

# Advantages of Integrating Non-Hazardous Disinfection Systems in DCP Cooling Towers



**DistrictCooling2018**

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**INNOVATIVE  
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# Advantages of Integrating Non-Hazardous Disinfection Systems

## IWET OBJECTIVE



Since production of both Energy & Water are interdependent, IWET focusses on solutions that optimize the utilization of Water & Energy resources and are Sustainable for the environment.

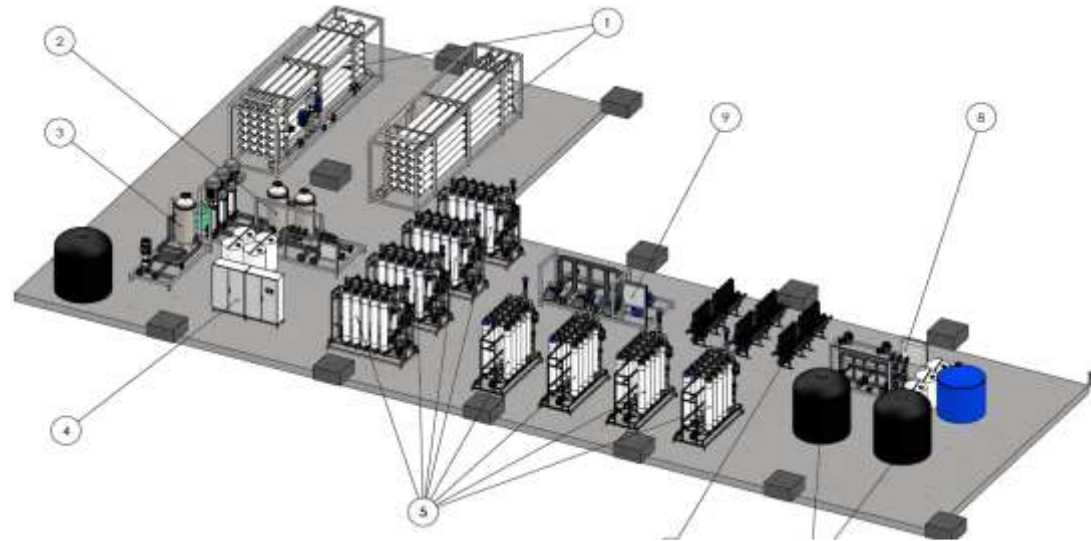
Guide industrial & commercial customers to adopt cost effective solutions by utilizing advanced technologies that require low operation and maintenance costs, evaluated over the life cycle of the plants.



# Advantages of Integrating Non-Hazardous Disinfection Systems

## IWET SOLUTIONS

- High Performance Filters that improve DCP Efficiency and consumes less power (<50% for Filter).
- TSE Polishing Plant that consumes less power 0.75 kWhr/m<sup>3</sup> (< 25 - 40%).
- Advanced Oxidant Generation for non-hazardous disinfection that reduces Chemicals by 50%.



# Advantages of Integrating Non-Hazardous Disinfection Systems

## Disinfection Technologies for DCP Cooling Towers

Disinfection Technology	Chemical Based Biocides	On-site Disinfection Generation
<p><b>Advantages / Benefits</b></p>	<ul style="list-style-type: none"> <li>- Non-oxidizing Biocide Programs</li> <li>- Oxidizing Biocide Programs</li> </ul> <ul style="list-style-type: none"> <li>- Tried &amp; tested, well-versed by Operators, dependable vendors / service providers.</li> <li>- Low Capex cost</li> <li>- Can be easily controlled for varying load, can be mobilized quickly (local stock).</li> </ul>	<ul style="list-style-type: none"> <li>- UV, Ozone, Hybrid UV/Ozone</li> <li>- Sodium Hypochlorite Generator</li> </ul> <ul style="list-style-type: none"> <li>- Environmentally friendly, Non-hazardous, enables water reuse, suitable for irrigation.</li> <li>- Low operational &amp; life-cycle cost. ROI &lt;3yrs</li> <li>- Keeps system much cleaner, reducing cleaning schedules of cooling tower.</li> </ul>
<p><b>Disadvantages / Challenges</b></p>	<ul style="list-style-type: none"> <li>- Hazardous to environment and people, recurring high operational cost, control varies depending on dosage schedule. Controls water quality but cannot limit CT fills fouling.</li> </ul>	<p>New technologies - seen as risky, sold as a product, high Capex, specialized O&amp;M. Cannot handle varying load; very expensive for highly contaminated systems.</p>

