Where's My Water?

Bay Area Data Center Industry

Reclaim Water Needs

End User's Perspective

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Topic Agenda

- Data Center Design & Operation
- Sustainable Operation Priorities
- Mission Critical Parameters
- Reclaim Water Supply Considerations
- Safety Handling & Site Security Issues
- Outsourced Critical Performance
- Water Consultant Role - Make It Work
- Utility Role - Address Concerns
- Utility Role – Water Quality
- Case Studies
- Summary

Data Center Design & Operation

- Data Centers are energy intensive operations
- Cooling process efficiency and reliability are mission critical factors
- Numerous new facilities have experienced severe consequences due to inability of water treatment approaches to manage inferior source water quality.

Sustainable Operation Priorities

Site Selection Considerations: Sustainable Needs

- Energy supply
- Water supply
- Water quality
- Treatment capability
- Discharge options
- Tax incentives

Site selection is generally not dependent on market access or labor issues

Mission Critical Parameters

- All risks must be evaluated and vetted in the design stage for new facilities
- Water supply and quality, waste discharge options, and permitting are MC decisions.
- Ultimate DC energy efficiency and reliability is paramount to competitive market survival.
- Retrofit reuse opportunity for existing facilities must take these same issues into account.

Reclaim Water Supply Considerations

- Build reuse facility and they will come?
- Reliability Of Reclaim Water Supply
- Reclaim Water Cost vs. Other Sources
- Long Term Water Supply & Cost Assurances
- Alternative Water Sources During Outages
- Incentives Offered By Reclaim Authority

Safety, Handling & Site Security

- Data Handling Efficiency & Reliability is our Product
- *Not* Water Sourcing & Treatment
- Water Treatment Concerns:

  Safety & Handling Risk - Chemical Storage & Use

  Treatment Control

  - Variable Water Quality

  Water Treatment Performance

  Limited Vendor Access

  - Security

  Limited Internal Man Power

Outsourced Critical Performance

Outsourcing Considerations:

- POWT Water & Discharge Suppliers vs. Facility Operated Wells and WT operations
- Cooling System Operation & Maintenance
  - Contractors vs. Internal Staff -
- Site Water Treatment Consultants
- Water Treatment Options

Water Consultant Role - Make It Work

- The Water Treatment Consultant Will:
  - Evaluate reuse quality potential for scale, corrosion, bio-fouling, pathogen control
  - This is *Data Center / Consultant responsibility*
- They do not want or need utilities to provide designed water treatment. This has led to reuse water becoming an economically unattractive resource in recent cases.
- Data Centers and their water treatment consultants will determine their own source water and sustainability requirements. They have extensive experience with this practice.

Utility Role - Address Concerns

- Provide consistent quality and reliable supply at the lowest competitive cost.
- Either the utility or the DC must address back up water supply redundancy for outages.
- DC's need infrastructure from the utilities for coordinated source and discharge permitting.

Utility Role - Water Quality

- *Do* Provide Reclaim Water "As Is Title 22"
- Filtration On Site To Remove Distribution System Generated TSS Is Needed
- *Do Not* Over Treat Reclaim Water To Change Quality (Reverse Osmosis, Demin, etc)
- Water Quality Needs Managed By End User

Water Cost

Typical Water & Sewer Cost

- City Water:
  $1.50-$2.50/1,000 gal.
- Well Water Cost:
  $0.12-$0.15/1,000 gal.
- Reclaim Water Cost:
  ???

"Must Be Competitive With Other Water Sources"

Case Study - Water Gone Bad!

Reclaim Water Source: RO Treated Muni Effluent

Location - Central Washington

- City Water: $0.75-$1.10/1,000 gallons
- Well Water Cost: $0.12-$0.15/1,000 gallons
- Reclaim Water Cost: $6-$10/1,000 gallons

"Result: DC's Used Alternative Water Sources - Primarily Well Water & Evap Ponds"

Case Study - Treatment Gone Bad!

Data Center: Failed Treatment Program

- Chiller Tubes Scaled within 6-months After Start-Up
  - Added Electrical Cost: $750/day
- Chiller MFG Tube Cleaning Efforts Failed
  - Recommended Re-Tubing
  - Cost: (12) chillers, $600,000

"Result: Two Additional Chillers Required On Line"

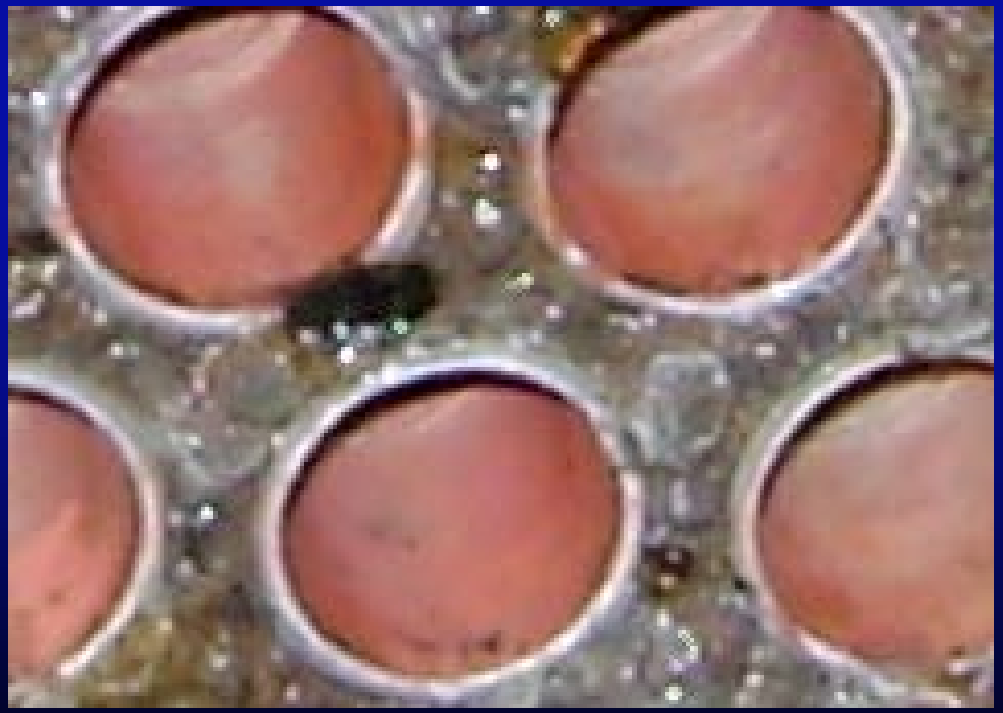
Case Study - Gone Bad - Corrected!

