equals to | 1051200 | gp/year saved |

# Step 1 Equipment Track

- MU METER ENSURES <=10% ANNUAL MU

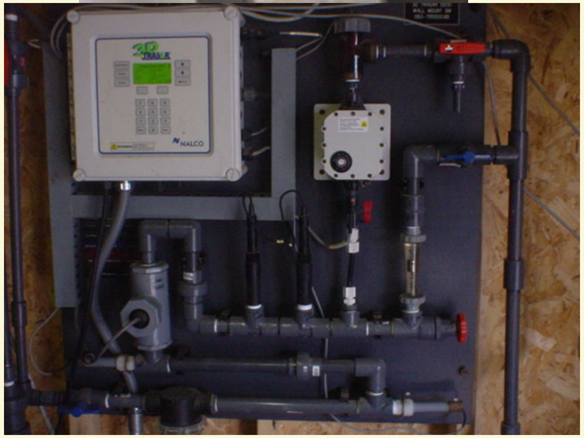
# Step 2 Equipment Automate

Pot Feeder

- Used for chemical additions
- Can be used for filtration
- Water in at bottom out at top

Direct Injection

- Direct injection can be set up for large loops – via meter or on line controller



# Step 3 Optimize

| | | | | |
|---|---|---|---|---|
| NOTE: | 2 | gpm stream equals to | 1051200 | gp/year saved |

The biggest enemy of closed loops is unfound leaks:

60 gph is 1gpm or 10,080 gl/week

40,320 gl per month

483,840 gl per year

Recall household average of 2079 per month

# Steam Systems

- Steam investment
  - $14 per 1MM lbs or more
  - Condensate 180 BTUs / LB
- Heat water with a fuel source to create steam
  - Natural gas
  - Coal
  - Wood chips
  - Steam from another unit

| | | | |
|---|---|---|---|
| Steam boilers can be large users of water if the steam generated is not returned as condensate. | | | |
| Steam boiler steam demand is driven by the system load. | | | |

# Step 1 Equipment Track

Tracking

Make up water to the loop

Steam produced by the steam gen units

# Step 2 Equipment - Automate


This can be as simple as pumps and controllers

# Step 3 Equipment - Optimize

24 by 7 Automation is now available for boilers chemistry too.

# Ideas to Cycle Up

| | |
|---|---|
| **Mechanical items to reduce water consumption** | Pretreat water to allow cycles in the boiler |
| | softeners remove hardness allow up to 50 cycles |
| | |
| | Demineralizations schemes remove most all minerals |
| | and allow up to ~100 cycles |
| | |
| | Returning maximum condensate directly reduces fuel |
| | water and chemical per 1000 lbs of steam |
| | |
| **Operation items to reduce water consumption** | Use need valves or orifice to steady surface blow down |
| **from the water treatment perspective:** | rates, utilizing bottom blow to control mud |
| | |
| | Move from precipitating programs like PO4 to all |
| | polymer programs to move from ~25 to ~50 cycles |
| | this reduces blowdown by 50% from 4 to 2 percent |
| | Thus reducing make up same amount |
| | |
| | Maximize condensate return as each percent gained |
| | directly reduces make up |

# Some Details

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Boiler | | Steam | hours per | Days per | Steam | Gallons | | | |
| | | Load PPH | day | Year | PP/year | per year | | | |
| | | 11,000 | 24 | 355 | 93720000 | 11291566 | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | **Generic Approach** | | | **Move to Polymer** | | **Proper Condensate** | | |
| | | **there is room to improve** | | | **to increase cycles** | | **Treatment and Return** | | |
| | condensate return | | 65% | | 65% | | 80% | | |
| | cycles | | 25 | | 50 | | 50 | | |
| | | | | | | | | | |
| | make up in pounds | | 36550800 | | 34676400 | | 20618400 | | |
| | make up in gallons | | 4403711 | | 4177880 | | 2484145 | | |
| | | | | | | | | | |
| **Payback** | | | | Savings in GL | | | | | |
| | Generic Program | | 4403711 | | | | | | |
| | Polymer Program | | 4177880 | 225831 | | | | | |
| | Polymer Program 80% Rtn | | 2484145 | 1919566 | | | | | |

