

Maintain Water Quality and Throughput

Cooling Tower Health Monitoring



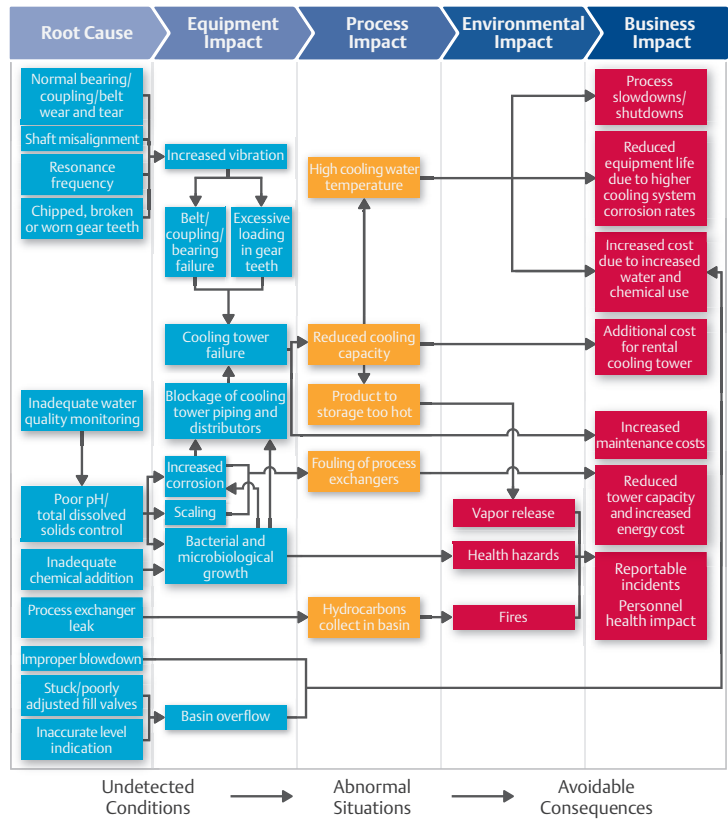
Tired of being surprised by cooling tower changes?

Inefficient or unreliable cooling towers can severely impact production units that rely on a consistent supply of cooling water. Making up for limited cooling capacity can erode your profits and increase your energy costs significantly. In fact, experts estimate that improperly maintained cooling towers consume 2.5 to 3.5 percent more energy for each degree increase in cooling water temperature.

Warmer water raises the risk of limited cooling for heat exchangers and condensers, which can require a slowdown to compensate for decreased cooling capacity. Fouling, corrosion, and microbiological growth due to poor water quality can also reduce throughput, especially on hot days when cooling capacity is limited. And in freezing weather, ice buildup can damage cooling tower fans.

Any unexpected failure of tower fans, supply pumps, or heat exchangers can not only affect cooling capacity, but also drive up maintenance costs. Fortunately, Emerson's Essential Asset Monitoring solution for cooling towers can help you get those lost profits back.

Anatomy of a Cooling Tower Failure



Common Threats to Induced-Draft Cooling Tower Health



HYDROCARBON LEAKAGE

Hydrocarbons may leak into the circulating water, and leaks caused by mechanical failures can be catastrophic. Early detection of abnormal conditions can help avoid leaks and their consequences.



SCALING

As water evaporates in cooling towers, solids settle on heat exchanger surfaces, reducing heat transfer. Root causes include increased water alkalinity and higher concentration of total dissolved solids.



CORROSION

Common problems from corrosion include reduction in heat transfer and water flow, resulting from a blockage of pipes, valves, or strainers. Root causes include alkalinity and acidity of water, and higher concentrations of total dissolved solids.



