

**EVAPORATIVE CONDENSERS
CLOSED CIRCUIT EVAPORATIVE COOLERS
COOLING TOWERS
MAINTENANCE INSTRUCTIONS**



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MAINTENANCE INSTRUCTIONS

EVAPCO units are heavy-duty and designed for long life. They require a minimum amount of maintenance, yet a regular maintenance schedule is essential for the performance and longevity that are built into the units.

Because evaporative cooling equipment is generally remotely located, periodic maintenance checks are often overlooked. It is important to set up a regular maintenance schedule and then see that the program is followed. A clean and properly serviced unit will result in lower power consumption for the entire system.

There are two major areas of maintenance. The first is the recirculated water system including the condition of the water itself. The second is the fan system.

Maintaining the Recirculated Water System

The cooling in an evaporative condenser, closed circuit cooler or cooling tower is accomplished by the evaporation of a portion of the recirculated spray water. As this water evaporates, it leaves behind all of the mineral content and impurities. These impurities can lead to scaling, corrosion, accumulated sludge and biological fouling. Therefore, it is important to bleed-off an amount of water equal to that which is evaporated to prevent the build up of impurities. If this is not done, the mineral content in the water will continue to increase until it starts to deposit out in the unit causing heavy scaling and corrosion. Water quality should be checked regularly for biological contamination. If biological contamination is detected, a more aggressive water treatment and mechanical cleaning program should be undertaken. The water treatment program should be performed in conjunction with a qualified water treatment company.

Bleed-off

Evaporative condensers and closed circuit coolers, supplied with a pump mounted on the side of the unit, are furnished with a bleed line and valve which, when fully open, will bleed-off the proper amount of water. If the make-up water supplying the unit is relatively free of impurities, it may be possible to cut back the bleed, but the unit must be checked constantly to make sure scale is not forming.

On other units furnished less pump, a bleed line should be installed on the pump discharge and connected to the drain. A metering connection and globe valve should be provided in the bleed line. The metering connection is to be used to determine the quantity of bleed water which can then be adjusted using the globe valve in the bleed line. It can also be used to check quality of the recirculating water. The bleed line should be sized large enough to bleed off an amount equal to 3 U.S. GPM per 100 tons (one pound of water per 1,000 Btu/Hr).

Water Treatment

In some cases, the make-up water will be so high in mineral content that a normal bleed-off will not prevent scaling. Water treatment will be required and a reputable water treatment company familiar with the local water conditions should be consulted.

Any chemical water treatment used must be compatible with the galvanized construction of the unit. If acid is used for treatment it should be accurately metered and the concentration properly controlled. The pH of the water should be maintained between 6.5 and 9.0. Batch chemical feeding is not recommended because it does not afford the proper degree of control.

If acid cleaning is required, extreme caution must be exercised. Only inhibited acids recommended for use with galvanized construction are to be used.

Control of Biological Contamination

Water quality should be checked regularly for biological contamination. If biological contamination is detected, a more aggressive water treatment and mechanical cleaning program should be undertaken. The water treatment program should be performed in conjunction with a qualified water treatment company. It is important that all internal surfaces be kept clean of accumulated dirt and sludge. In addition, the drift eliminators should be maintained in good operating condition.

Air Contamination

If the unit is located in an industrial area where there are chemical fumes, the impurities in the air will be washed out in the recirculated water and may cause scaling or corrosion. It is important not to locate a unit next to a smokestack because the unit will draw in these fumes and severe corrosive conditions may result. Bleed-off will help the situation, but if there is any sign of corrosion or scaling a reputable water treatment firm should be called immediately.

Regular Maintenance Procedure for the Recirculated Water System

Caution: Before working on unit, lock out motor disconnect switches.