# Drought Recovery Ideas

| | | | | | |
|---|---|---|---|---|---|
| Cycling Up | | | | | |
| | Assuming | 11,000 | pounds per hour of steam, moving from 25 to 50 cycles reduces | | |
| | | | water consumption by | 225831 | gallons per year |
| | | | | | |
| Increasing cond rtn | Assuming | 11,000 | pounds per hour of steam, moving from 65 to 80% condensate return | | |
| | | | water consumption by | 1919566 | gallons per year |
| | | | | | |
| RO/Demin | This process can reduce blowdown from 2% to 1% reducing make up by the same amount if | | | | |
| | you are already at 50 cycles. If you are limited to 25 cycles by water chemistry, RO/Demin | | | | |
| | can reduce blowdown from 4% to 1%. | | | | |
| | | | | | |
| Capture Streams | Rinse down water from softeners can often be routed to towers | | | | |
| | Rinse down water from demins can often be routed to towers | | | | |
| | Reject water from RO's can often be routed to towers | | | | |
| | Wifi water, and high purity waste streams can be routed to boilers | | | | |

# Municipal Reclaim and other streams

## Where do we begin?

- Traditional Water Treatment is designed to
  - Preserve Capital
    - Microbiological control
    - Corrosion control
  - Minimize Energy
    - Microbiological control
    - Scale control
    - Corrosion control
  - Minimize Water
    - Cycle up
    - Other conservation efforts

- Risk Minimization or Air and Water Hygiene is designed to
  - Prevent Pathogen Proliferation

We are going to focus on traditional first.

# Reclaim and other streams

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| Municipal<br>Reclaim | H<br>This can be mediated w chlorine, UV | H<br>Elevated Cl, SO4 | H<br>Generally higher anions | H<br>Due to suspended solids |
| Well Water<br>Limestone basis | S<br>Some have down hole chlorination | S | H<br>Limestone = Ca, CO3<br>May have SiO2 | S to L |

H = higher chance for issues, S = same chance for issues, L = lower chance for issues

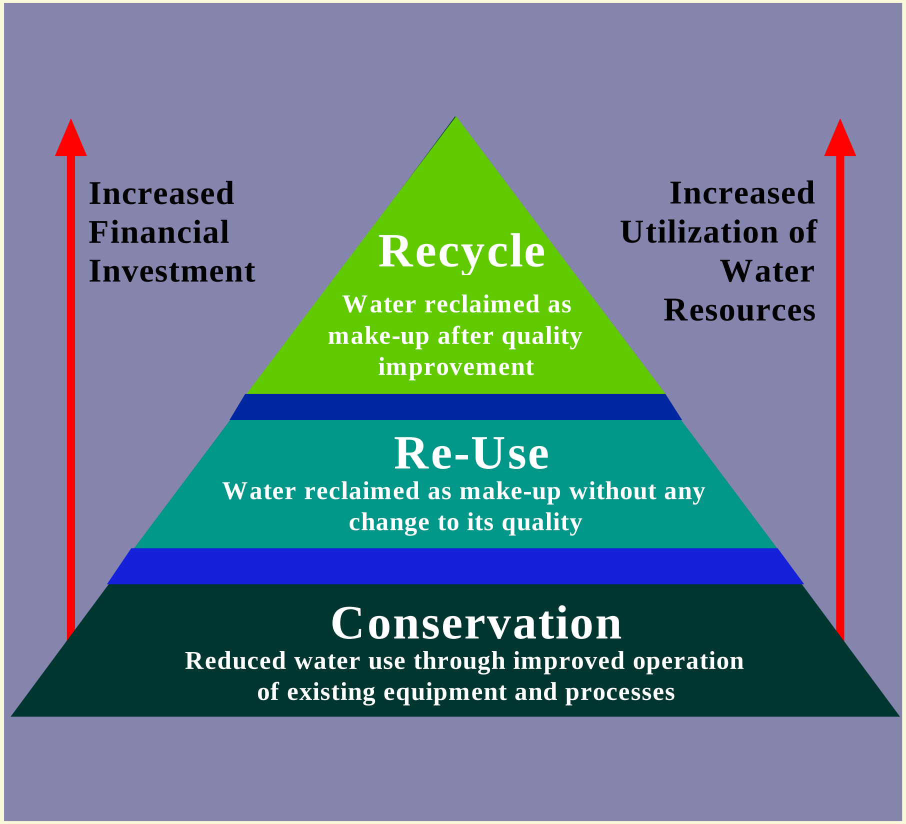
City water in the triangle is moderate with respect to hardness, alkalinity, silica and other key components. We can often run 6 to 10 cycles without pH control.

