This presentation premiered at WaterSmart Innovations

watersmartinnovations.com
COOLING TOWER SYSTEM UPGRADES AT SKY HARBOR INTERNATIONAL AIRPORT
OVERVIEW

• Terminal 4 Cooling Towers
  • Project Review
  • Performance and Additional Changes

• New Installation at Terminal 3
  Complete

• Rental Car Center
- Sky Harbor Airport
- 9,600 tons of cooling (all of Terminal 4)
SYSTEM CONDITIONS
PRE-RENOVATION

• Heavy Scale and Corrosion
  • Chemical and physical removal

• 2.5 Cycles of Concentration at peak efficiency

• Conflict: Chemical Company vs Chiller Company

• Storage of Strong Acids (Health and Safety Concerns)
PROPOSED SYSTEM UPGRADES

• Add water softener
  • Swap the calcium (removal) with sodium (ion exchange)
• Add mixed oxidant generator (MIOX)
  • Use salt to generate bleach (predominant) and peroxide (minor)
  • Replaces Biocide
• Replace all media
OTHER IMPROVEMENTS
OTHER UPGRADES
SS PIPE INSTALLATION
NO MORE RUST CRABS
CIRCULATION JETS IN BASINS
ESTIMATED COSTS & RETURN ON INVESTMENT (SIMPLE PAYBACK)

- Initial estimate = $295,000 (Capital and Labor)
- Actual = $407,000 (Includes Media/Pipes)
- Estimated savings = $140,000 per year
  - (Water = $100K, Chemicals = $40K)
- Estimated ROI = 2.9 years
HOW ARE WE DOING?

- 2.5 years in operation
- Monthly chemical monitoring
- Relocation of MIOX salt tank
- Achieving 6.5 COC on regular basis
- Water savings underestimated (21 million gallons saved in 2018, or $128,000, just in water)
- Actual ROI more like 2 years
HOW ARE WE DOING?

- Water savings projected to be 26 MG in 2019
- Saved 13K pounds of chemicals in 2018
- Adding soft water feed to MIOX to control varying water quality
- Cleaning of media in towers is now done with garden hose
- Addressing implications if wastewater salinity standard is established
- Future Capital savings and reduced O & M costs not included in ROI (will be reviewed)
<table>
<thead>
<tr>
<th>Sensor</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>S1 Cond</td>
<td>10813μS</td>
</tr>
<tr>
<td>S3 MU Condu</td>
<td>1670μS</td>
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<tr>
<td>AI1 4934D</td>
<td>144.68ppb</td>
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<tr>
<td>AI3 HACH CL</td>
<td>0.32ppm</td>
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<tr>
<td>DIC Bleed</td>
<td>224970gal</td>
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</table>

No Alarms
Conductivity shows excellent control - no issues. Red line is make up conductivity line, showing excellent control. Tower conductivity currently increasing.
ACTUAL WATER SAVING

Water Usage By Month for 2016 to 2018

Gallons

January  February  March  April  May  June  July  August  September  October  November  December

2016  2017  2018
ADDITIONAL INSTALLATIONS

• Replication of system in Terminal 3 (completed)
• Rental Car Center
TERMINAL 3

- New Cooling Towers
- 4 X 1,000 tons
- No previous performance for comparison – savings similar to T4
- Estimated 10 MG water savings
RENTAL CAR CENTER

- Replace Media
- 3 X 600 tons
- Same systems: Softening/MIOX
- Estimated 4 MG water savings
WHAT ABOUT SALINITY?

- No change to systems
- Minor operational changes
- 5 – 10 years to come into compliance if standard is adopted
- Compliance would not affect overall performance
QUESTIONS

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