

Maintain Water Quality and Throughput

Cooling Tower Health Monitoring



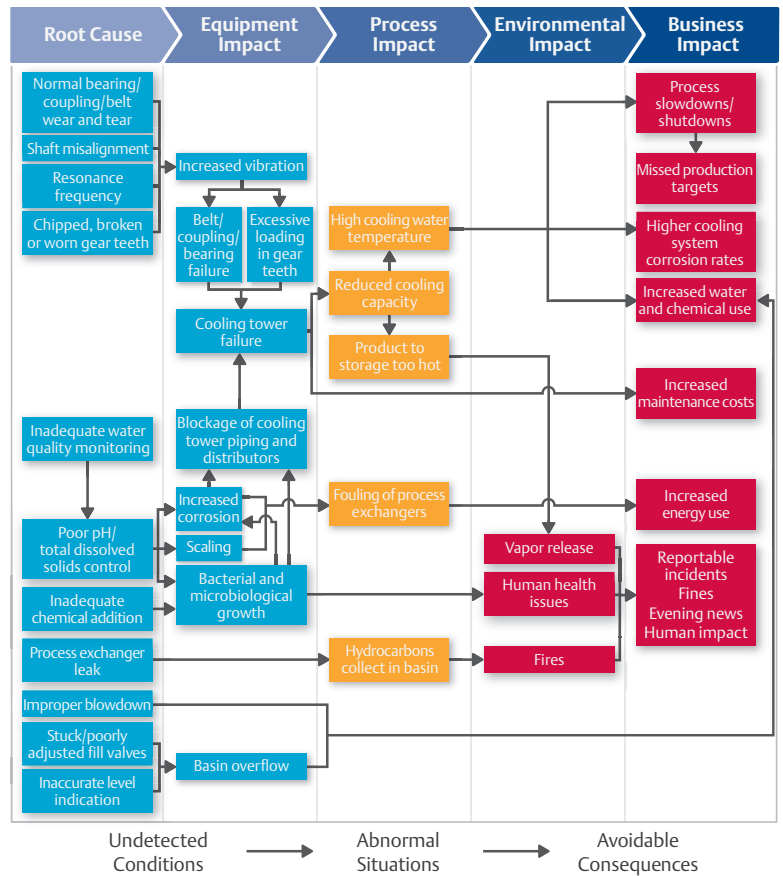
Tired of being surprised by cooling tower changes?

Industry experts estimate that two barrels of water are circulated through the cooling water and steam systems for each barrel of converted oil. A lack of available cooling water can keep you from getting the most profit from your production, and the cost to make up for limited cooling capacity through chemicals will erode your profits.

Faced with a hot day and limited cooling capacity, water temperature will rise. While the rise may seem insignificant in itself, warmer water increases the potential for overloaded column condensers and product coolers, which can require a slowdown to match available cooling. If you lose a supply pump or a tower fan on a hot day, you'll have to rush to react to an imminent shutdown.

Even if a shutdown does not occur, energy expenses rise while trying to meet cooling demand. Increased demand means increased water and chemical costs. Scrambling to meet increased demand and limited cooling capacity puts you in a reactive mode, rather than out ahead of the problems.

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, solubility of solids is exceeded and they 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.