# Things to look for in reclaim and other streams

| | Target spec used for city mu current | city water quality 2007 | Desirable Wastewater from literature | 2006 muni reclaim ave | 2007 muni reclaim ave | Tower Target on Reclaim |
|---|---|---|---|---|---|---|
| **Element of Interest** | | | | | | |
| Aluminum (Al) | | <0.1 | *<0.1 | ND | ND | |
| Total Hardness (CaCO3) | | 29 | | 38 | 49 | |
| Calcium (CaCO3) | 22 | 19 | <200 | 34 | 34 | <1000 |
| Copper (Cu) | | 0.15 | <1.0 | ND | ND | |
| Iron (Fe) | | 0.11 | <1.0 | ND | 0.072 | <3 |
| Magnesium (CaCO3) | 14 | 10 | | 6.4 | 14.75 | |
| Sodium (Na) | 39 | 18 | | 110 | 80.63 | |
| Phosphorus (PO4) total | | 1.4 | <5.0 | 0.41 | 0.3 | |
| Phosphorus (PO4) ortho | | 0.9 | | 0.26 | | |
| Silica (SiO2) | 15 | 14 | <30 | 16 | 10.48 | <150 - 300 w SiO2 disp |
| Sulfur (SO4) | | | | | | |
| Nitrite (NO2) | | <0.20 | | 0.31 | ND | |
| Chloride (CaCO3) | 16 | 16 | | 63 | 71.25 | |
| Chloride as Cl | | 11 | | 45 | 50.75 | <400, or 500 to 750 |
| Nitrate (CaCO3) | | 0.87 | | | 61.38 | depending on metallurgy |
| Sulfate (CaCO3) | 21 | 28 | | 68 | 97.63 | |
| Sulfate as SO4 | | 27 | | 65 | 93.5 | <1000 |
| Bicarbonate (CaCO3) | 38 | 23 | <200 | | 22.71 | |
| Carbon dioxide free | 5 | | | | | |
| pH | | 7.5** | | 8.1 | 7.28 | |
| Conductivity (mmhos/cm) | | 150 | <1500 | 660 | 581 | <6000 |
| Conductivity treated limit | | | | | | |
| Free Chlorine | | | | | | |
| Residual Chlorine PPM | | | | | | |
| Ammonia (NH3) | | 0.055 | <1.0 | ND | 0.526 | |
| Suspended Solids | | <1.5 | <10 | ND | ND | |
| Alkalinity (CaCO3) | | 23 | | 161 | 21.86 | |
| Manganese (Mn) | | <0.01 | *<0.05 | ND | 0.096 | |
| Zinc | | 0.38 | | ND | 0.053 | |
| Total Organic Carbon | | <2.0 | <50 | 7.2 | 6.96 | |
| Oils/grease | | | <10 | | | |
| | | | | | | |
| NOTES: | | | | | | |
| desirable waste water guidelines taken from "Consevation Wastewater reuse for Ind Cooling Water Systems, Puckorius | | | | | | |

# Steps to Evaluate Streams

- Analyze the sample
- Model the water against the application
- Balance the results versus the investment to make it work
- If $ are large test the results in a pilot application

