

Make your Cooling Tower safe:

Safety Instructions

It is very essential for the cooling tower personnel to follow the safety instructions for their own safety as well as the longevity of the cooling tower. For this they must follow the operation and maintenance procedures along with some safety procedures:

- **Rotating Equipment Maintenance:**

Rotating equipments like fan, motor, gear box, pump, motor, turbine need to be stopped and their power source to be disconnected appropriately. Sufficient protection or locking should be there against accidental start up.

- **Vibration and Noise:**

Condition of a rotating equipment is expressed by vibration and noise. Unusual vibration and noise must not be ignored. Any such event with unusual vibration or noise must be investigated till the root cause is found and remedied. Provision of vibration switches should be there and must be tested for its action for a proper set point.

- **Guards:**

There should be sufficient guard or covering over drive shaft and coupling. They should be in proper place as in the condition of accident they protect other equipments and fan stack from damage.

- **Precautions during maintenance of distribution system:**

Provision of access door, walkway and suitable lifting device like monorail should be there for maintenance work in the fan stack area. High performing fills like PVC V bar, Opti-Grid (Poly propylene) etc. are made of flammable materials. Hence cooling tower area must be no smoking area.

- **Fills and water treatment:**

The condition of the fill must be assessed before taking up any maintenance work. This is available for assessment from air intake area. Extra care should be taken while dismantling the fills as the weight of the fouled fills can even treble up. Water chemistry of recirculating water changes as a portion of that water is always evaporating. These changes should be monitored and circulating water treatment should be done as per the schedule. This helps in reduction of fouling of heat exchangers, pipes and fill media.

OPERATING INSTRUCTION:

During operating condition be sure to make the following inspection every day

1. Check motor amperage to ensure that it is below design value. If it exceeds design value, then reduce the pitch angle of the blades.
2. Check the oil level in the gear box through sight glass provided near motor, if it goes below the required level then fill more oil in the gear box.
3. Check the normal water level in the cold water basin. Ensure that it is maintained to design level by adjusting make up water.
4. Make blow down in the circulating water of the cooling tower at regular intervals to maintain the TDS in the circulating water. (normally make a blow down in such a way that the cycles of concentration should maintain in between 2 to 3, if it exceeds the limit then consult to cooling tower supplier)

MAINTENANCE INSTRUCTION

Various components of cooling tower and their specific maintenance requirements are listed below:

• Hot Water Distribution System

1. Nozzles can be cleaned without shutting down the tower. Remove all the dirt, algae etc. Clean nozzles help in uniform distribution of hot water.
2. Check the water level in the distribution RCC duct. It is important to maintain constant water level in the RCC duct.
3. If excessive algae is present or cooling tower is in dusty environment, it is desirable to provide cover to RCC duct. These covers eliminate dust falling into duct from above. These covers also prevent direct incidence of sun light on hot water there by eliminating formation of algae.
4. Check the flow control valve, and carry out proper maintenance as per manufacturer's guidelines.
5. Also for every month apply proper greasing to the valve spindle and housing to ensure its smooth operation.

• Cold Water Basin

1. Clean cold water basin periodically (at least once in year). Check water level on daily basis.
2. Incorrect water level can reduce tower performance by allowing some air to bypass the fill.

• Fills

1. Clean the fills as frequently as required.
2. During shut down of the cooling tower remove all the fills and re-fix it after cleaning and replacement of any damaged pieces.

- **Drift eliminators**

1. Clean the drift eliminators as frequently as required.
2. Visually inspect the drift eliminators every month and clean it, also ensure that there should not be any clogging or any damage to the drift eliminator, which will cause for additional static pressure drop to the fan resulting in poor performance of the cooling tower.
3. During shut down of the cooling tower remove all the drift eliminator and re-fix it after cleaning and replacement of any damaged pieces.

- **Motor**

1. Lubricate motor as per manufacturer's recommendations.
2. Axial, Horizontal and Vertical Vibrations in motor should be
Velocity ≤ 7 mm/sec.; Displacement ≤ 120 microns.

- **Gear box.**

1. Fill the correct oil in the gear-box as per manufacturer's recommendations.
2. Do not overfill the gear box. Overfill will cause excessive heating up and under fill will cause gear damage.
3. Ensure that air vent is clear of dirt and is open.

- **Fan**

1. Being relatively slow running equipment little maintenance is required. In case of adjustable pitch fans a regular check of holding down bolts is necessary.
2. It is normal practice to dismantle fans when any maintenance is done on the gear box. While re-fixing the blades, blade angle must be set correctly, all the blades should be set to same pitch angle and should be at proper location. It is also necessary to balance the fan at site after repair or replacement of fan blades.
3. Check and tighten (to prescribed torque) blade clamping hardware after about a week of commissioning and at least at 6 months intervals thereafter.
4. Visually inspect fan every month and clean the blades if any dirt has accumulated. Dirt accumulation on blades could affect balance and result in excessive vibration.
5. Blade Tip clearance (from fan stack inside wall) should be between 25mm to 50mm.
6. Fan blade angle should be as per manufacturer's recommendation.
Min. Pitch Angle= 11 deg.; Max. Pitch Angle= 17 deg.

- **Drive shaft**

1. Drive shafts normally operate at motor speed and hence dynamically balanced. Check the balancing if abnormal vibrations are noticed.
2. Whenever drive shaft assembly is attended for the maintenance, dynamic balancing should be checked and ensured.
3. Drive shafts in cooling tower are of floating type with flexible couplings. Neoprene rubber disk, rubber bushes, SS pins used in the shafts requires periodic replacement. Inspect bushes at least once in 6 months and replace complete set of bushes as necessary.

4. Bolt torque on all coupling bolts shall be checked monthly to prevent looseness.
5. Check drive shaft alignment at least once in 6 months. Proper alignment is a critical requirement for satisfactory operation of mechanical equipment.

- **Tower structure**

1. During shut down of the cooling tower clean all the structure of the cooling tower to remove any dirt, algae, mud etc... (This can be done by injecting a jet of water on the structure.)
2. Once in six year it is advisable to inspect cooling tower RCC structure and carry out repair, maintenance if required.