PREVENTATIVE MAINTENANCE

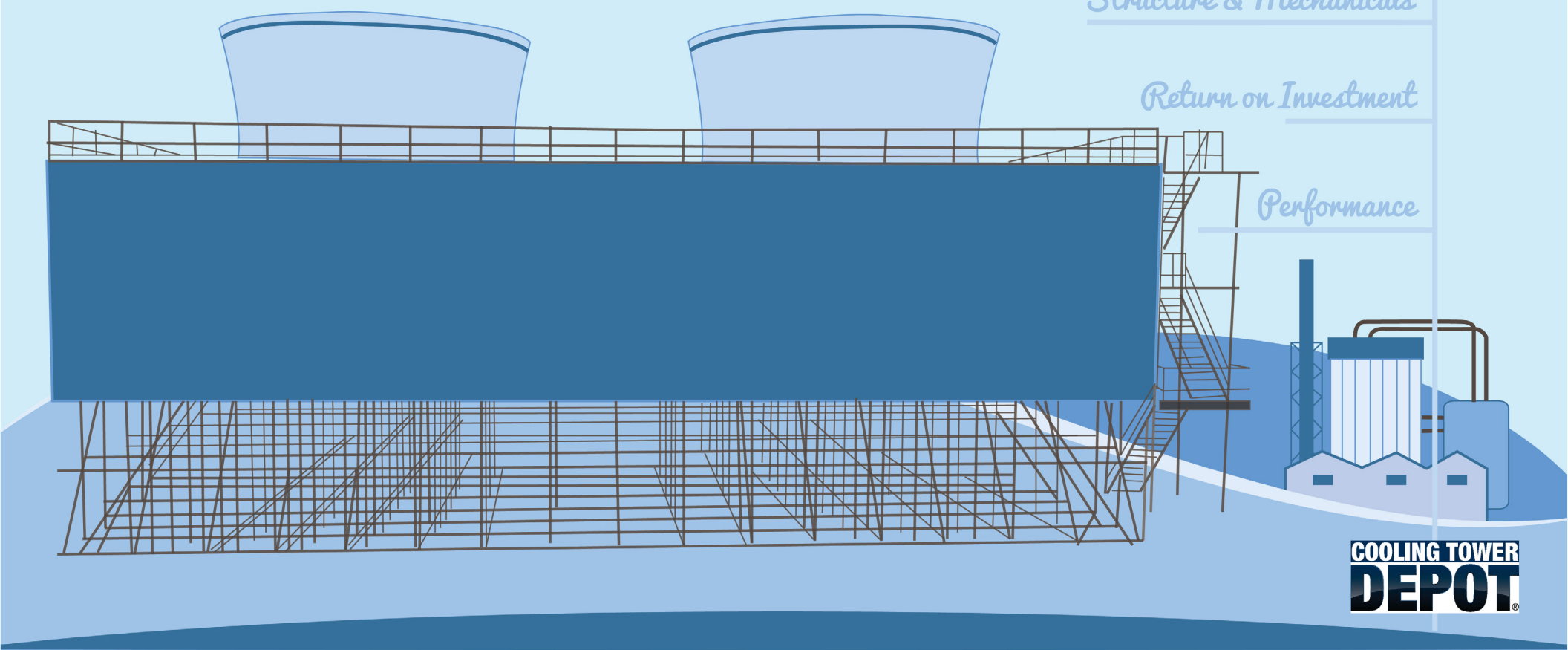
Did you know?

101

Structure & Mechanicals

Return on Investment

Performance



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WHAT ARE WE GOING TO COVER?

- Steps to Prolong the Life of Your Structure
- Maintaining Your Mechanicals & Why It's Important
- Preventative Maintenance Best Practices: Industry Insider Perspectives
- Determining & Maintaining Quality & Performance

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WHY YOU SHOULD CARE...

Preventative maintenance can save a lot of headaches and a lot of unnecessary stress. Preventative maintenance strategies can adapt with any budget. This guide will go over the impact that preventative maintenance (PM) can have on your entire tower and how to scale your PM needs to be in-line with proper performance and energy savings strategies.