1. STRAINER
The strainer in the pan should be removed and cleaned **weekly** or as often as necessary to keep it clean.
2. PAN
The pan should be flushed out **monthly** or as often as necessary to keep down any accumulation of dirt.
3. BLEED-OFF VALVE
The bleed off valve, whether factory or field installed, must be checked **weekly** to make sure it is functioning and set properly. Keep the bleed-off valve wide open unless it has been determined that it can be set partially closed without causing scaling or corrosion.
4. PUMP (when supplied)
The pump and pump motor should be lubricated and serviced in accordance with the manufacturer's instructions supplied with the unit.
5. WATER MAKE-UP
The float and float valve should be checked **monthly** to make sure they are operating properly and that the water level in the unit is correct. In condensers and coolers the water level should be approximately 3-4 inches below the overflow and in cooling towers approximately 5-6 inches below the overflow during operation and should always be above the strainer and pump suction. This can be checked by running the pump with the fans off and observing the water level through the access door. On pump shutdown (or when refilling the basin), the water level should be approximately 1 inch below the overflow. **Maintain make-up water pressure between 20 and 50 PSIG.**
6. WATER DISTRIBUTION SYSTEM
Check the water distribution system **monthly** to make sure it is operating properly. On forced draft models, remove one or two sections of the eliminators at the top of the unit and observe the operation of the water distribution system. On some "AT" models, a lifting handle is provided on one eliminator just inside the access door for easy removal. Upon removal of the first eliminator, other sections can easily be positioned for better viewing of the spray system. Always check the spray system with the pump on and fans off on all models. The water diffusers are virtually non-clog and should seldom need cleaning or attention.

If the water diffusers are not operating properly it is a sign that the strainer in the pan has not been operational and the water distribution pipes have accumulated dirt or foreign matter. With the cooling load off and spray pumps on, a small pointed probe is to be inserted in the diffuser opening and rapidly moved back and forth to dislodge any debris in plugged water diffusers.

If an extreme build-up of dirt or foreign matter occurs, then remove the last two diffusers in each branch to flush the debris into the pan for removal. The branches or header can be removed for cleaning, but only if necessary. Check the strainer in the pan to make sure it is in good condition and is positioned properly so that cavitation or air entrainment does not take place. When inspecting and cleaning the water distribution system, always check that the orientation of the water diffusers is as shown in figure 1.

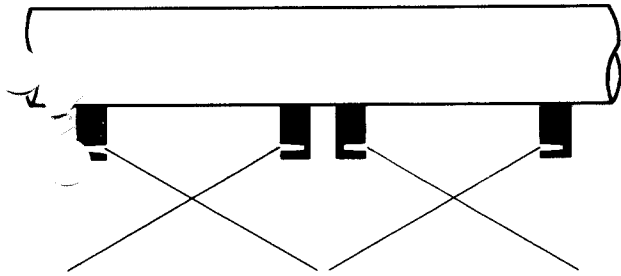


Figure 1-Water Diffuser Orientation

For Forced Draft units, figure 2 shows the proper orientation of the drift eliminators which are to be replaced before placing the unit back in operation. AT-Line units have the drift eliminators inside the unit. However, there is no directional orientation of the AT-Line airflow as in the case of the forced draft units.

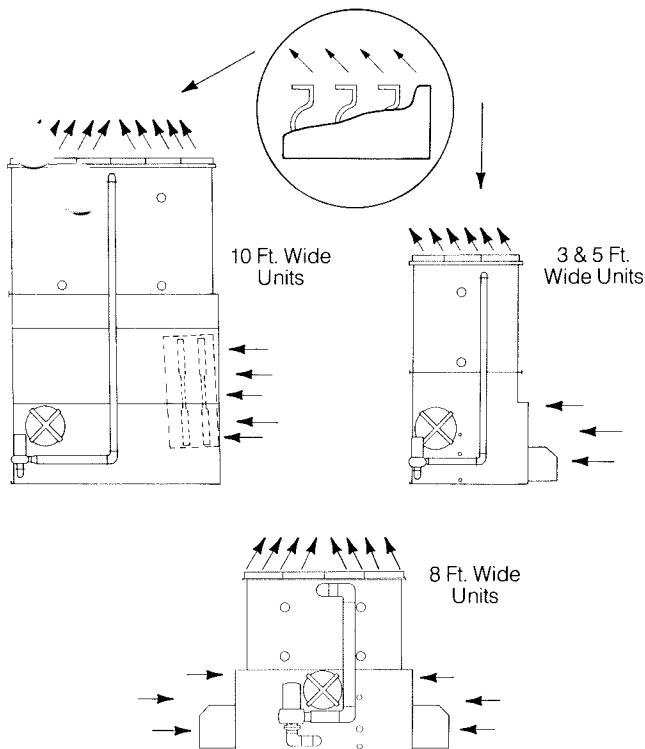


Figure 2-Eliminator Placement for Forced Draft Units

Maintaining The Fan System

Caution: Before working on unit, lock out motor disconnect switches.