Data Center: Soft Makeup – Silica – Zero BD

- Consultant – Program designed for source quality
- Effective chemical tube cleaning approach
  - Cost:

    $38,280
  - Result:

    <1.0°F Approach



Result: Clean Tubes

Savings: $561,720

Case Study - Reclaim Water Use

Data Center: Santa Clara, CA

Make Up: Reclaim - South Bay Water

- (2) 980-Ton Tower
- Converted To Reclaim In March 2011

Case Study - Reclaim Water Use

Data Center: Santa Clara, CA

Reclaim Water Quality- No Pre-Treatment

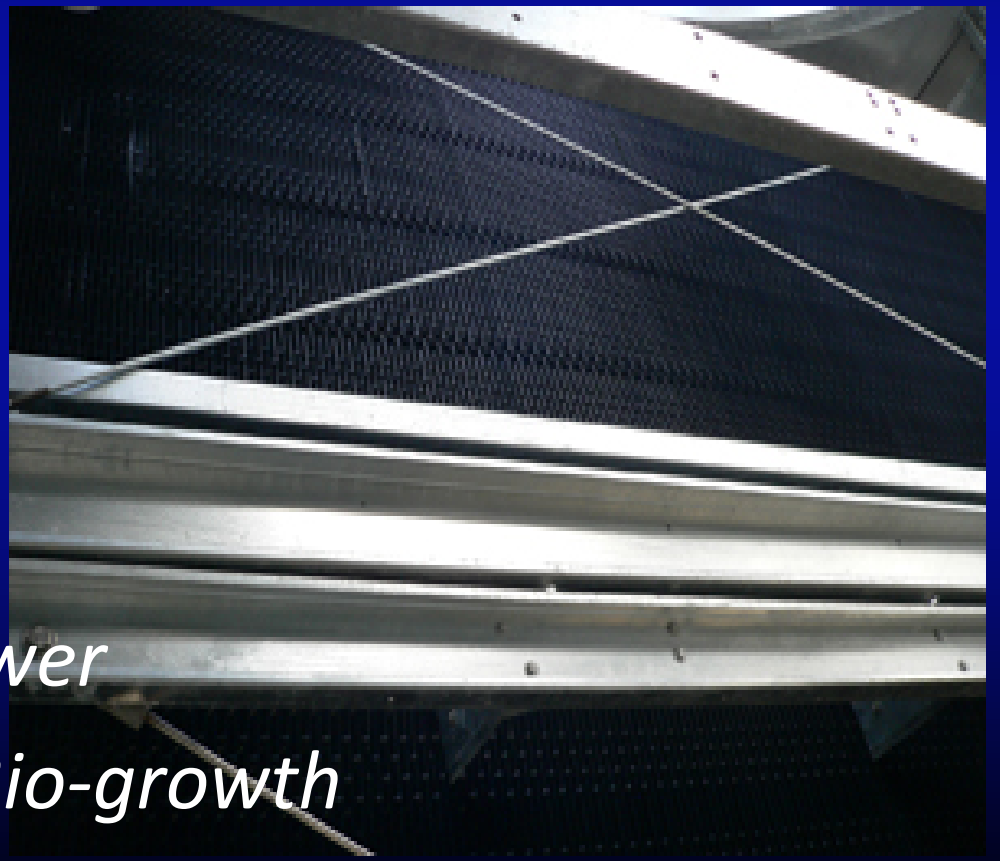
Conductivity: 891 umho

Hardness: 280 PPM

Alkalinity: 190 PPM

Silica: 19 PPM

pH 7.4



Result: Clean Tower

No Scale, Corrosion or Bio-growth

Case Study - Reclaim Water Use

Data Center: Santa Clara, CA

Reclaim Water

Off-Site Pre-Treatment:

- None, Title 22 Std.

On-Site Pre-Treatment:

- High Efficiency Filtration
- High Efficiency Softening

Result: Water Cost Minimized

Summary

Reclaim Water - Industry Needs

- Reliable Reclaim Water Supply & Quality
- Competitive Reclaim Water Cost
- Long Term Supply & Cost Assurance
- End User To Define Water Quality Needs
- End User To Determine Treatment Option

"Provide consistent quality and reliable supply at the lowest competitive cost"

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Thank You For Your Time!

Any Questions?

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