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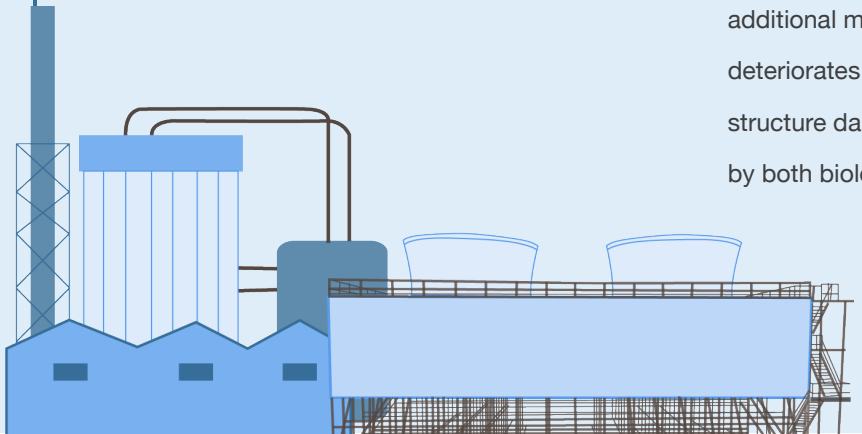
Chapter 1

STRUCTURE

STRUCTURE



How To Maintain FRP VS Wood

Fiberglass structures are not quite 100% maintenance free, however they are the easiest material to maintain. FRP structures need a UV protection to be re applied every 5-7 years to protect against heavy exposure to sunlight. If not re applied the UV light will damage the fiberglass. Fiberglass has a resin rich surface containing UV inhibitors which causes fiber blooming. Fiber blooming is the deterioration of your fiberglass structure from UV rays. Remember to re apply the coating about every 5-7 years, and there will be nothing to worry about!

When it comes to wood there is a lot more maintenance involved. A wood structure requires additional maintenance because wood damages and deteriorates more quickly. The most common wood structure damage is wood rot. Wood rot is caused by both biological and chemical attacks that can be hard to see. This will significantly deteriorate structural strength and thickness. In some cases the outside of the wood can appear undamaged while the inside has severe structural loss. To prevent this, treat the lumber yearly with a safe and effective wood preservative, such as CCA (Chromated Copper Arsenate).

Weather conditions are harsh on wood structures. Significant changes in temperature will cause the wood to expand and contract, loosening bolts and affecting structural integrity. Wood structures can also be at high risk for fire hazards. If you are located in a hot or dry summer climate, practicing a wet down system would be well advised. Doing this will protect your structure from drying out and becoming highly flammable.

Did You Know?

Seeing is not always believing. Even though a wood structure can look fine on the outside, the inside can have structural loss.

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STRUCTURE

Structure

Mechanicals

Best Practices

Performance

Which Material is a Better Choice for my Preventative Maintenance Strategy?

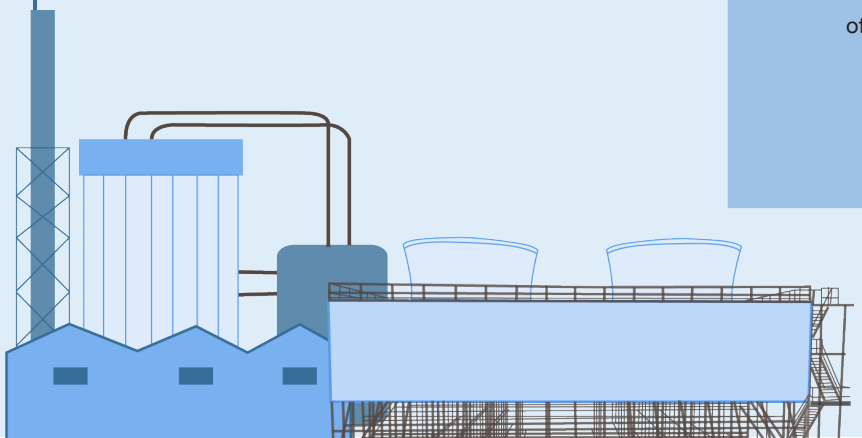
FRP

- FRP only needs to be treated with a UV coating every 5-7 years.
- FRP resists chemical and biological attacks and is much stronger than wood.
- It is very low maintenance and will likely last for over 30 years of cooling capacity.
- Even though FRP has a greater initial cost, it will save you money in the long run because of it's 30+ long life span.

