LEVERAGING ADVANCED COMPUTING TECHNIQUES

WATER
OUR FOCUS
OUR BUSINESS
OUR PASSION

Optimizing Your Water Solutions Using Blue Plan-it®

Better Problem Solver for Water Industry Data

Given recent advancements in modern technology advancement, users can now leverage big data, cloud computing, and advanced computing techniques to make smart and cost-effective decisions that lead to tailored solutions to challenges of water systems.

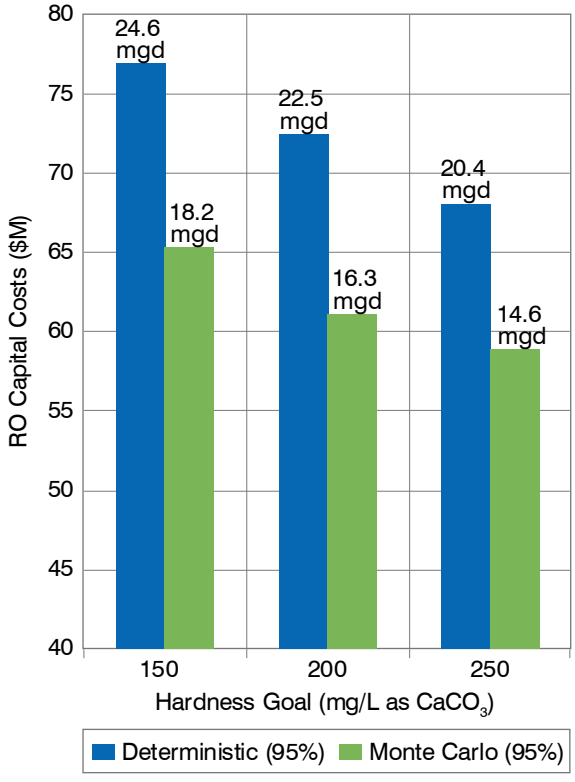
Equipped with these algorithms, the Blue Plan-it® (BPI) Decision Support System handles multi-dimensional, dynamic, and real-time data to help users identify trends, quantify the effects of a given design and operation parameters on costs and performance, understand trade-offs between parameters, and capture cost-saving opportunities while achieving the project objectives.

Blue Plan-it® Advanced Computing Techniques		
 INTELLIGENT PFD	What-if Analysis	• Conducts a single trial and error to simulate a water system. • Completes a manual what-if on the fly in a decision support workshop to virtually experiment the system performance and impacts on costs.
 SCENARIO MANAGER	Sensitivity Analysis	• Conducts a batch of trials and errors to show the effects of one or several factors on performance and costs.
 OPTIMIZER	Genetic Algorithm Solver	• Finds optimized solutions to a water challenge that meet water quality, quantity, social, and environmental goals at lowest costs by randomly generating mutations that mimic natural selection.
 FULL FACTORIAL	Full or Partial Factorial Solver	• Leverages experiment design principles and computing power to find optimized solutions by exploring all or selected combinations of all factors at every level.
 MONTE CARLO	Monte Carlo Simulation	• Applies randomness on selected inputs to determine probabilistic results of complex water problems. • Widely leverages for the modeling water system's uncertainty, risks, reliabilities, etc. • Produces more realistic results than deterministic approaches when describing what could happen to a water system and how likely it is to happen to avoid creating overly conservative designs.
 SCADA LINK	SCADA Link	• Manually and automatically loads in and processes SCADA data for simulation and optimization, which is crucial when utilizing big data and model predictive control (MPC).
 MULTI-OBJECTIVE	Multi-Objective Optimization	• Optimizes more than one objective function simultaneously in situations where optimal decisions cannot avoid trade-offs between two or more conflicting objectives. • Offers supportive and informative decision-making assistance that takes owner preferences into consideration.

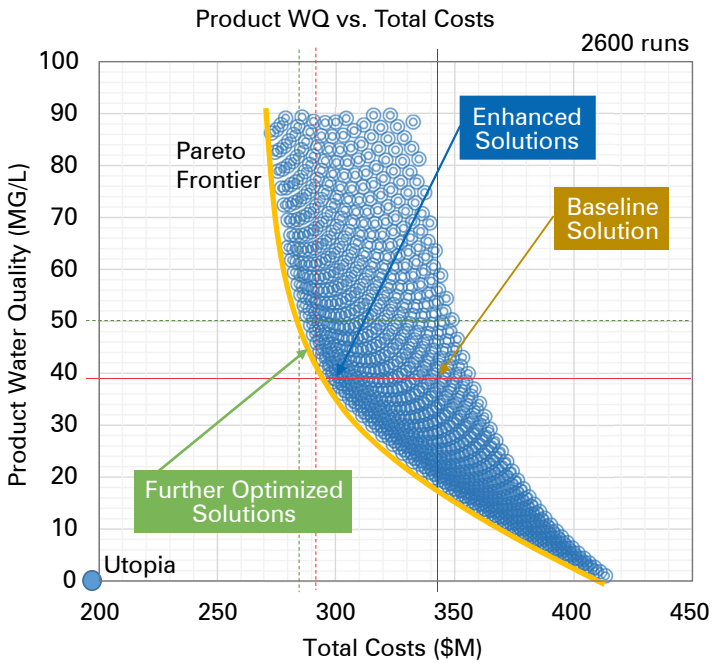
Successful Case Study

Using better problem solvers like these, Carollo Engineers has solved many complex technical problems for our clients and offered more optimized solutions than what conventional approaches could produce. Below are just some of our past projects that exemplify how our solutions met the specific project goals, lowered capital and O&M costs, and reduced risks and environmental effects.

	Conventional Approach	Blue Plan-it® Solution	Savings	Technology Leveraged
Confidential Data Center Cooling Tower Make-up Water Treatment	~$56.5 M	~$10.6 M	~$45.9 M	Genetic Algorithm
Municipal RO Facility, West Texas	~$77 M	~$65 M	~$12 M	Monte Carlo Simulation
Confidential Industrial Client Reuse System	~$10 M	~<$5 M	$5 M	Full Factorial Solver and Multi-Objective Optimization
Confidential Az Well Field PFAS Treatment 20-Year Operation Costs	~$11.4 M	~$3.8 M	~$7.6 M	Combined Testing and Modeling Approach



Monte Carlo Simulation showed a plant size that was 4 million gallons per day (mgd) below what was recommended by the overly-conservative, deterministic approach, reducing capital costs by approximately $10 million.



Multi-objective optimization identifies optimal solutions and represents the trade-offs between the performance and costs that the owner faces.