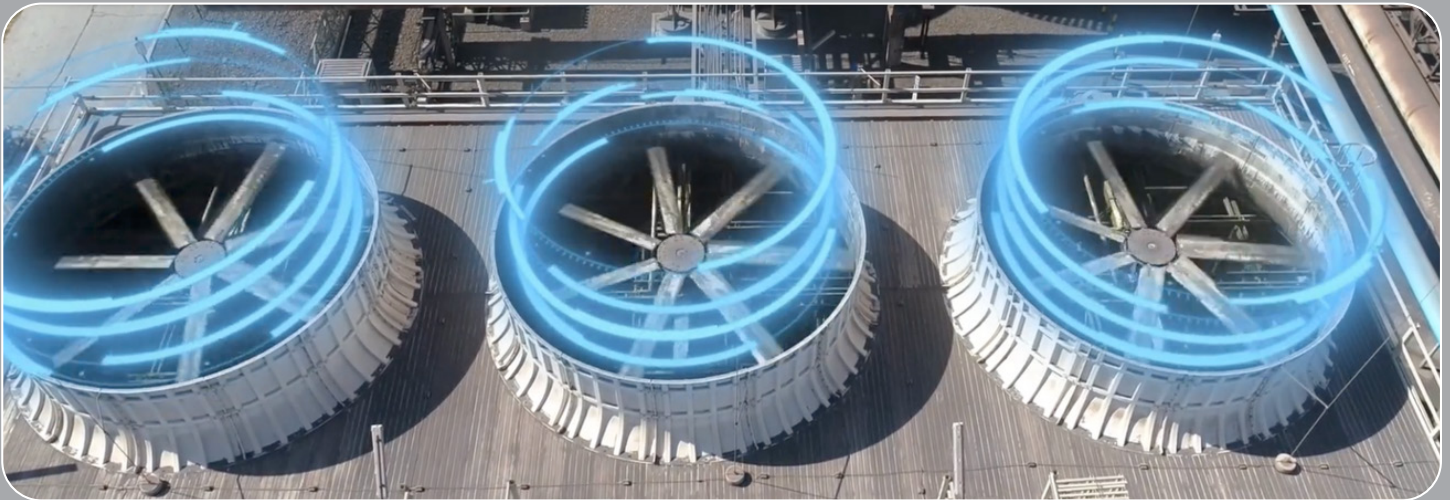


Cooling Towers Reimagined: Unlocking Hidden Efficiency in Industrial Cooling

**Presenters:**

Bob DeBorde, POSM Technical Manager, LyondellBasell
Karim Khalil, PhD, CTO & Co-Founder, Infinite Cooling

MARCH 26, 2026**KEY TAKEAWAYS**

- Cooling system optimization significantly improves performance without major capital investments.
- TowerPulse uses data-driven insights to help address inefficiencies in industrial cooling towers.
- Infinite Cooling ties cooling system efficiencies directly to overall facility operations.

in partnership with

InfiniteCooling

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OVERVIEW

Cooling towers across power plants, manufacturing facilities, data centers, and campuses are often operating below their true potential. Performance degradation, hidden inefficiencies, and missed optimization opportunities quietly lower production and increase energy use, water consumption, operating costs, and emissions.

Optimizing cooling systems is a significant—but often overlooked—opportunity in industrial operations.

Data-driven performance analytics can transform cooling towers from background infrastructure into performance-critical assets. By combining physics-based modeling, machine learning, and user-friendly software, [Infinite Cooling's TowerPulse](#) platform transforms cooling towers from passive utilities into actively managed assets. Customer results are remarkable—improved efficiency, increased production, reduced costs, lower water usage, and better-informed decision making across the organization.

CONTEXT

The presenters discussed the operational impact of cooling system underperformance and explained how Infinite Cooling TowerPulse unlocks efficiency gains, cost savings, and improved decision making.

KEY TAKEAWAYS

Cooling system optimization significantly improves performance without major capital investments.

Through analysis of over 100,000 hours of operating data collected from cooling towers across dozens of power plants, manufacturing facilities, data centers, and campuses, Infinite Cooling found that every cooling tower they analyzed was underperforming.

While significant, the result is not surprising. Cooling systems in industrial facilities are typically not a top priority and do not receive the same level of attention as other plant processes. However, cooling systems provide a heatsink for a facility's operations—cooling system efficiency impacts overall operations.

Cooling towers are sensitive to weather. Fluctuations in dew point, ambient temperatures, and even rain can result in de-rating certain products or plant sections. Summer months especially, with consistent warmer temperatures, can have a significant effect on production. For example:

- A bottling plant had to reduce production every summer due to heat rejection limitations.
- A power plant was producing 2MW less in warm weather than in lower temperatures.
- A chiller plant consumed 10% more energy than the spec—despite regular chiller maintenance.

“Because the cooling tower water temperature impacts the rest of our plant so significantly, it’s something that we monitor pretty closely.”

– *Bob DeBorde, LyondellBasell*

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Figure 1: Improving cooling tower efficiency can unlock production gains



TowerPulse uses data-driven insights to help address inefficiencies in industrial cooling towers.

