

COOLING TOWER DESIGN AND OPERATION OPTIMIZATION

WATER
OUR FOCUS
OUR BUSINESS
OUR PASSION

Optimizing Cooling Tower Make-up and Blowdown Treatment

The Blue Plan-it® Cooling Tower Dashboard

Cooling towers use significant amounts of water. The thermal efficiency and longevity of the cooling tower and its equipment depend on the quality of the makeup water and the proper management of recirculated water.

Carollo's Blue Plan-it® (BPI) Decision Support System offers an advanced approach to optimizing water use efficiency while protecting the cooling tower's equipment from problems such as scaling, fouling, and corrosion. This fully customizable integration, simulation, and optimization model suite includes a cooling tower assessment tool that completes the following tasks:

- Simulates cooling tower operations for steady-state and dynamic under a wide range of feed water conditions and cooling demand conditions.
- Models scale formation associated with calcium sulfate, calcium carbonate, calcium phosphate, silica, etc.
- Calculates 14 corrosion and stability indices including Langelier Saturation Index (LSI), Larson Index (LI), Ryznar Stability Index (RI), the calcium

carbonate precipitation potential (CCPP), and chloride-to-sulfate mass ratio (CSMR).

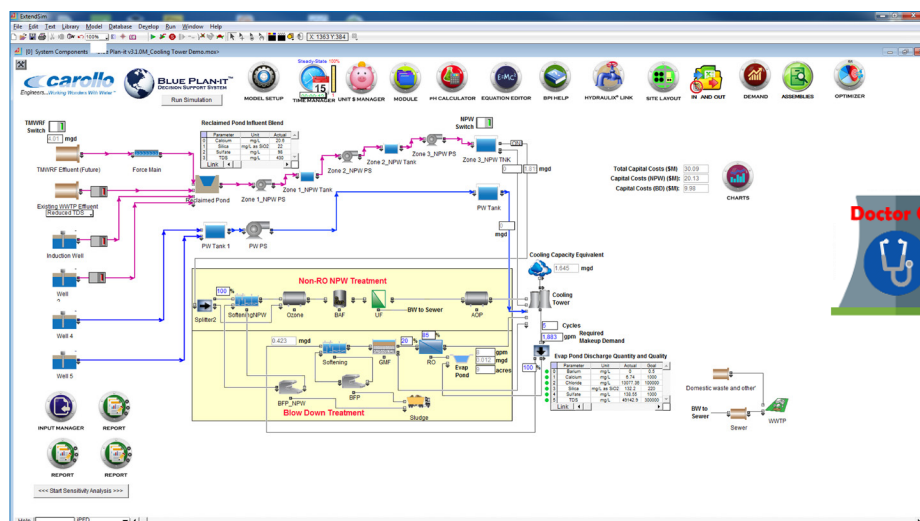
- Determines chemical types and doses required for pH adjustment, corrosion and scaling inhibition, etc.
- Tracks multiple parameters to assess organic and biological-fouling propensity.
- Simulates the performance of various make-up water and blowdown treatment processes such as softening, membranes, ozone-biofiltration, UV advanced oxidation, and zero liquid discharge technologies.
- Drags and links icons to quickly reconfigure the process flow diagram when evaluating alternatives.
- Estimates capital and O&M costs associated with the cooling tower system.

Benefits of Blue Plan-it® Cooling Tower Dashboard

The BPI cooling tower dashboard offers a unique platform that is powerful, user-friendly, and customizable. Serving as a design aid, operation guidance, trouble diagnostic, system optimization, and business intelligence tool, BPI boasts features that are beneficial to everyone from engineers to operators and managers.

Design

BPI accurately simulates the performance of the cooling towers' proposed water system, which allows engineers to validate their design concepts and alternatives quickly. For instance, engineers can use the projected blowdown water quality to evaluate alternative cooling equipment and select appropriate construction material based on their tolerance to chlorides, sulfates, and TDS. This flexibility optimizes the design and prevents unnecessary upgrades of expensive alloys. BPI also has an alternative analyzer function, which allows users to quickly compare multiple design alternatives side-by-side and make decisions according to water usage efficiency, water quality, costs, and triple-bottom-line matrices.