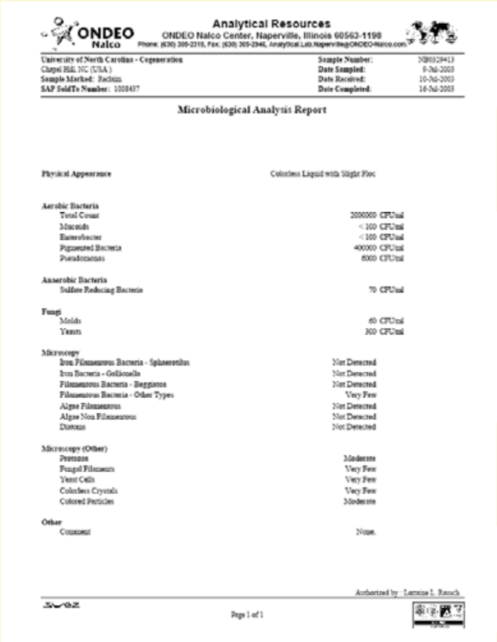


# Steps to Evaluate Streams

**1.) Analyze the water – determine key constituents**

Performance – Al, Ca, Cu, Fe, Mn
PO4, SiO2, HCO3, NH3
Conductivity, Suspended Solids
TOC, Oils, Grease

Risk – fecal ecoli, other pathogens



**Analytical Resources**
ONDEO Nalco
ONDEO Nalco Center, Naperville, Illinois 60563-1198
Phone: (630) 305-2315, Fax: (630) 305-2946, AnalyticalLab.Naperville@ONDEO-Nalco.com

| | | | |
|---|---|---|---|
| University of North Carolina - Cogeneration | | Sample Number: | NB0029413 |
| Chapel Hill, NC (USA) | | Date Sampled: | 9-Jul-2003 |
| Sample Marked: Reclaim | | Date Received: | 10-Jul-2003 |
| SAP SoldTo Number: 1008437 | | Date Completed: | 16-Jul-2003 |

**Microbiological Analysis Report**

| | |
|---|---|
| **Physical Appearance** | Colorless Liquid with Slight Floc |
| **Aerobic Bacteria** | |
| Total Count | 2000000 CFU/ml |
| Mucoids | < 100 CFU/ml |
| Enterobacter | < 100 CFU/ml |
| Pigmented Bacteria | 400000 CFU/ml |
| Pseudomonas | 6000 CFU/ml |
| **Anaerobic Bacteria** | |
| Sulfate Reducing Bacteria | 70 CFU/ml |
| **Fungi** | |
| Molds | 60 CFU/ml |
| Yeasts | 300 CFU/ml |
| **Microscopy** | |
| Iron Filamentous Bacteria - Sphaerotilus | Not Detected |
| Iron Bacteria - Gallionella | Not Detected |
| Filamentous Bacteria - Beggiatoa | Not Detected |
| Filamentous Bacteria - Other Types | Very Few |
| Algae Filamentous | Not Detected |
| Algae Non Filamentous | Not Detected |
| Diatoms | Not Detected |
| **Microscopy (Other)** | |
| Protozoa | Moderate |
| Fungal Filaments | Very Few |
| Yeast Cells | Very Few |
| Colorless Crystals | Very Few |
| Colored Particles | Moderate |
| **Other** | |
| Comment | None. |

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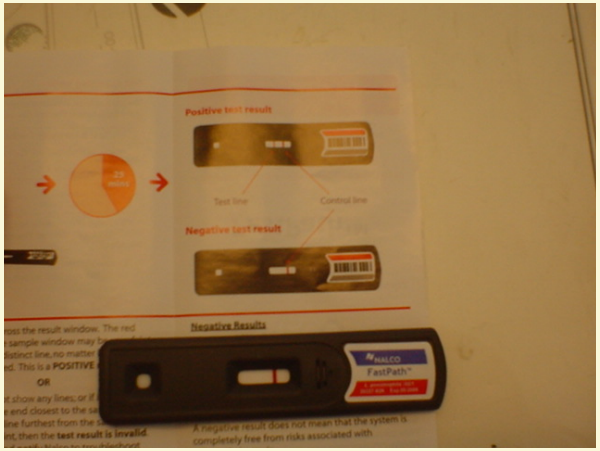
Example of differential bio

<<<<<




Example of Fastpath

Legionella SRG1>>

# Steps to Evaluate Streams

**2.) Model the water against the application:**

Mechanical (metallurgy, flows) Around your limits
Operational (temperatures, intermittent) >> (Corrosion rates)>>Solution
Chemical (PO4, Metals, PSO, azoles) (Traditional or Risk Mgmt)

<u>Mechanical</u>

*Performance*

Protect the investment

| | Excellent | Good | Un-Acceptable |
|---|---|---|---|
| Mild Steel Corrosion Rates | <2 | <5 | >10* |
| Copper Corrosion Rates | <0.1 | <0.2 | >0.5 |

*Depends on pipe size, thickness and location too
Will the stream be on a shell side or the tube side

*Risk* – Location near susceptible population?

