

## TROUBLE SHOOTING

### Cause & Remedy

PROBLEM	CAUSE	REMEDY
<b>LOWERING OF TEMPERATURE DROP ACROSS COOLING TOWER</b>	FILLS CONDITION IS POOR	REPLACE / CLEAN FILLS
	FAN NOT IN OPERATION	CHECK MOTOR, PUT FAN IN OPERATION IN CORRECT DIRECTION CLEAN THE NOZZLES
	DISTRIBUTION OF WATER THROUGH NOZZLES ON FILLS NOT CORRECT CHANGE IN DESIGN PARAMETERS AS WATER FLOW RATE, AIR FLOW RATE	CHECK PUMP FLOW RATE, PLANT LOAD, CLEAN HEAT TRANSFER SURFACES WHEREVER POSSIBLE ADJUST FAN BLADE ANGLE.
	WET BULB TEMPERATURE HIGHER	CHECK DESIGN CONDITION, TRY TO AVOID SATURATED AIR RECIRCULATION.
<b>MOTOR NOT WORKING</b>	IMPROPER POWER SUPPLY	CONSULT SUPPLY TERMINALS.
	PHASE SUPPLY IMPROPER	CHACK PHASE POWER, CONSULT POWER SUPPLY TERMINAL
	STARTER NOT PERFORMING PROPERLY	REPLACE STARTER, CONNECT PHASE FAILURE SAFETY DEVICES.
	MOTOR WINDING DAMAGED	SEND OUT FOR REPAIR WITH SPECIFIC EXPLANATION AS PER MOTOR QUALITY.
	BEARING JAMMED	CLEAN / REPLACE BEARING

**FLUCTUATING WATER FLOW OBSERVED**

NOZZLES CLOGGED

CLEAN NOZZLES

PUMP PERFORMING AT HIGHER/ LOWER DISCHARGE PRESSURE

CHECK PUMP GRAPH, CHECK PUMP POWER, REMOVE AIR TRAP, REPLACE PUMP

SUMP WATER LEVEL LOW

MAKEUP SUFFICIENT WATER IN BASIN

VALVES, PUMP BAFFELS, FILTERS CHOCKED

PERFORM CLEANING ACTIVITY

**WATER CARRY AWAY FROM TOP OF TOWER**

WATER FLOW MORE THAN DESIGH PARAMETER

PUT THE CORRECT PUMP

NOZZLES CLOGGED, NOT IN POSITION  
FILLS CHOCKED  
MOTOR RPM HIGHER

CLEAN NOZZLES, PUT IN CORRECT DIRECTION  
CLEAN / REPLACE FILLS  
PUT THE CORRECT MOTOR WITH COMPARATIVELY LOWER RPM

**AIR FLOW NOT SUFFICIENT**

FILLS CLOGGED  
FAN ANGLE OF ATTACK IN NOT CORRECT  
FAN SPEED NOT CORRECT

CLEAN / REPLACE FILLS  
INCREASE FAN ANGLE

CHECK MOTOR POWER  
SUPPLY VOLTAGE, BEARING CONDITION

**EXCESS VIBERATION & NOISE THROUGH FAN**

FAN NOT IN GOOD CONDITION  
BALANCING NOT DONE

REPLACE / REPAIR FAN

MOTOR NOT PERFORMING IN GOOD CONDITION

DO STATIC & DYNAMIC BALANCING OF FAN  
CHECK MOTOR BEARING

MOTOR MOUNTING FRAME NOT IN GOOD CONDITION  
FAN TOUCHING CASING

PUT A GOOD MOTOR SUPPORT FRAME.  
CREAT PROPER CLEARANCE BETWEEN FAN TIP AND CASING.

The operating and maintenance instructions as given below are of general nature.

## 1. PREPARATIONS FOR STARTING

### 1.1. Cleaning.

Open the drain plug of the cooling water tank and scrub the water tank with a brush to flow out the dirt.

### 1.2. Trial Circulation of Water.

Fill the water basin until the float valve cuts off. Start the circulating pump and make up the water level in the basin as necessary. ( Refer also to pump starting instruction- part 2.1 )

### 1.3. Checks.

After the circulations test, check for dirt or foreign matter stuck to the inside of the tower. Rotate the fan by hand to check that it is free and check the fan blade tip clearance. Measure the supply voltage and check that the power supply suits the fan motor. Run the fan momentarily to check the direction of rotation. It should rotate in anti clock wise direction. Then run the fan for two to three hours to check that no vibration or abnormal sound develops. Move the float of the float valve, up and down, to check its discharge and control of the water level.