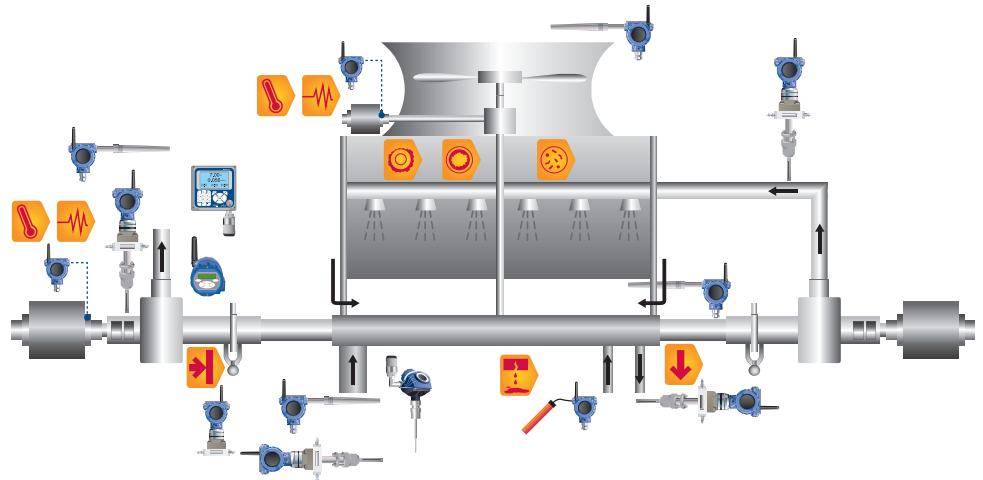
IMPROPER BLOWDOWN AND MAKEUP

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 would it mean to you to have timely information on cooling tower health and water quality?

Avoid Unplanned Slowdowns

To get the most from your assets, you have to find a way to mitigate unplanned slowdowns and shutdowns. Timely information on cooling tower health is needed to stop delays and failure. With more insight, you can maintain water quality and keep your cooling exchangers online longer while reducing the risk of fouling or microbiological growth.

Improve Asset Reliability

Accelerated fouling in exchangers caused by poor water quality can lead you to have earlier than expected shutdowns for cleaning. Run-to-failure incidents on tower fans and supply pumps not only cause reduced tower capacity, but are costly to repair. Online asset health information can alert you before problems with bearings, lubrication, or alignment cause asset failure. Timely information can also give you a better understanding of your chemical consumption, allowing you to understand your chemical provider's advice and more effectively manage your chemical usage.

Mitigate Safety and Environmental Risks

Emerson's automated solutions enable you to monitor vibration, temperatures, flows, water conductivity, and pH, as well as hydrocarbon leak detection. Hydrocarbon leak detection can provide warnings before damaging hydrocarbons are released into the environment. In freezing weather, ice formation threatens to freeze fans and endanger personnel when they manually collect asset data. Better monitoring enables your personnel to run fans in reverse or cycle on/off before ice buildup damages fans. Monitoring brings asset data to maintenance so they can plan condition-based maintenance and send it to operators for immediate action if abnormal operation or imminent failure is occurring. Emerson's monitoring solution allows you to reduce the number of potentially dangerous trips to the field and the likelihood of a costly safety incident by streamlining monitoring, maintenance, and operations.

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
Cost of 1°F water temperature increase (\$/hr)	\$57
Days at cooling limited operation	60
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)	\$2.93
Maintenance chemical cost (\$/ton cooling)	\$8.77
Cost of electricity (\$/kWh)	\$0.0651

OPERATIONAL BENEFITS

Water temperature reduction from increase in airflow (°F)	0.23
Annual Savings from Reduced Water Temperature	\$19,193
Power consumption savings percentage with optimization	33%
Annual Savings with Power Consumption Optimization	\$25,780
Water supply savings	\$122,570
Water disposal savings	\$163,241
Maintenance chemical cost savings	\$127,595
Water savings percentage	5%
Total Annual Savings at Optimal Cycle	\$413,406

TOTAL ANNUAL PROFIT IMPROVEMENT

\$458,378

Value calculation notes

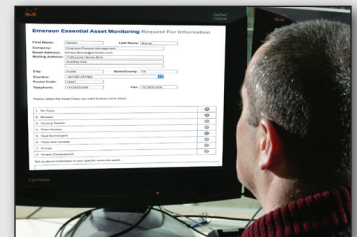
- Calculations based on a 12-cell cooling tower system, one fan for each cell
- Assume cooling tower system has one basin and three pumps
- Fans increased from 75 percent to 100 percent capacity during cooling-limited days
- Savings associated with using power consumption optimization during 225 days
- For complete calculation details, please refer to the Cooling Tower Initial Value Proposition 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 and eliminate unplanned slowdowns.



Request Information

Use our simple online form to select the options most important to you. An Emerson specialist will contact you shortly.



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Emerson 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, including light and heavy crude and gasoline in drip pans, sumps 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 adjustments to blowdown rate can be made.



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 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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