# Advantages of Integrating Non-Hazardous Disinfection Systems

## Managing Disadvantages / Challenges of Non-Hazardous Disinfection Systems

### Disadvantages / Challenges

New technologies - seen as risky

Sold as a product / High Capex

Specialized O&M

Cannot handle varying MB load

Expensive for contaminated systems

### Solutions

Offer demo/trial units; or offer 'Try & Buy' scheme so risk is minimized.

To be offered as 2-3 years Service Contracts similar to Chemical Biocides

Train O&M, or manage by Service contracts

In DCP CTs microbiological load can be controlled by installing effective Filters

In DCPs, as there are no process contamination other than environmental dirt, this can be managed by effective filters.

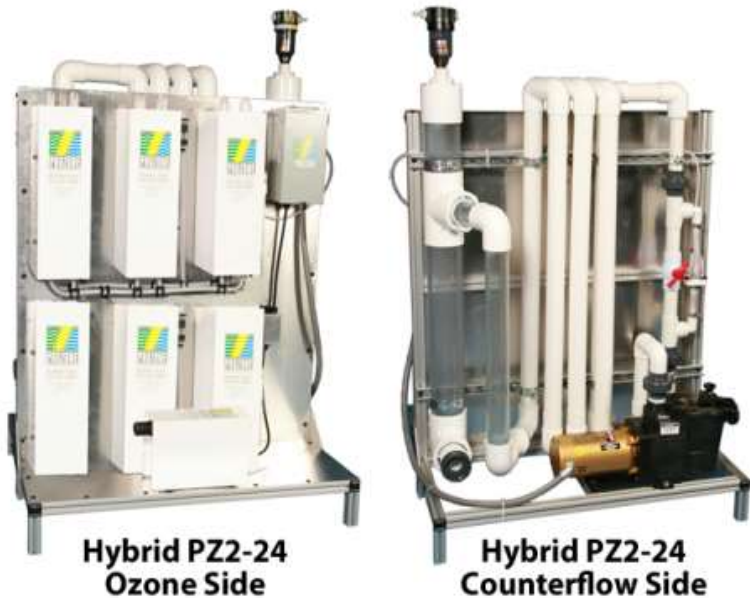
# Advantages of Integrating Non-Hazardous Disinfection Systems

## Design Criteria for Non-Hazardous Disinfection System

- Oxidant to be effective in high pH water, close to 9
- Oxidant Generation Technology to be less complex and easy to maintain
- Oxidant generation with NO raw material are preferred
- Clean Condenser Water: By utilizing high-performance Filters TSS: < 6 PPM. This reduces the nutrients for Microbiological organisms by > 50%.
- Manage corrosive nature of the Oxidant, by Corrosion Inhibitor and location of dosage.
- Start dosage step-by-step, if required in conjunction with Chemical Biocides, until complete MB Control is achieved.

# Advantages of Integrating Non-Hazardous Disinfection Systems

## Hybrid UV/Ozone Advanced Oxidation Systems



- Disinfectant: High potent Hybrid Oxidation process consisting of UV-C, Ozone & Hydroxyl Radicals.
- Production: On-site produced from Air, so NO raw material cost for the entire lifecycle of Plant.
- Maintenance: No maintenance required; only UV tubes replacement every 3 years.
- Residual Effect: <1 min only, strips in Cooling Tower.