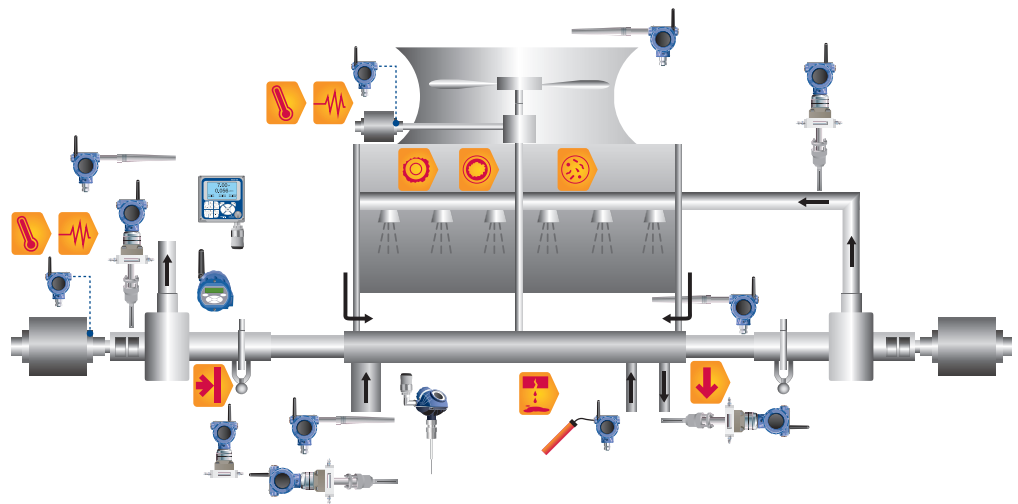
IMPROPER BLOWDOWN AND MAKEUP

To control concentration of dissolved solids and maintain optimum water level on the tower basin, new water needs to be added to the cooling tower (makeup) and a portion of the concentrated water needs to be discharged (blowdown). Improper blowdown and makeup may lead to reduced pH, corrosion, and higher water consumption.



BIOLOGICAL GROWTH

Biological organisms coat heat transfer surfaces and restrict water flow. It can lead to increased corrosion and potential health issues if bacteria is released through the drift. Biological growth is controlled by favorable water temperature and pH.



HIGH VIBRATION AND INCREASED BEARING TEMPERATURE

Excessive vibration and rising temperature can lead to bearing failure and damaged pump seals. Pump failures and fan trips result in reduced unit throughput and cooling capacity. Root causes include bearing wear, shaft misalignment, or inadequate lubrication.



RESTRICTIONS IN WATER FLOW

Restrictions of the pump's suction can result in cavitation or low cooling water supply pressure to the plant. Root causes include a plugged suction strainer or valve issues.

What if you could have timely information on cooling tower health and water quality?

Maximize Availability and Efficiency

Emerson's automated monitoring solution provides you with timely information on cooling tower health, allowing you to get the most from your assets and avoid unplanned delays and equipment failure. With greater insight, you can maintain water quality and keep your fans, pumps, and heat exchangers online longer.

Improve Asset Reliability

Online asset health information can alert you before problems with bearings, lubrication, alignment, or excessive fouling before problems impact equipment health and cause a production slowdown. Real-time information provided by Emerson's unique solution can also give you a better understanding of your energy and chemical consumption, allowing you to more effectively manage your usage.

Mitigate Safety and Environmental Risks

Emerson's solution enables you to monitor vibration, temperatures, flows, water conductivity, and pH, as well as hydrocarbon leaks that can be detected before they are released into the environment. You'll be able to plan for condition-based maintenance to avoid unexpected equipment failure that can cause safety issues. Monitoring also enables you to run fans in reverse or cycle them on and off before ice buildup causes damage. With Emerson's solution in place, you'll avoid risky trips to the field and reduce maintenance costs at the same time.

Protecting your profit

Industry experts suggest that cooling tower operation represents an opportunity to generate savings in energy and water consumption. Care to see your savings firsthand?

INPUT

| | |
|--|---------|
| Tower capacity (GPM) | 350,000 |
| Temperature range (CW in-CW out, °F) | 10 |
| Lost production or cooling tower rental cost due to fan failure (\$/per day) | \$2,000 |
| Days at cooling limited operation | 15 |
| Actual cycles of concentration | 4.5 |
| Optimal cycles of concentration | 5.0 |
| Cost of water supply (\$/1000 gallons) | \$2.20 |
| Cost of water disposal (\$/1000 gallons) | \$3.00 |
| Maintenance chemical cost (\$/ton cooling) | \$10.00 |
| Cost of electricity (\$/kWh) | \$0.10 |

