OPERATION MAINTENANCE

For stainless steel evaporative condenser



- *Start-up procedure*
- *Maintenance table*
- *Water treatment*

OPERATION PROCEDURES

Initial and Seasonal Start-up

Prior to initial start-up or after a long shut-down period, the unit should be thoroughly inspected and cleaned:

1) Clean all debris at the inlet air screens, fans, eliminators, heat transfer sections, and basin.
2) Flush-down basin by placing strainers and drain-out for removing accumulated dirt.
3) Remove and clean sump strainers.
4) Turn the fans by hand to ensure rotation without obstruction.
5) Check float operated make-up valve to be sure it is operating freely.
6) Fill basin with fresh water.
7) Set the float on the make-up valve to shut off the valve when the float is approximately 13 mm below the overflow level.
8) Start the pump and check for the proper rotation as indicated by the arrow on the pump cover.
9) Inspect the spray nozzles and heat transfer section.
10) Start the fan and check for the proper rotation as indicated by the arrow on the fan housing.
11) Check the voltage and current of all three legs of the fan and pump motors. The current should not exceed the nameplate rating.
12) Check the bleed system to be sure it is fully functional and adjust the bleed rate to the recommended rate (see “Water Treatment”).

After 24 hours

After 24 hours of operating under load, the following services should be performed:

1) Check the unit for any unusual noise or vibration.
2) Check the operating water level in the basin. Adjust the make-up float valve if necessary.
3) Inspect the spray nozzles and heat transfer section.

Operation

During operation, the unit should be inspected and cleaned on a regular basis. The required services and recommended frequency for each are summarized in Table1 : Operation and Maintenance Schedule.

ATTENTION

For your safety, please always wear safety equipment while operate the unit or maintenance.

OPERATION PROCEDURES

Seasonal Shut-Down

The following services should be performed whenever the unit is to be shut-down for more than three days:

1) Drain the water in the sump and all piping.
2) Clean and flush the basin with the sump strainers in place. Leave the basin drain open so rain will drain from the unit.
3) Clean the sump strainers and re-install.
4) Close the shut-off valve in the make-up water line and drain all exposed make-up water piping.
5) Inspect the protective finish on the unit. Clean and refinish as required.

ATTENTION

For your safety, please always wear safety equipment while operate the unit or maintenance.

MAINTENANCE PROCEDURES

Basin

The basin should be inspected regularly. Any trash or debris which may have accumulated in the sump or on the strainers should be removed. Each month, the entire basin should be drained, cleaned and flushed with fresh water to remove the silt and sediment which normally collects in the sump during operation. If not removed periodically, this sediment can become corrosive and cause deterioration of the protective finish. When flushing the sump, the strainers should be left in place to prevent the sediment from re-entering the system. After the sump has been flushed, the strainers should be removed, cleaned, and replaced before refilling the sump with fresh water.

Make-Up Valve

A float operated mechanical make-up valve assembly is furnished as standard equipment on all units unless the equipment has been ordered with the optional electric water level control or for remote sump application. It is located inside the unit basin within easy reach from the louver at the side end of each unit.

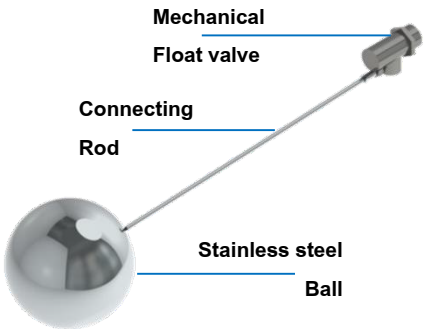


Figure 1 : Standard make-up valve

The standard make-up assembly (See Figure 1) consists of a bronze make-up valve connected to a float arm assembly and actuated by a large diameter stainless steel or plastic float. The float is mounted on a rod which is held in place by screw. The operating water level in the basin can be adjusted by repositioning the float on a float arm. **The make-up assembly should be inspected monthly and adjusted as necessary. The valve itself should be inspected annually for leakage and the valve seat replaced if necessary. The make-up water supply pressure should be maintained between 1.0 and 3.5 bar for proper operation.** To set the initial sump water level, adjust the screw so that the make-up valve is completely closed when the water level in the basin is 13 mm below the overflow connection. The unit sump should be closely monitored and water level adjusted as necessary during the first 24 hours of operation.

MAINTENANCE PROCEDURES

Spray Nozzles and Heat Transfer Section

The spray nozzles and heat transfer section should be inspected and cleaned each month. The inspection procedure is as flows:

1) Shut off the fan, but leave the pump running.
2) Remove the eliminators.
3) Check to see if the nozzles are producing the spray pattern shown in Figure 3-14.
4) Clean any nozzles which are clogged. If necessary, the nozzle may be removed for cleaning.
5) Inspect the coil surface. Any corrosion, scale build up, or obstructions must be corrected.

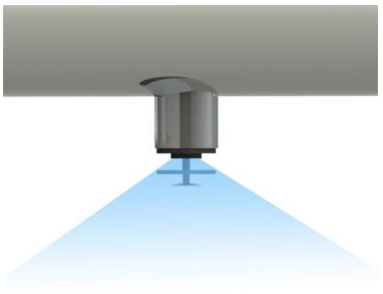


Figure 2 : Nozzle Spray Distribution

Water Treatment

Evaporative condenser is accomplished by the evaporation of a small portion of the recirculating spray water as it flows through the unit. As this water evaporates, the impurities originally present remain in the recirculating water. The concentration of the dissolved solids increases over time and can reach unacceptable levels. In addition, airborne impurities are often introduced into the recirculating water, intensifying the problem. If these impurities and contaminants are not effectively controlled, they can cause scaling, corrosion, and sludge accumulations that reduce heat transfer efficiency and increase system operating costs.