The fan systems on both centrifugal fan units and propeller fan units are of rugged construction and will require a minimum amount of attention. However, like every moving part they should be checked regularly and lubricated at proper intervals to assure trouble-free operation. The following maintenance program is recommended.

1. FAN SHAFT BALL BEARINGS

Lubricate the fan shaft ball bearings every 1000 hours or 3 months on the model "AT" cooling towers and every 2000 hours or 6 months on all other cooling tower, condenser and closed circuit cooler models. Use any of the following waterproof, inhibited greases good for ambient temperatures between -40° F to 250° F:

Exxon - Beacon #325

Shell - Aeroshell #7

Mobil - Mobilgrease #28

American - Ryon Premium #3

Grease should be **fed slowly** to avoid damaging bearing seals.

Most units are supplied with extended grease lines to allow easy lubrication of fan shaft bearings. Model "AT" units with belt drive fans have extended lubrication fittings located beside the fan casing access door. All large (10 ft. wide) forced draft models are equipped with grease fittings extended out to the front of the unit to allow bearing lubrication without removal of fan screens. Small centrifugal fan forced draft models are normally not equipped with extended lubrication fittings since bearings are easily accessible.

2. FAN SHAFT SLEEVE BEARING(S) (when supplied)

Lubricate the intermediate sleeve bearing(s) with the oil provided in the rigging packet before start up. The reservoir should be checked several times during the first week to insure that the oil reserve is brought up to full capacity. After the first week of operation, lubricate the bearing(s) every 1000 hours of operation or every 3 months. High temperatures or poor environmental conditions may necessitate more frequent lubrication. The oil reservoir consists of a large felt packed cavity within the bearing. Note that it is not necessary to maintain the oil level within the filler cup.

Use one of the following industrial grade non-detergent mineral oils. **Do not use a detergent based oil or those designated heavy duty or compounded.** The proper oil will be determined by the ambient temperature seen by the bearing(s). Listed below are the ranges and appropriate lubricants.

Ambient Temp.	Texaco	Drydene	Exxon
30° to 110° F	Regal R&O 220	Paradene 220 R&O	Teresstic 220
-25° to 30° F	Capella WF 32	Refrig. Oil 3G	

Oil drippage may result from over oiling or from using too light an oil. Should this condition continue in spite of close adherence to the lubrication instructions, it is permissible to apply the next heavier weight oil of the same grade without damaging the bearing(s).

All bearings used on EVAPCO equipment are factory adjusted and incorporate a self aligning feature. Do not disturb bearing alignment by tightening the sleeve bearing cap bolts.

3. MOTOR BEARINGS

Lubricate the fan motor bearings as recommended by the manufacturer's maintenance instructions enclosed with the unit.

4. In addition to the above instructions, always lubricate all bearings before and after any prolonged unit shutdown.

5. FAN DRIVES

The fan belt tension should be checked at start-up and after the first 24 hours of operation to correct for initial stretch. Both adjustment bolts on the motor base should have an equal amount of exposed thread for proper sheave and belt alignment. To check belt alignment, measure the distance from the motor base to the J-bolt mounting angles to ensure that both sides of the base are located the same distance from the unit. This should ensure that the sheaves are properly aligned since they were pre-set at the factory. As a final check, lay a straight edge from sheave to sheave. There should be a 4 point contact between the sheaves and the straight edge. Adjust the position of the motor sheave if necessary.

Proper belt tension can be determined by pressing the belt with one finger using moderate pressure midway between the sheaves. The belt should deflect approximately 3/4" on AT-Line models and 1/2" on forced draft models when it is properly adjusted. Check the belt tension on a **monthly** basis.

