## **Mechanical Specification**



# **EVAPCO Water Saver Pre-Treatment** for Evaporative Cooling Systems

## PART 1 - GENERAL

#### 1.1 DESCRIPTION

### A. Work Includes:

- 1. Provide capacitive deionization pre-treatment system.
- 2. Completely coordinate with work of all other trades.
- 3. See Division 1 for General Requirements.
- 4. Services of manufacturer's representative company to provide PLC controlled pretreatment system and equipment as specified herein.

## B. Description of System:

- 1. Uses the process of capacitive deionization to proportionally remove dissolved ions from the make-up water.
- 2. Improved make-up water quality increases the cycles of concentration for the evaporative cooling units.
- 3. Reduction in blowdown water for evaporative cooling equipment.

## 1.2 SUBMITTALS (See Division 1)

- A. Submit per the requirements Division 1.
- B. Shop drawings: Show all water treatment equipment, including the following:
  - 1. Piping and Instrumentation Diagrams (show all field piping required, if any).
  - 2. PLC control panel and wiring diagrams (show all field wiring required). Include bill of materials showing model number, manufacturer, physical layout drawings, panel and equipment catalog cuts.
- C. Installation Operation and maintenance manuals
  - 1. Provide a copy of IOM with equipment.
- D. Laboratory make-up water sample analyses: Submit a copy of the site specific make-up water analysis to document the water quality available at the project site. Make-up water test analysis to include at a minimum the analysis of the following compositions of the water, field testing shall not be accepted:
  - 1. Calcium Hardness (as ppm CaCO<sub>2</sub>)
  - 2. Total Hardness (as ppm CaCO<sub>2</sub>)
  - 3. Total Alkalinity or m-Alkalinity (as ppm CaCO<sub>2</sub>)
  - 4. pH
  - 5. Silica (as SiO<sub>2</sub>)
  - 6. Specific Conductivity (micro S/cm)
  - 7. Sulfate (as SO<sub>1</sub>)
  - 8. Chloride (as Cl-)

- 9. Phosphate (as PO<sub>1</sub>)
- 10. *Iron*
- 11. Copper
- 12. Manganese

## 1.3 QUALITY ASSURANCE

- A. The water treatment supplier shall:
  - 1. Obtain water samples from the site and furnish a laboratory analysis of the water supply with submittal.
  - 2. Review the make-up water analysis to ensure compatibility with the water treatment program.
  - 3. Propose the increase in cycles of concentration by implementing the capacitive deionization pre-treatment system on the makeup water to the evaporative cooling unit.

### 1.4 PERFORMANCE CRITERIA

- A. Pre-treatment system shall provide ≥ 75% recovery of raw makeup water
- B. Selection Criteria
  - 1. Manufacturer: Evapco
  - 2. Unit Type (cooling tower, evaporative condenser, closed circuit cooler):
  - 3. Total Load: MBH
  - 4. Site Makeup Conductivity: mhos
  - 5. Site Makeup Silica: ppm
  - 6. Current/Design Cycles without Water Saver:
  - 7. Desired/Optimized Cycles with Water Saver:
  - 8. Recovery: %
  - 9. Electrical Specification: 230/3/60 3-wire (delta) or 460/3/60 4-wire (wye)
  - 10. Number of Loops:
- C. If reclaim water is to be supplied to the inlet of pre-treatment system, water shall meet the following:
  - 1. Conductivity: <850 mhos
  - 2. Alkalinity: <150-ppm (as CaCO<sub>2</sub>)
  - 3. Ammonia: < 0.20-ppm
  - 4. Calcium Hardness: <150-ppm (as CaCO<sub>2</sub>)
  - 5. Chloride: <130-ppm
  - 6. Total Organic Carbon (TOC): <10 mg/l
  - 7. Oil & Grease: <1.0 mg/l
  - 8. pH: 6.0 to 8.0
  - 9. Silica: <25-ppm
  - 10. Total Suspended Solids (TSS): <25-ppm
  - 11. SDI 15: <5
  - 12. Iron: <5 ppm
  - 13. Copper: < 0.5 ppm

## 2.1 PRE-TREATMENT SYSTEM

- A. Acceptable Products:
  - 1. EVAPCO Water Saver Capacitive Deionization Pre-Treatment System
- B. Provide a Capacitive Deionization system capable of reducing dissolved ion concentration, other than silica, by 35% to 60% while achieving a recovery rate of 75% to 90%.
- C. Sizing of the Capacitive Deionization system is based on project goals.
- D. Electrical Requirements:
  - 1. The system shall have a maximum power draw of 36.5 amps for 230V, and 23.1 amps for 480V.
  - 2. The system shall operate on a single 230V, 3-phase, 3-wire (delta) or 480V, 3 phase, 4-wire (wye)
  - 3. The electrical panel shall meet UL and cUL specifications.
  - 4. The PLC shall be enclosed in a NEMA 4 water resistant shell and be provided with Human Machine Interface (HMI), and have a ventilation fan.
- E. Construction Requirements:
  - 1. The pre-treatment skid shall be mounted on a galvanized steel frame and anchored indoors near a sanitary drain.
  - 2. The system shall have USB Data Download capability.
  - 3. The pre-treatment skid shall include the following water meters:
    - a. Inlet
    - b. Outlet to Process

## PART 3 - EXECUTION

## 3.1 INSTALLATION AND SERVICES

- A. Installation of pre-treatment system will include:
  - 1. Sanitary drain shall be provided near the installation location of the pre-treatment skid.
  - Piping to and from the pre-treatment skid shall be provided "by others."
  - 3. Provide instructions to installing contractor for field installation of pre-treatment system by-pass line for use during emergency or temporary filling of the evaporative cooling unit.
  - 4. Systems utilizing a make-up water tank shall be sized based on makeup water rate of the evaporative unit. The make-up tank shall be sized to hold a minimum of twenty-five (25) minutes worth of water using the average make-up rate of the unit. Make-up water tank and Electronic Water Level Controller (EWLC) to be provided by pre-treatment system supplier. Pump and pump sizing "by others".
  - 5. Include 50 micron filtration before pre-treatment system when required.
  - 6. The pre-treatment skid shall include an inlet and clean output water meters.
  - 7. Clean In Place (CIP) tank, piping or tubing, pump and chemistry shall be provided with the skid (may ship separately).
- B. Provide all consulting services, for a period of 1-year from start-up of the cooling system, which will include:
  - 1. Installation and system start-up procedure recommendations.

- 2. Initial water analysis and recommendations.
- 3. Training of operating personnel on proper control techniques.
- 4. Routine field service visits.
- 5. Any necessary log sheets and record forms.
- 6. Any required laboratory and technical assistance.
- C. All services will be provided by a Factory Authorized Service Partner of the evaporative cooling unit manufacturer.