VS

WOOD

- Wood needs to be treated with a preservative every single year.
- Wood is dense and does not retain the preservative treatment well. Thus, wood has a lower life expectancy for your cooling tower.
- It requires more maintenance care for your team to complete.
- While wood is cheaper up front compared to FRP, maintenance costs will add up over time. Secondarily a wood structure will only last 15-20 years on average.



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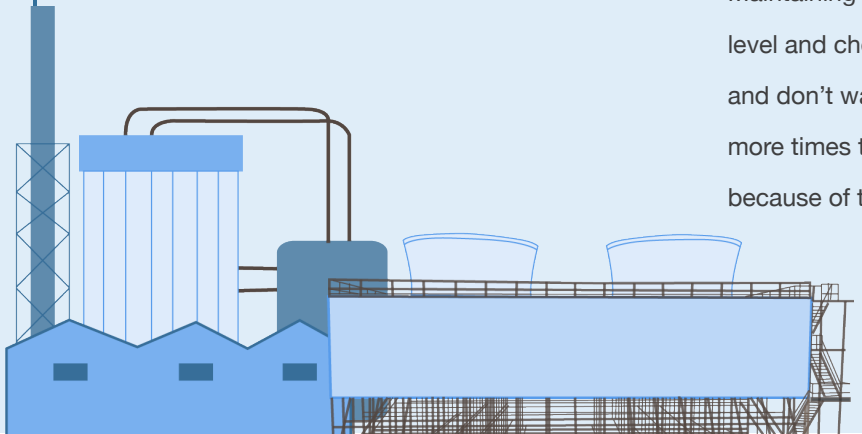
Chapter 2

MECHANICALS

Mechanicals



MECHANICAL MADNESS: The Gearbox

Cooling tower gearboxes, fans and motors have the biggest impact on cooling tower performance and efficiency. They can also play the biggest role in your preventative maintenance strategy.

Cooling tower mechanicals are the powerhouse of your tower. Think of your gearbox as your heart. If your gearbox seizes, your entire cooling tower shuts down. You will have zero performance and a lot of costly damages. When a gearbox suddenly seizes, it will break the drive shaft, damage the fan, fan stack, structure and drift eliminators. All the expensive parts of your cooling tower will now need to be replaced. Your gearbox truly is the life source of your tower. Maintaining your gearbox is simple. Check your oil level and check your oil for debris. We say this a lot and don't want to sound like a broken record, but more times than not we see gearboxes seize primarily because of these two issues:

Advice:

To help avoid the cost of a seized gearbox, at a minimum it is necessary to install an oil level switch and oil sight glass.

- **Check your oil levels monthly!**
- **Analyze, change & check your oil for debris & viscosity every 6 months!**

Additionally, we recommend checking your oil line hoses and vent lines for any leakage or blockage that my cause your oil levels to drop and prevent inadequate ventilation.

Tip: you can find evidence of oil leaks on the underside of the fan blades.

If proper gearbox maintenance is hard to keep up with consider your options for additional gearbox accessories that will help save you and your business time and energy:

Find Your Gearbox Accessories

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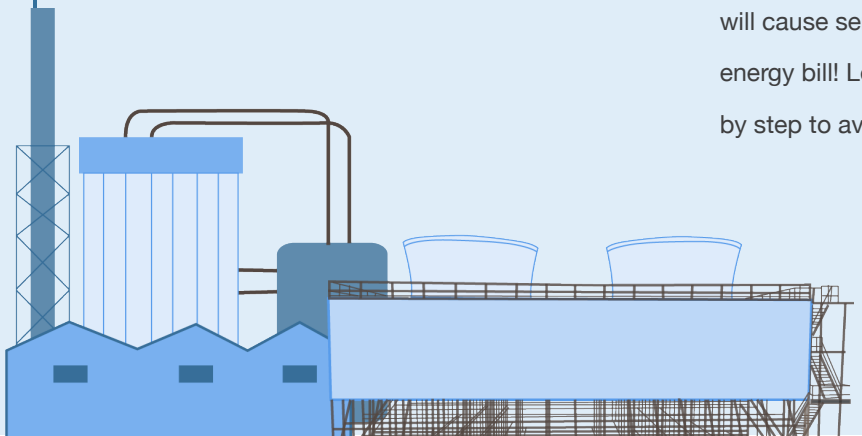
Mechanicals



MECHANICAL MADNESS: Fans

Fans allow for increased air flow through your tower. They help push out hot air and allow for cooler air to circulate through the tower. Thus, the better the air flow, the better the cooling performance. Fan maintenance such as alignment and vibration monitoring is imperative to your preventative maintenance strategy.