Table 1 : Recirculate Water Quality Guidelines

Properties of Water	Recommended Level
pH	6.5 – 8.5
Hardness as $CaCO_3$	< 600 ppm
Alkalinity as $CaCO_3$	< 300 ppm
Total dissolved solids	< 1,800 ppm
Chlorides	< 500 ppm
Sulfates	< 250 ppm
Silica	< 150 ppm

MAINTENANCE PROCEDURES

Bleed Rate

For optimal heat transfer efficiency and maximum equipment life, the cycles of concentration should be controlled to maintain the quality of the recirculating water within the guidelines given above. In order to control the cycles of concentration such that above guidelines are maintained, it will be necessary to “bleed” or “blow down” a small amount of recirculating water from the system. This “bleed” water is replenished with fresh make-up water, thereby limiting the build-up of impurities.

The required continuous bleed rate can be determined by the water analysis of the make-up water and the water quality guidelines (if water analysis is not available, it is suggested to bleed at least a quantity equal to the amount of water being evaporated). In many localities, this constant bleed and replacement with fresh water will keep the concentration of impurities in the system at an acceptable level.

The evaporation rate can be approximately determined by 1 m3/h per 645 kW of heat rejection. The rate of bleed can be adjusted using the valve in the bleed line and measured by filling a container of known volume while noting the time period. **The bleed rate and water quality should be periodically checked to ensure that adequate control of the water quality is being maintained.**

Chemical Treatment

If the condition of the water is such that constant bleed-off will not control scale or corrosion, chemical treatment may be necessary. If a water treatment program is used it must meet the following requirements:

1) The chemicals must be compatible with stainless steel.
2) Chemicals should be fed into the recirculate water, but not into the basin, on a continuous metered basis to avoid localized high concentrations which may cause corrosion. These chemicals are normally fed into the pump discharge line. Batch feeding of chemicals does not afford adequate control of water quality and is not recommended.

Biological Control

Bleed-off with or without chemical treatment for scale and corrosion control is not adequate for control of biological contamination. The growth of algae, slimes, and other micro-organisms, if unchecked, will reduce system efficiency and may contribute to the growth of potentially harmful micro-organisms, including Legionella, in the recirculating water system.

Accordingly, a treatment program specifically designed to address biological control should be initiated when the system is first filled with water and administered on a regular basis thereafter in accordance with the suppliers instructions.

OPERATION AND MAINTENANCE SCHEDULE

Table 2 : Maintenance Check List

Type Of Service	Period				
	Start Up	Monthly	Every 6 Months	Annually	Shut Down
Inspect general condition of unit	✓	✓			
Clean debris from unit	✓	✓			✓
Clean and flush basin	✓	✓			✓
Clean basin strainer	✓	✓			✓
Check and adjust water level of basin	✓	✓			
Inspect heat transfer section (Coil)	✓	✓			
Inspect spray nozzles	✓	✓			✓
Check and adjust bleed rate	✓	✓			
Check operation of make-up valve	✓	✓			
Check unit for unusual noise or vibration	✓	✓			
Check motor voltage and current	✓		✓		
Check rotation of fan without obstruction	✓				
Check fan and pump motor for proper rotation	✓				
Inspect protective finish				✓	
Inspect drift eliminator	✓		✓		✓

Warning: Before performing any maintenance or inspection make certain that all power units have been disconnected.

ATTENTION

HEATAWAY shall NOT be responsible for any damaged which occur from water quality do not comply with HEATAWAY's standard as shown in Table 1 : Recirculate Water Quality Guidelines.

ATTENTION

Please always check and clean all components of unit as follow suggestion manufacturer or distributor, HEATAWAY shall NOT be responsible in case of unit is not performed maintenance.

WARRANTY

TERMS AND CONDITIONS OF HEATAWAY WARRANTY

HEATAWAY warrants that the product sold under this contract shall be free from defects in material and workmanship for a period of twelve (12) months from the date of shipment or as discussed. The following original product components only are warranted against defects in materials and workmanship. Exceptions and details of option-specific warranties follow:

- Damage caused by misuse of the product, including without limitation failure to properly install or maintain the product, is **NOT** covered by the warranty.
- This warranty is predicated on unit operation and maintenance in accordance with HEATAWAY's recommended operation and maintenance procedures.

Under the following circumstances, parts and labour will be chargeable even during the warranty period. The warranty **DOES NOT** extend to the followings :

- The appliance has been tampered with, subject to misuse, negligence and damaged while in transit.
- The product has undergone repairs, modifications, or dismantled by third party or by any other person prior verification of approval by HEATAWAY.
- Defect caused by abnormal voltage or in-coming power supply from a generator.
- Defect caused by fire, lightning, electrical disturbance, negligence, accidents and other natural disasters or due to deviation from recommended application and installation.

Warranty will be void if the product is being operated without HEATAWAY genuine or manufacturer recommended parts. According to HEATAWAY's policy, HEATAWAY shall not refund for any kind of situation. Under no circumstances shall HEATAWAY be liable for lost profits, lost savings, personal injuries, incidental damages, economic loss, property damage, or any other consequential, indirect, incidental, or punitive damages, even if HEATAWAY has been advised of the possibility of such damages.

In addition, HEATAWAY shall not be responsible for any injuries or damages of any kind whatsoever under any theory of tort to the extent the injuries or damage are caused by misuse of the product by buyer or any third party.

WARNING

HEATAWAY is not responsible for any damaged if buyer do not comply with terms and conditions of HEATAWAY warranty.



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