Should the tower be idle for some months (either prior to commissioning or due to shut down ) the following extra checks should be made.

- a) Check the insulation of the motor with a megger.
- b) Check for loose nuts, especially at fan motor mountings and at the attachment of the casing and the tank.

## 2. STARTING

### 2.1. Pump Start Up

Run the Pump intermittently for 5 minutes to drive any air out of the water piping. Again check the water level in the basin before operating the tower. Start the pump, and adjust the necessary valves until the required water flow rate is obtained.

### 2.2. Fan Start Up

Check that there is no foreign matter near the air inlet and outlet that could interfere with the fan operation . After Starting the fan, check the phase currents and voltages to ensure that the motor is operating in accordance with name plate data.

## 3. OPERATIONAL CHECKS

### 3.1. Performance

The specified water flow must be maintained to obtain rated cooling capacity. Be sure that the tower interior is kept clean and that scale and algae do not form.

### **3.2. Water Level**

If the water level in the water basin drops, air may be drawn, causing cavitation in the pump. Hence, it is important to maintain the water level.

### **3.3. Make regular checks for vibration and noise.**

Also, regularly check the cooling water temperatures and the electric current to the fan. As the source of vibration or noise is usually the fan, be careful not to overlook even a slightest defect.

## **4. MAINTENANCE**

### **4.1. Casing**

No painting is needed for the casing as it is made of F.R.P. when it is soiled, wash it with soap and water.

### **4.2. Water Tank**

Scrub the water tank when it is dirty. Flush any dirt out through the drain.

### **4.3. Nozzles**

Ensure that there is adequate water spray and the nozzles are not blocked. If nozzles are blocked remove them through the inspection window, clean them and refit them. Broken spray nozzles should be replaced.

### **4.4. Fill**

PVC fills do not deteriorate and no attention is necessary provided proper water quality control is maintained. In case some scaling is observed clean the fill packs after removing them from the inspection / service window. The fill packs may be cleaned by a pressurized jet of water. If the scale is still not removed the packs may be cleaned by dipping them in dilute solution of HCL acid (Commercial grade).

### **4.5. Fan**

Check and tighten Blade Clamping Hardware after about a week of Commissioning and at least at 6 monthly intervals thereafter visually inspect fan every month and clean the Blades if any dirt has accumulated on them. Dirt accumulation on Blades could affect balance and result in excessive vibration.

### **4.6. Fan Motor**

Check fan motor bearings at best at 6 monthly intervals and lubricate if necessary.

## **5. PERFORMANCE**

The performance of the Cooling Tower depends on – (a) water flow, (b) water temperatures inlet and outlet ), (c ) ambient wet bulb temperature and (d) air flow. A large temperature difference in the circulating water does not necessarily mean that the tower is of high performance. Similarly, a small temperature difference does not mean that it is of low performance. The temperature difference is small if the heat load is low. A similar result is seen when a large volume of water is flowing.

On the other hand, an higher heat load, a reduced water flow or the higher water inlet temperature makes the temperature difference larger. The relevant factors may be checked if the performance is not met.

## 6. CIRCULATING WATER MAKE UP

Loss of water from the Cooling Tower consists of evaporation and carry over, which is scattered about by the fan as drift. As continued evaporation of the circulating water results in increased hardness, corrosion of the circulating system is possible and scale may form. For this reason, blow-down, in which part of the circulating water is bled off, is necessary.

### 6.1. Evaporation Loss

Evaporation loss (E) can be calculated with the following equation :

$$E (\%) = \frac{t}{600} \times 100$$

where

t : water temperature range deg.c

600 : latent heat of evaporation in kcal / kg

### 6.2. Carry over volume

It is very small in volume, and though it is affected by the construction of the tower proper to a certain extent, it is normally 0.2 to 0.3 % of the volume of the circulating water flow.

### 6.3. Blow-down volume

In order to drain part of the circulating water periodically or continuously, it is effective to leave the drain slightly open during operation, or to let the water overflow constantly by raising the operating water level or to change the water completely from time to time when the water basin is cleaned.

The blow-down volume differs depending on the quality of the water or the degree of hardness. In most of the cases of air conditioning, about 0.3 % blow-down is usually necessary. For proper quantity of blow down, please send the analysis of make water, water circulation quantity and temperature range to HIMGIRI so that the desired blow down quantity can be informed to you.

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