When your fan is not aligned fan vibration occurs. Fan vibration has a huge effect on all other cooling tower mechanicals and their performance. It is important to align your fan blade pitch to reduce fan vibrations that will lead to loose hardware, thus causing damage to your fan stacks and possibly misaligning your drive shaft. A misaligned drive shaft will cause serious damage to your gearbox and your energy bill! Learn how to align your fan blades step by step to avoid those costly damages.

Check Fan Blade Pitch

How can you avoid fan vibration? Luckily there is an easy and affordable option, vibration switches! Vibration switches will shutdown your gearbox and alert your maintenance team when too much vibration has occurred. Vibration monitoring and prevention technology is constantly changing for the better. Learn which additional fan accessories can aid with your preventative maintenance and performance strategies for your business.

Find Your Fan Accessories

Did You Know?

You should mount your vibration switch on the outside of your fan stack. This way you do not need a confined space permit!

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Chapter 3

BEST PRACTICES

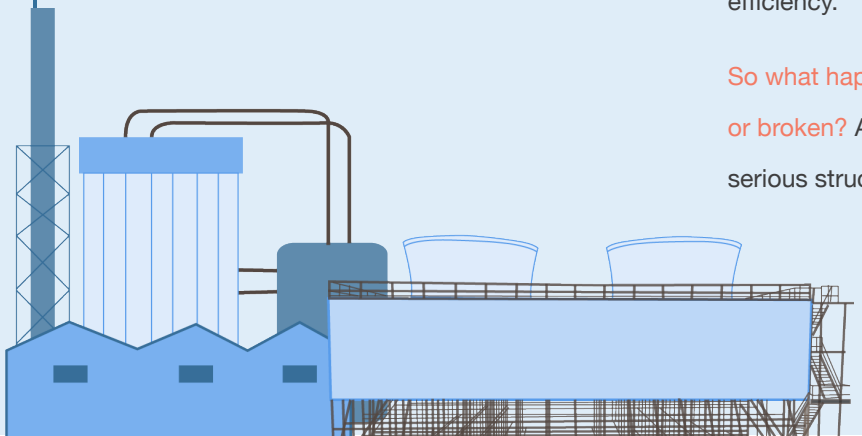
Best Practices

Structure

Mechanicals

Best Practices

Performance



Helpful Tip

Water quality can make a big difference in the performance and maintenance of cooling tower nozzles, fill and drift eliminators.

MAINTAINING YOUR PARTS: Nozzles

Just because your mechanicals are the most expensive to repair, that doesn't mean that preventative maintenance for your nozzles, fill and drift eliminators can be pushed to the side. These parts can pack a costly punch if not maintained properly.

Nozzles are the first stage in cooling tower performance. They help to distribute water evenly across the fill area to increase efficiency of thermal performance. Even though nozzles are small they can still cause serious damage to your cooling tower and impair performance efficiency.

So what happens when a nozzle(s) become clogged or broken? A clogged or broken nozzle can lead to serious structural damage. When a nozzle is clogged or broken, it cannot distribute water evenly onto the fill area. Water will flow through the nozzle as a hard stream, acting like a drill and drilling a hole through your fill. Once the water has drilled through the fill it will drill into your structure (wood and fiberglass structures). Your fill is now damaged and the integrity of your structure is impaired. Nozzles are inexpensive and their inspection and replacement should be a necessary part of your preventative maintenance strategy.

What do I have to do to maintain my nozzles?

Nozzle maintenance is simple. Protect your nozzles by maintaining water quality and be sure to replace any broken or clogged nozzles to avoid further and more expensive damages to your cooling tower.