On 10 foot wide vane-axial fan models, a motor adjustment tool is provided to facilitate belt tensioning. The tool will be found threaded onto one of the motor adjustment all-threads. To use; unthread and invert the tool placing the hex end over the locknut. Place a 1 5/16" socket over the nut on the end of the tool and turn counter clockwise to loosen the locknut.

Tension the belts by turning the nut on the underside of the motor plate counter clockwise. When belts are properly tensioned, tighten locknut.

6. CENTRIFUGAL FAN UNITS

Inspect the fans monthly and remove any paper, leaves or other foreign matter that might be on the fan screens or lodged inside the fan wheels.

7. AT-LINE UNITS

Inspect the inlet louvers monthly and remove any paper, leaves or other foreign matter that may be blocking air flow into the unit.

Maintaining the Protective Finish

Once a year clean and inspect the finish on the unit inside and out. If there are any blemishes or any signs of corrosion, clean the area thoroughly with a wire brush then apply a coat of industrial grade zinc rich paint such as ZRC or Galvicon which are available at local welding supply distributors.

Freeze-up Protection

If units are installed in a cold climate and operated year-round, freeze-up protection must be provided for the heat exchanger coil (closed circuit cooler) as well as for the recirculating water system.

Heat Exchanger Coil (closed circuit cooler)

The simplest and most fool-proof method of protecting the heat exchanger coil from freeze-up is to use an ethylene glycol solution inside the coil. If this is not possible, a heat load must be maintained on the coil at all times so that the water temperature does not drop below 50°F. Also, a minimum flow rate must be maintained.

Unit No.	Minimum Flow (GPM)
20 thru 61	60
58 and 87	75
81 thru 122	120
116 thru 174	150
232 thru 348	300

In order to keep water temperatures from dropping below 50°F, some type of capacity control is normally required during freezing weather. Operating dry with a remote sump is an excellent way to reduce unit capacity at low temperatures (this is covered under recirculating water freeze-up protection). Other methods that can be used are modulating fan dampers, fan cycling or two-speed motors. These can be used individually or in combination with dry operation. Which method will depend upon the particular application, and EVAPCO engineers are available for recommendations.

If an anti-freeze solution is not used, the coil must also be drained immediately whenever the pump is shut down or flow stops. This can be accomplished by adequately sized automatic drain valves and air vents in the piping to and from the cooler.

Recirculating Water System

The simplest and most fool-proof method of protecting the recirculating water system from freeze-up is through the use of a remote sump located inside the building below the unit. The recirculating water pump is mounted

remote sump and whenever it is shut-off, all of the water in the unit drains back to the warm sump inside.

Recommendations for sizing the remote sump tank and recirculating water pump are presented for Evaporative Condensers and Closed Circuit Coolers in the respective catalog bulletins. The spray pump for these units should be sized as follows:

Cross Section*	Spray Pressure
4x6 thru 4x18	2 PSI
5x6 thru 5x18	4 PSI
8x12 thru 8x18	3 PSI
10x12 thru 10x18	5 PSI
10x24 thru 10x36	5 PSI

*Cross Section indicates approximate unit width x unit length.

If a remote sump cannot be used, pan heaters are available, either steam, hot water or electric type to keep the pan water from freezing when the unit is shut down. However, the basin heater will not prevent the external water lines nor the pump and pump piping from freezing. The make-up water supply, overflow and drain lines, along with the pump and pump piping up to the overflow level must be heat traced and insulated to protect them from freezing and consequent damage.

A condenser or cooler cannot be operated dry (fans on, pump off) with this method unless water is completely drained from pan. The pan heaters are sized to prevent pan water from freezing when the unit is shut down but they are not sufficient to prevent freeze-up when the fans are turned on.

Note: The following precautions should be carefully observed:

1. Caution-Tarpping Units Prohibited

If the units are to be stored before installation or during building renovations, do not place tarps or other protective coverings over the top of the equipment. Excessive heat can build up in the units causing possible damage to the PVC eliminators or PVC fill in cooling towers.

2. Do not run fans on cooling towers with water pumps off.

Possible damage to the PVC fill can result during dry operation. Always start water pumps first with the fan motors following.