	Cycle Number	Demand (mgd)	Cooling Tower Warning				
			Si	Ba	Ca	Cl	Org.
CT1	8	2.68	🟡	🟢	🟢	🟢	🔴
CT2	2	3.53	🟢	🟡	🟢	🟢	🟢
CT3	4.5	1.71	🟢	🟡	🟢	🟢	🟡
CT4	3.5	1.39	🟢	🟡	🟢	🟢	🟡
CT5	4.0	1.39	🟢	🟡	🟢	🟢	🟡
Total Demand		10.70	Phase II MD				

The Blue Plan-it® cooling tower doctor tracks water quality parameters and triggers animated warnings to provide interactive guidance.

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Besides the cooling tower system and make-up and blowdown treatment system, BPI can also be used to evaluate system-wide water reuse options and water efficiency improvements.

Operation and Trouble Shooting

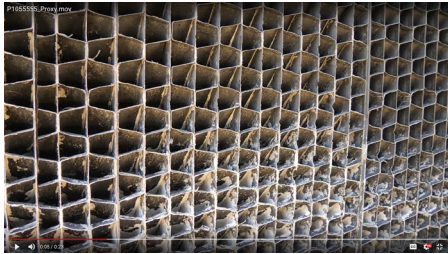
BPI offers an interactive guide for the operations team to virtually experiment with their strategies for process control. When operators input feed water quality and target cycle numbers, the model calculates solubility thresholds, corrosion and stability indices, and other user-defined flow and water quality targets. When any of these targets are exceeded, the user receives animated warnings and suggested remedial actions. This monitoring is instrumental when operating conditions change or when new operation strategies must be implemented.

When water-related problems are observed, operators can also use this tool for troubleshooting. Besides training the operators using BPI tools, our team also provides on-call services such as on-site water quality monitoring, troubleshooting, and system optimization.

Optimization and Business Intelligence

To serve user needs efficiently and effectively, BPI leverages advanced computing techniques such as scenario manager, genetic algorithm optimizer, full factorial solver, and multi-objective optimization. Another great tool is the Monte Carlo Simulation, a feature that helps engineers optimize the system design with more realistic sizing and water quality criteria to avoid creating overly conservative designs.

With visual dashboards and a built-in database, BPI also allows operators and managers to maintain their assets, track the records, generate daily, weekly, monthly or annual operation reports, and identify opportunities for improvements.

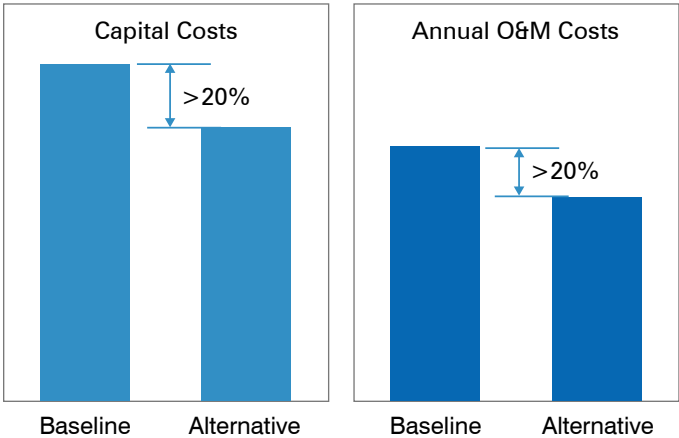


Our team provides onsite water quality monitoring for operation optimization and troubleshooting.

Conclusions

The BPI cooling tower assessment tool can simulate any cooling tower system, and allows every type of user to virtually experiment with changes in design and operation strategies before they are implemented. By allowing this freedom, users save time and money and reduce the need for costly maintenance activities.

With added connectivity features, BPI accesses and organizes historical data, helping users understand not just the current system, but also their system's potential response to different short- and long-term operational changes. Simply put, BPI makes assessing, optimizing, and managing your cooling tower system simple and efficient.



Optimized solutions using Blue Plan-it® help our clients capture significant savings on capital and O&M costs.