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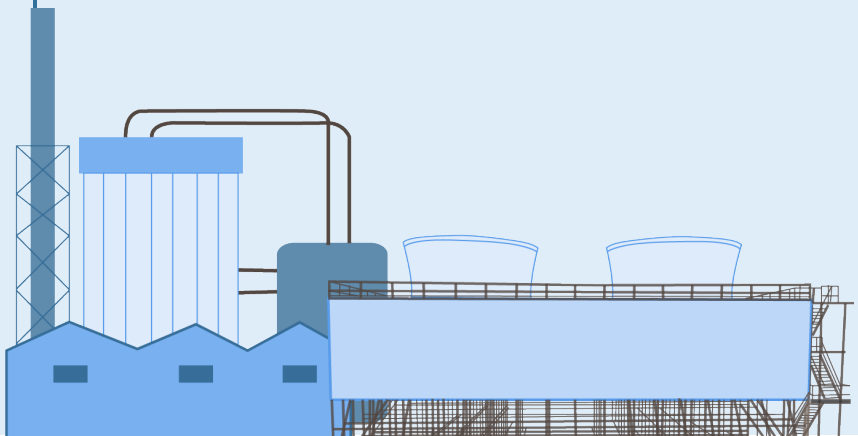
Best Practices

MAINTAINING YOUR PARTS: Fill

Did you realize that by not replacing your fill as necessary it could actually cause your cooling tower to collapse? How can this happen? Unfortunately this scenario does happen more often than you may think. Fill collects and stores calcium deposits from chemicals in the water. Over time these heavy calcium deposits build up on your fill and increases its weight significantly. It is just a matter of time before your fill collapses and takes your tower down with it. The good news is that this scenario is easily preventable by replacing your fill as necessary.

Additionally, maintaining a water treatment strategy is also important. We will discuss cooling tower water quality and treatment in chapter four. A combination of maintaining water quality and necessary fill replacement will improve both performance and the lifespan of your cooling tower.

Choose the Right Fill Design



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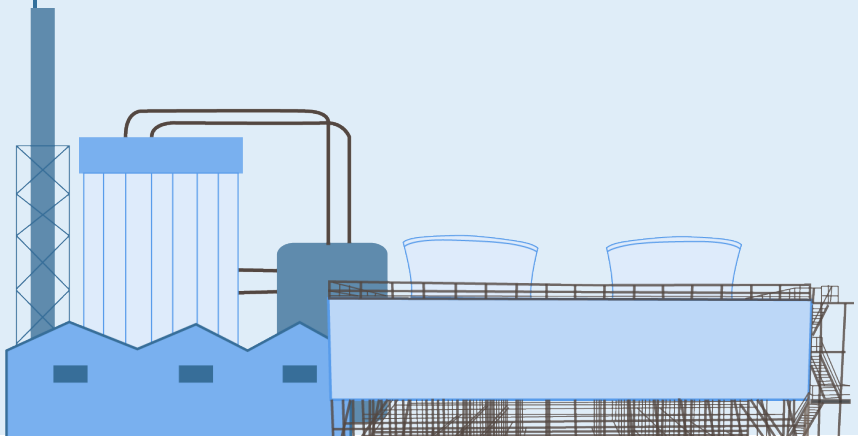
Best Practices

MAINTAINING YOUR PARTS: DE's

Drift eliminators (DE's) control air temperature by maintaining water and air flow inside of your tower. Maintenance of your DE's have a significant and direct impact on your cooling tower performance. The better your tower is able to control air temperature, the better performance it maintains. When DE's are clogged from debris and calcium the air flow is interrupted. Now hot air is trapped inside your tower thus decreasing tower performance and efficiency.

Maintain your DE's by maintaining water quality and replace any brittle or broken DE's. One way to help maintain water quality is to control the total dissolved solids in your water with the process of adding makeup water and performing cooling tower "blowdown".



