

WCTI SCOPE OF WORK - COOLING TOWER WATER TREATMENT (Zero Blowdown / Chemical Replacement / Green Chemistry)

The intent of this water treatment approach is to support strategic objectives for water and energy conservation, elimination of chemicals that are hazardous to environment or employees and to sustain natural resources needed for our future.

Program Service and Performance Guidelines

WCTI TECHNOLOGY IS BASED ON MAINTAINING THE FOLLOWING METHOD USE CONTROLS & SERVICE MONITORING:

- Pre-treatment system specification & operation:
 - < 0.5 mg/l average total hardness in makeup to cooling tower
 - <1.0 NTU average turbidity prior to HES (high efficiency softener)
- Tower system water specification:
 - < 30.0 mg/l hardness
 - > 9.0 pH, Preferred 9.7 to 10
 - > 200 mg/l silica, Preferred 300+ mg/L
 - > 10,000 conductivity (if tower operating system and environmental conditions permit)

Performance Goals (reached when specifications are met and maintained);

- Clean heat exchanger surfaces
- Corrosions rates;
 - A. Less than 0.5 mils/year on steel (generally less than 0.2 mpy)
 - B. Less than 0.3 mils/year on copper (generally less than 0.1 mpy)
- Low aerobic bio-growth in wetted areas (generally less than 10^3 CFU/ml)
- Zero Tower Bleed at designed specifications (to maximize water conservation and minimize discharge of chemical products to sewers)
- Optimum WCTI chemistry control ranges should be determined for each site based on performance evaluations and equipment inspections, as source water quality and operating conditions at each site will impact performance and control requirements.
- The WCTI Distributor warrants that these performance goals will be met with adherence to WCTI specifications and guidelines outlined as Customer and Distributor requirements.

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DISTRIBUTOR - PERFORMANCE REQUIREMENTS

Distributor shall be responsible for and have expertise to perform the following services during an expected visit frequency of once a month:

- Provide HES, RPA and HEF pre-treatment system installation and start up assistance. Provide commissioning of HES, RPA and HEF operation and communications.
- Provide customer training at start up and continue as required, for recommended program testing and control procedures. Develop testing log sheets for customer recording of test results, observations and actions taken.
- Troubleshoot, as needed, and correct pre-treatment system operation deficiencies.
- Review daily RPA auto generated 24 hour summary reports for performance anomalies, and respond to RPA control alarms with contact and instruction of site staff to insure proactive corrective actions are taken to avert performance impact or water wastage.
- Apply biocides, silica and alkalinity chemicals when sufficient make-up chemistry is not attainable during start-up transition. Azoles may be used in some systems for copper inhibition.
- Sample and test source water TDS and hardness, pre-treatment system hardness, tower system hardness and tower TDS, silica and pH at least once per month
- Review customer site testing results and operation logs for pre-treatment system and cooling tower water, and retain copy of logs for file.
- Analyze source water hardness monthly and provide adjustments to regeneration programming and regenerate usage to optimize gallons of water produced per regeneration / service run as specified for WCTI proprietary equipment design and configuration. Frequent optimizations may be required with significant variation in source water in order to meet HES output quality specifications.
- Provide recommendations to correct mechanical conditions causing tower overflow, tower leaks or excessive splash and drift that lead to excessive water loss and treatment control issues.
- Document service visit test results, actions, corrections and recommendations in visit report to Customer and retain copy for files.
- Provide corrosion coupon corrosion evaluations and on site biological testing (dip sticks) as required to demonstrate treatment performance.

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- Monthly program fees will include normal equipment repairs and maintenance, and minor wear parts for pre-treatment units – does not include salt, resin or filter media replacement.
- WCTI distributors are required to meet license agreement payment terms for purchases of equipment and monthly method use royalties for licensing of customer application.

CUSTOMER – PERFORMANCE REQUIREMENTS

- Customer to test daily for HES and tower hardness, and take actions to support HES and HEF operation; Hardness and other test data should be logged daily, along with salt consumption.
- Customer to maintain salt supply levels sufficient to maintain HES pre-treatment equipment performance to maintain total hardness < 30 mg/L in tower water. Tower bleed should be implemented when hardness exceeds 30 mg/L.
- Customer to inform distributor of all anomalies in order to help prevent system upsets
- Customer to monitor pre-treatment HEF filter flows when this equipment is required due to inferior source water quality. Customer will inform distributor of HEF problems.
- Monitor total system water use to insure uncontrolled wastage is avoided.
- Respond proactively to upset conditions detected by RPA monitoring system alarms and/or distributor corrective recommendations to avert system performance impact or water wastage.

SERVICES NOT INCLUDED IN WCTI SCOPE OF WORK

The following additional services may be provided by the service distributor if required by customer sites, but not included in monthly service fees, thus will require additional project fees or purchase cost when requested.

- Softener or filter equipment installation
- Weekly or added routine service visit frequency
- Testing equipment and reagents, corrosion study assemblies (racks)

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- Support of specialized monitoring or evaluation equipment
- Specialized biological or pathogen testing
- Resin or filter media replacement and installation
- Major equipment parts, after 12 months or expiration of warranty.
- Full service contracts
- Tower cleaning services
- Supply salt or handling services
- Tube brushing
- Eddy current testing
- Recycled water use (pre-filtration support; supplemental biocide, foam control, copper inhibitor)