<u>Operational</u>

*Performance* – max bulk water temps, max skin temps, flow rates below 2ft/sec are higher potential for failure

*Risk* – Has a Risk Assessment been done?
Is on site Legionella Testing done?
Is remediation plan in place?

<u>Chemical</u>

*Performance* – Any discharge restrictions? Metals, PO4, pH

*Risk* – Are biocides registered for their uses


# Steps to Evaluate Streams

**3.) Balance versus the investment to make it work**

*Performance* **–** Calculate the $/1000 saved vs. the investment
Good will
*Risk* – Will additional treatments be required?

# Steps to Evaluate Streams

**4.) Test via a pilot cooling system, a wastewater simulator or a pilot boiler**

This can ensure success and provide peace of mind especially when the dollars get large

Again – most water treatment programs are set up to provide performance. Things like maximizing cycles, maintaining clean heat exchangers and protecting equipment. Risk Management requires a plan, documentation and agreed to actions.

**Active or soon to be Municipal Waste Water Applications**

Cary, OWASA
Raleigh, Durham

Water for pilot scale evaluation

# Others?

**From a water treatment perspective here are some other "out of the box" ideas that can help**

| | |
|---|---|
| TOWER | Where large air handling units are making condensate, capture that water and use as tower make up |
| | An extreme application is taking "microfiltration" to in essence capture blowdown and using the |
| | principles of reverse osmosis reduce BD by 75% and return this filtrate to the tower |

**Here are some things we have seen.  Please note application may create an issue in other areas:**

| | |
|---|---|
| Reduce or eliminate irrigation | No flush urinals(est savings 40kgl /yr) |
| Turn off drinking fountains and ice machines | low flush toilets (1.0gl/per), two position flush toilets |
| Move all cafeteria items to disposable | Use w astew ater, foundation drains, roof drains as system make up |
| Reduce outside air intake to reduce load | Reduce or eliminate humidification |
| Use low  flow  show er heads and or eliminate on site show ering | |
| Increase all summer temperature set points 2 to 4 degrees to reduce load | w w w .flushmate.com 866.873.1391 |
| Decrease all w inter temperature set points 2 to 4 degrees to reduce load | |

**We are often asked how to these measures compare to what an individual can do?**

*Data from the Raleigh N and O, taken from Handbook of Water Conservation, Amy Vickers*

*Typical single-family home: Standard vs Efficient*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | STD GL/Day | Eff GL/Day | Percent | | Annual Household Numbers | |
| Showers | | 11.6 | 8.8 | Savings | | Days in year | 365 |
| Clothes Washing | | 15 | 10 | | | Gallons per day STD | 69.3 |
| Dishwasher | | 1 | 0.7 | | | Monthly GL STD | 2079 |
| Toilets | | 18.5 | 5.2 | | | Gallons per day EFF | 42.3 |
| Faucets | | 10.9 | 10.8 | | | Monthly GL EFF | 1269 |
| Other | | 12.3 | 6.8 | | | Daily Savings GL | 27 |
| TOTAL | | 69.3 | 42.3 | | | Monthly Savings GL | 810 |
| Savings | | 0 | 27 | 39% | | Annual Savings GL | 9855 |
| NOTE: | 2 | gpm stream equals to | 1051200 | gp/year saved | | | |

# In the End:

| **Conclusions** |
| --- |
| Know where you are with respect to industry standards |
| Capture low hanging fruit and document it annually |
| Evaluate advanced options versus payback |
| Take the best actions first |

Look for 2 for 1 Optimization!

Take action get two benefits.