Maintaining Design Peak Performance in Cooling Towers
Maintaining Design Peak Performance of Cooling Towers

Design

CT Peak Performance

Facility Maintenance

Construction
Outline/Agenda

15 min

- Location
- Accessibility
- Type of cooling tower
- System Type
- Water Treatment
- Mechanical Maintenance
- Conclusion
- Q&A
1. Unobstructed space for maintenance AND supply of fresh air
2. Top to be level or higher than surrounding walls
3. Orientation ⇒ wind to blow away discharge air from air intake side(s)

4. Increase design wet bulb for multi unit installations (micro climate)
Downward air velocity = \[
\frac{\text{Unit airflow (} \frac{m^3}{s} \text{)}}{\text{Usable well area (} m^2 \text{)}} \leq 1.5 \frac{m}{s}
\]

\[\star 2 \frac{m}{s} \text{ for centrifugal fan units with a tapered hood}\]
Accessibility

What is missing on these pictures?
Accessibility

Ladders and Platforms!
Accessibility

External access
Accessibility

Internal access

Ladder + Internal Service Platform

Internal Walkway
Type of Cooling Tower

COUNTERFLOW

CROSSFLOW
Type of Cooling Tower

Counterflow: Air moving System
Type of Cooling Tower

Crossflow: Air moving System

Internal platform
Type of Cooling Tower

Counterflow: Water distribution system

Headers & spray branches
Type of Cooling Tower

Crossflow: Water distribution system

Hot Water Basin

Easy access on site
System Type: Open Type

- Condenser
- CHILLER
- Evaporator

Heat Load (i.e., AHU, coil, chilled beam, process, etc...)

Cooling Tower
System Type: Open Type

Systems that can benefit by “closing the loop”
System Type: Open Type

OPEN SYSTEM CHALLENGES

Fouling reduces efficiency, increases operating costs
System Type: Closed Circuit Type

Condenser | CHILLER | Evaporator

Heat Load (i.e., AHU, coil, chilled beam, process, etc.)
System Type: Closed Circuit Type

- Minimal Equipment fouling
- Less shutdowns
- Life extension

(pumps, piping, etc..)

MAXIMUM EFFICIENCY & UPTIME!!
Water Treatment

4 major problems in cooling water systems

- Scale
- Corrosion
- Fouling
- Microbiological Growth
Water Treatment

Scale

Corrosion
Water Treatment

Microbiology

Fouling
Water Treatment

![Graph showing cycles of concentration with makeup water usage and critical points]

- **Good Balance between water usage and scale/corrosion risk**

- **EXPENSIVE**

- **CRITICAL**
Water Treatment

Filtration package & sump sweeper piping = PERFECT COMBINATION

Water Treatment dosing system + Automatic Bleed
Mechanical Maintenance

- Consult the O & M
- Specify O & M training by the supplier
- Don’t forget the DLP & Warranty period
- **Pro-Active** instead of Re-Active
- Implement

### Recommended Maintenance Service

<table>
<thead>
<tr>
<th>Item</th>
<th>Start-Up</th>
<th>Monthly</th>
<th>Quarterly</th>
<th>Annually</th>
<th>Shutdown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspect general condition of the unit and check unit for unusual noise or vibration</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Inspect cold and hot water basins</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Flush water distribution system/inspect spray nozzles</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Drain basin and piping</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Inspect air intake louvers/combined inlet shields</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Check and adjust water level in cold water basin</td>
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<tr>
<td>Check operation of make-up valve</td>
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<tr>
<td>Check and adjust bleed rate</td>
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<tr>
<td>Check optional EASY CONNECT™ Piping Arrangement</td>
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<tr>
<td>Inspect unit finish</td>
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<td>✔️</td>
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</table>

### Mechanical Equipment System

<table>
<thead>
<tr>
<th>Item</th>
<th>Start-Up</th>
<th>Monthly</th>
<th>Quarterly</th>
<th>Annually</th>
<th>Shutdown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check belt condition</td>
<td>✔️</td>
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<td>✔️</td>
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<tr>
<td>Adjust belt tension</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Lubricate fan shaft bearings</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Lubricate motor base adjusting screw</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Check and lubricate refrig gear drive</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Check drive alignment</td>
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<td>✔️</td>
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<tr>
<td>Check motor voltage and current</td>
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<td>✔️</td>
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<tr>
<td>Clean fan motor exterior</td>
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<tr>
<td>Check fan motor for proper rotation</td>
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<tr>
<td>Check general condition of the fan</td>
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<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Check and unplug fan drain holes (hollow blade fans)</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Check fan for uniform pitch</td>
<td>✔️</td>
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<td>✔️</td>
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<tr>
<td>Check fan for rotation without obstruction</td>
<td>✔️</td>
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<tr>
<td>Check and recoat steel shafts with RUSTYET™</td>
<td>✔️</td>
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<tr>
<td>Check optional basic heat and stand alone HVAC heater control panel</td>
<td>✔️</td>
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<td>Check optional vibration cutout switch</td>
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Mechanical Maintenance

Major risks when choosing parts other than original & Genuine Spare Parts

- Performance decreases
- More maintenance
- Higher operating costs
- Higher hygiene risks

It’s not a cost – It’s an Investment!
Design

COMMUNICATION

Facility Maintenance

Installation

CONCLUSION
QUESTIONS?

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