# Advantages of Integrating Non-Hazardous Disinfection Systems

## Hybrid UV/Ozone Advanced Oxidation Systems

Replacement:	Hazardous Non-Oxidising Biocides & Halogen based Oxid.Biocides
Application:	Cooling Towers, Water Storage Tanks, to mitigate Legionella Risk
Ingredients:	Onsite Generated UV-C, <b>Non-CD Ozone</b> , Hydroxyl Radicals.
Raw Materials:	None - only ambient air
Target:	Total Bacteria Count - $10^2$ or less. Legionella: 'Nil' Apart from MB Control, maintains Cooling Tower Clean.
Benefits:	Increased Efficiency, HSE Improvement, Enables Water Reuse.
Hazards:	No Fire or HSE Hazards, as no Halogen or H <sub>2</sub> is generated.
Commercial:	ROI of 2-4 years with Direct Saving; <1 year with Indirect Saving.





# Advantages of Integrating Non-Hazardous Disinfection Systems

## Hybrid UV/Ozone Advanced Oxidation Systems - Benefits

### Reduces Chemicals by 50%.

Eliminates hazardous chemical Biocides and reduces Inhibitor.

Reduced Cost of Chemicals and transportation / handling which helps Operators, HSE.

### Reduces Water Consumption & Enables Reuse

CT can operate at higher Cycles of Concentration, COC 8 - 10 possible with Filtration

Blowdown could be utilized for Irrigation, as there are no hazardous chemical Biocides

### Improves Operations, Efficiency & Reduces Cost

Guaranteed elimination of Legionella Bacteria - not possible with Chemical Biocides

Clean Cooling Towers reduces 'Quarterly Cleaning Cost' by 50 - 75%

Clean Condenser Tubes in Chillers reduces 'Energy Cost' by 1 - 10%

### Environment Friendly with Lower Lifecycle Cost

Eliminates hazardous chemical Biocides transport, storage, handling and discharge.

AOP have lowest operating cost, since it is generated from air and only UV tubes need replacement.



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# Advantages of Integrating Non-Hazardous Disinfection Systems

## Hybrid UV/Ozone Advanced Oxidation Systems - Benefits

- Dosage of AOP Solution to be after 'Condenser' before 'Cooling Tower'.
- This avoids even traces of Ozone entering Condenser / Chillers. Ozone will be measured on daily basis in CDW system at 3 points - near Dosage point, before Condenser & in CT Basin.
- Total Bacteria Count to be measured in above 3 points, during start-up.
- Corrosion Inhibitor to be measured on Daily basis in above 3 points, during start-up.
- Corrosion Rate to be measured using Coupon Racks and Online Analyser (if available).
- Cooling Towers shall be pictured in detail before and after Start-up.
- Chiller Approach Temp and other parameters to be logged before and after Start-up.



# Advantages of Integrating Non-Hazardous Disinfection Systems

## Hybrid UV/Ozone Advanced Oxidation Systems - Benefits

### Cost & Benefit Comparison:

Compared to traditional Chemical Treatment system, AOP systems offer excellent protection against fouling and scaling, ensuring cleanliness of the Condenser water system.

- Savings in Biocide Chemicals cost (**Direct saving**)
- Savings in Cleaning Cooling Towers (**Direct saving**)
- Savings in Cooling Tower fills replacement, owing to less cleaning (**Indirect saving**)
- Savings in Cleaning Condenser tubes (**Indirect saving**)
- Savings in Power consumption owing to increased efficiency because of better heat exchange, even a 0.5 - 3% reduction would save several hundred thousand AED per year. (**Indirect saving**)
- ROI with Direct Saving would be 2-4 years, while including Indirect Savings could be < 1 year.



# Advantages of Integrating Non-Hazardous Disinfection Systems

Hybrid UV/Ozone Advanced Oxidation Systems - Benefits

## Questions on Implementation / Demo