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Chapter 4

PERFORMANCE

Performance

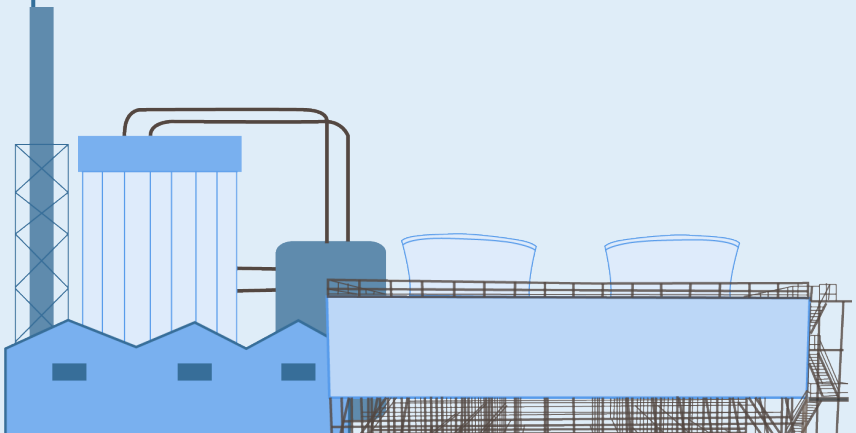
MAINTAINING WATER:
Quality, Usage, & Temperature

Cooling tower energy savings and optimized performance can begin with improving your cooling system by managing water quality. This will help to improve energy by keeping water free from debris, dirt, microbes and high salt concentrations which leads to scale, corrosion and biological fouling that clog nozzles and fill. Maintain water quality by implementing a water treatment plan. A water treatment plan will help to identify copper leaching (in wood structures only) and will aid in controlling biological attacks and corrosion inhibitors. Developing a water treatment plan along side of your preventative maintenance strategies will increase cooling performance.

The next step is to manage your water consumption. The quality of water will affect the water flow rate, which in turn affects your tower's water usage. Complete an analysis of your current water consumption by calculating your water usage. Once you understand the amount of water your tower is using, you can begin making adjustments to improve your cooling tower water consumption.

water usage calculator

Lastly, maintaining control of your cold water temperature or wet bulb temperature leads to the control of your air flow and fan speeds. For example, if your plant needs to maintain a maximum of 70 degree cold water temperature but the air temperature outside is cooler, then fans can be cycled and the energy output controlled. This will be dependent upon what type of gearbox you have and will help increase performance and save energy.



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Performance

MAINTAINING DRIFT:

Drift is another performance issue that needs to be maintained. If the percentage of water lost from your cooling tower due to evaporation exceeds a certain amount your drift rate is too high. Drift rate is calculated as a percentage of the amount of circulating water being lost and is measured as pounds of water per million pounds of exhaust air. Too much water lost through the air stream that passes through your drift eliminators significantly affects tower performance. Your tower will require more water to operate rather than keeping the maximum amount of water possible to recirculate and maintain cooling capacity.

Calculating your drift rate is important in determining if your drift rate is too high. The amount of acceptable drift loss can vary depending on weather and geographical locations, The average drift rate is .002% but a drift rate of .0005% can be achieved. Speak with a cooling tower expert as to the multiple variables to consider in helping you achieve a .0005% drift rate. Maintaining proper drift eliminator maintenance as previously discussed in chapter three will aid in obtaining the lowest possible drift loss percentage.

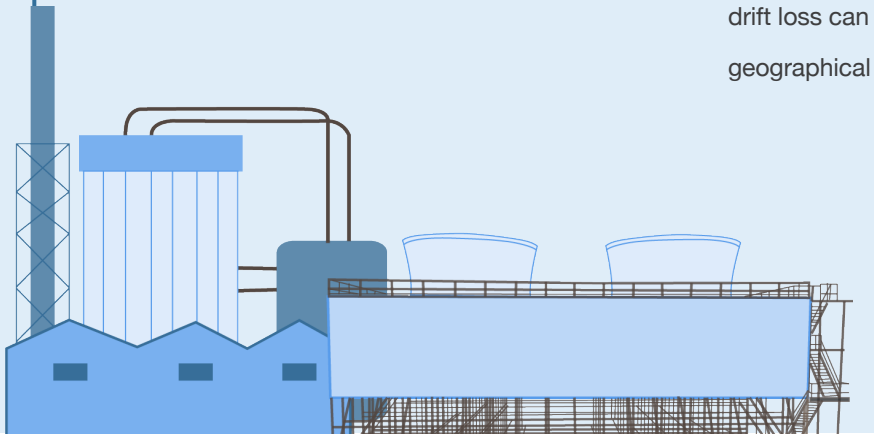
Did You Know?