OPERATIONAL BENEFITS

| | |
|--|------------------|
| Annual Savings with Early Warning of Asset Health Deterioration | \$30,000 |
| Power consumption savings percentage | 45% |
| Total Savings with Power Consumption Optimization | \$51,110 |
| Water supply savings | \$122,570 |
| Water disposal savings | \$167,141 |
| Maintenance chemical cost savings | \$145,490 |
| Water savings percentage | 6% |
| Total Annual Savings at Optimal Cycle | \$435,201 |

TOTAL ANNUAL PROFIT IMPROVEMENT

\$516,311

Notes

- Calculations based on a 12-cell cooling tower system
- Savings associated with using power consumption optimization during 290 days
- For complete calculation details, please refer to the Cooling Tower value model document available on the Global Sales Portal

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Cooling Towers Solution

Emerson's Essential Asset Monitoring for cooling towers will help you detect conditions that lead to lost performance or asset damage. Infrequent manual readings can be replaced with online insight into the health and performance of the cooling tower. With easy installation and user-friendly maintenance, Emerson's solution offers your operators, maintenance staff, and engineers timely information, allowing them to act and prevent failure, while helping them increase reliability.



Learn More

Visit the Emerson Process Management website to learn more.



Scan this code or visit
[EmersonProcess.com/
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Emerson's Cooling Tower Monitoring Products

SOFTWARE INTERFACE



AMS SUITE: ASSET GRAPHICS FOR OPERATIONS

Provides online graphical displays that indicate operating conditions, including cooling tower efficiency, recommended blowdown and makeup flows, cycles of concentration, saturation index, fan power consumption optimization, and overall cooling tower health. A pre-engineered algorithm delivers diagnostic information for alarms, process analysis, trending, historization, and key performance indicators.



NETWORK INTERFACE



SMART WIRELESS GATEWAY

Connects IEC 62591 (*WirelessHART*[®]) self-organizing networks with any host system.



ADDITIONAL OPTIONS



ROSEMOUNT WIRELESS DISCRETE TRANSMITTER with Tyco TraceTek Sensor

Senses liquid hydrocarbons in drip pans and on the surface of water before leaks become catastrophic.



SMART WIRELESS THUM ADAPTER

Allows devices compliant with HART 5 (and later revisions) to wirelessly transmit measurement and diagnostic information that was previously unavailable.



AMS SUITE FOR MAINTENANCE

Aids early identification of asset problems using predictive diagnostics, allowing maintenance to schedule repairs while reducing cost and downtime.

DEVICES



CSI WIRELESS VIBRATION TRANSMITTER

Provides early warning of excessive vibration in pumps and fans. Helps determine root cause and guides corrective action. Optional functionality can identify premature bearing wear and predict failure.



ROSEMOUNT WIRELESS PRESSURE TRANSMITTER

Detects increases in discharge pressure variation and early warning of impending suction strainer plugging, which leads to cavitation, impeller damage, and seal failure in cooling tower pumps.



ROSEMOUNT ANALYTICAL DUAL-INPUT ANALYZER with Smart Wireless THUM Adapter and Torodial Conductivity Submersion/Insertion Sensor

Monitors conductivity, an indication of dissolved solids concentration (leading to buildup of scale), so that operators can adjust blowdown rate.



ROSEMOUNT ANALYTICAL WIRELESS pH/ORP TRANSMITTER with TUpH pH Submersion/Insertion Sensor

Monitors pH of cooling tower basin to control treatment chemicals consumption to reduce scale formation and minimize corrosion.



ROSEMOUNT WIRELESS TEMPERATURE TRANSMITTER

Enables temperature measurements to determine heat transfer efficiency in cooling towers. Ideal for this high-performance application to enable optimization of cooling tower at a low cost.



ROSEMOUNT GUIDED WAVE RADAR with Smart Wireless THUM Adapter/Wireless Vibrating Fork Level Switches

Enables measurement of the water basin level, ensuring adequate supply of cooled water for the heat exchangers while preventing overfills.

Note: Guided wave radar is a suitable technology for continuous level monitoring. For high/low level indications, vibrating fork switches may be more suitable.



ROSEMOUNT WIRELESS DP FLOWMETER

Provides high performance flow measurements to give valuable insight into cooling tower operation. Cooling water supply and return flows are an indication of cooling tower performance and can indicate potential problems with an associated pump.

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