How much energy does a drift rate of .0005% save? Well, a drift rating of 0.002%, would get a drift loss of 1.2 gal/hr, or **4 TIMES GREATER** drift loss

Calculate drift (example):

Drift Loss (gal/m) = 1000 gal/min x (0.0005/100) = 0.005 gal/min

Expressed over an hour period: 0.005 gal/min x 60 min/hr = 0.3 gal/hr min/hr = 0.3 gal/hr



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Conclusion

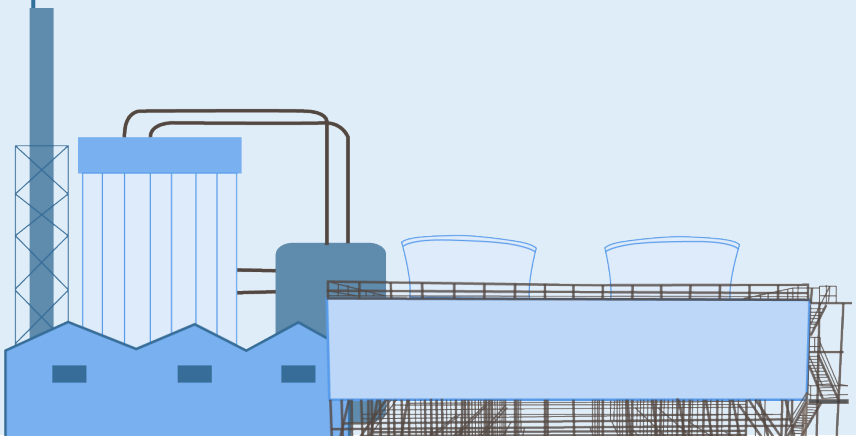
Structure

Mechanicals

Best Practices

Performance

A cooling tower preventative maintenance strategy is just as important as any other industrial plant process to implement and maintain. We hope that the information in this guide will help you to begin either building new or adjusting your current PM strategy. Now is the perfect time to start reducing costs, improving cooling capacity and maintaining mechanical systems and structures of your cooling tower.



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Additional Resources

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Educational Articles

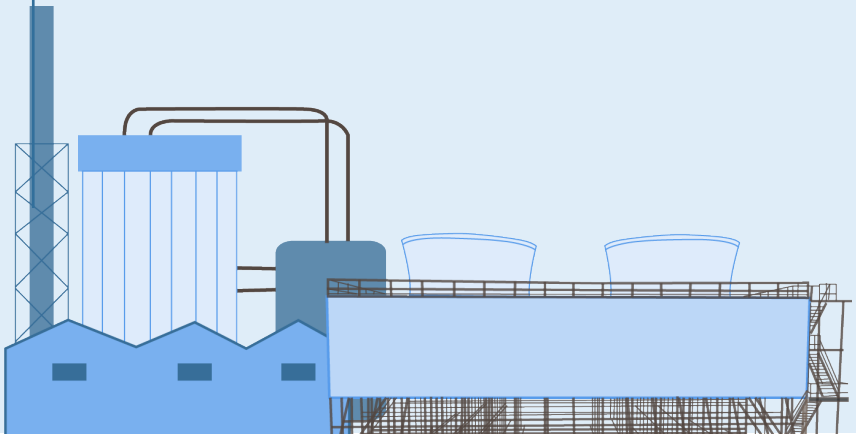
coolingtowerdepot.com/content/company-info/blog

Cooling Tower Depot Document Library:

coolingtowerdepot.com/content/free-tools/library

How Spring/Fall Inspections Increase Preventative Maintenance ROI

coolingtowerdepot.com/content/company-info/cooling-tower-inspections



About Us

A Proven Record:

Cooling Tower Depot (CTD) has been a proven cooling tower supplier for field-erected mechanical draft cooling towers with decades of experience in cooling tower design, engineering, construction, and project management.

An Innovative Leader in Custom Design

Whether it is fiberglass, wood, or a concrete cooling tower, CTD will provide the right solutions for your inspections, repairs, replacements, upgrades, or new tower construction and design. **With the only custom cooling tower design App in the industry,** you can design and price your own cooling tower! You can rest assured that you are receiving the BEST cooling solutions, for your needs!

Taking the Guess-Work Out:

We have continuously worked hard to provide you with easy and accessible information. This is why we have created the ONLY on-line warehouse for your cooling tower parts. No guess-work, no hidden costs, just simple pricing.