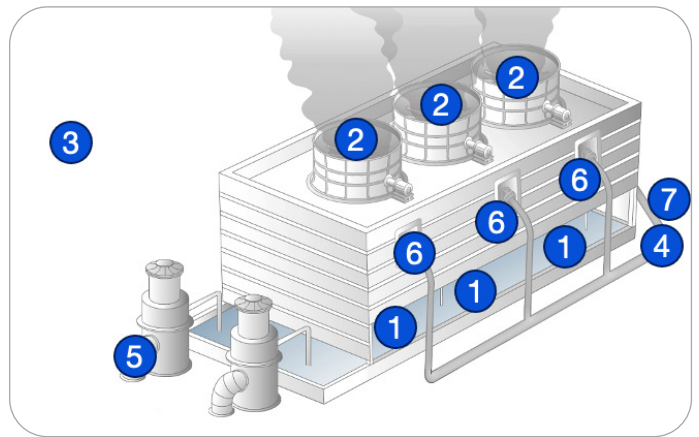
To address industrial cooling system performance limitations, Infinite Cooling developed TowerPulse, a platform that leverages physics-based modeling and machine learning algorithms to provide real-time optimization, feedback, and predictive maintenance capabilities for evaporative cooling systems.

TowerPulse ingests data from distributed sensors, along with data from an existing distributed control system (DCS), and analyzes this information in real time against historical trends from an integrated historian to identify cooling system improvements that can increase cooling capacity, reduce energy use, and lower maintenance costs.

Sensors provide rich real-time data

TowerPulse collects a wide range of data through sensors. Some sensor types are typically not present in industrial facilities, in which case Infinite Cooling provides its own accurate and robust wireless sensors for cooling towers or works closely with customers to integrate other sensors that meet facility requirements (e.g., military sites).

Figure 2: Sensors constantly monitor cooling tower performance for real-time insights



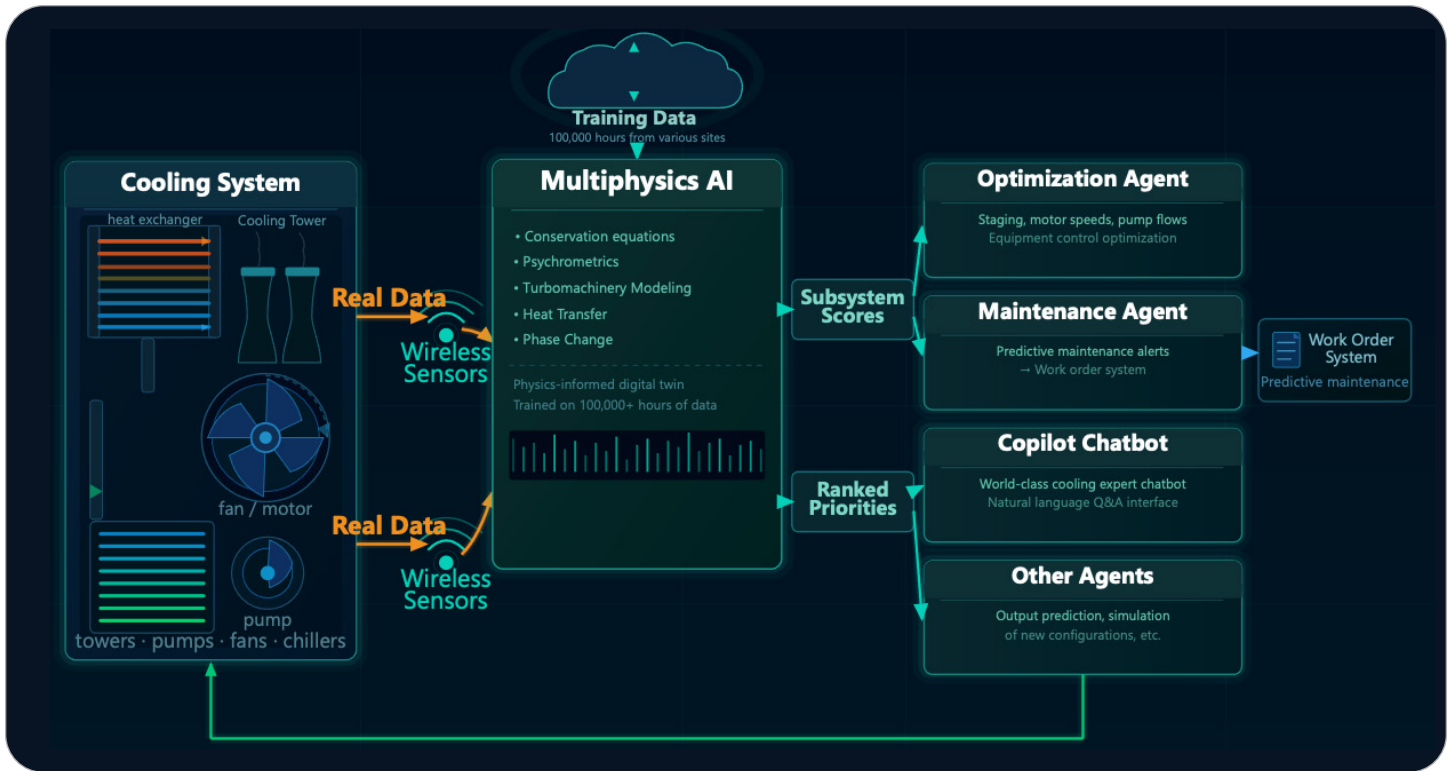
Industry-leading models ensure high-accuracy solutions

TowerPulse applies physics modeling to the sensor data, leveraging Infinite Cooling's state-of-the-art evaporative cooling physics models to determine the true performance of the cooling system. Through modeling, TowerPulse identifies issues such as low airflow, insufficient heat transfer, or leaks. Machine learning algorithms then generate targeted recommendations based on real operating data, enabling high-confidence recommendations rather than broad suggestions.

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Figure 3: TowerPulse leverages Multiphysics AI to identify targeted optimization and maintenance solutions



Simulations calculate realistic performance gains by category

A web-based dashboard allows multiple users—including engineers, operators, maintenance teams, and executives—to access valuable cooling system performance insights.

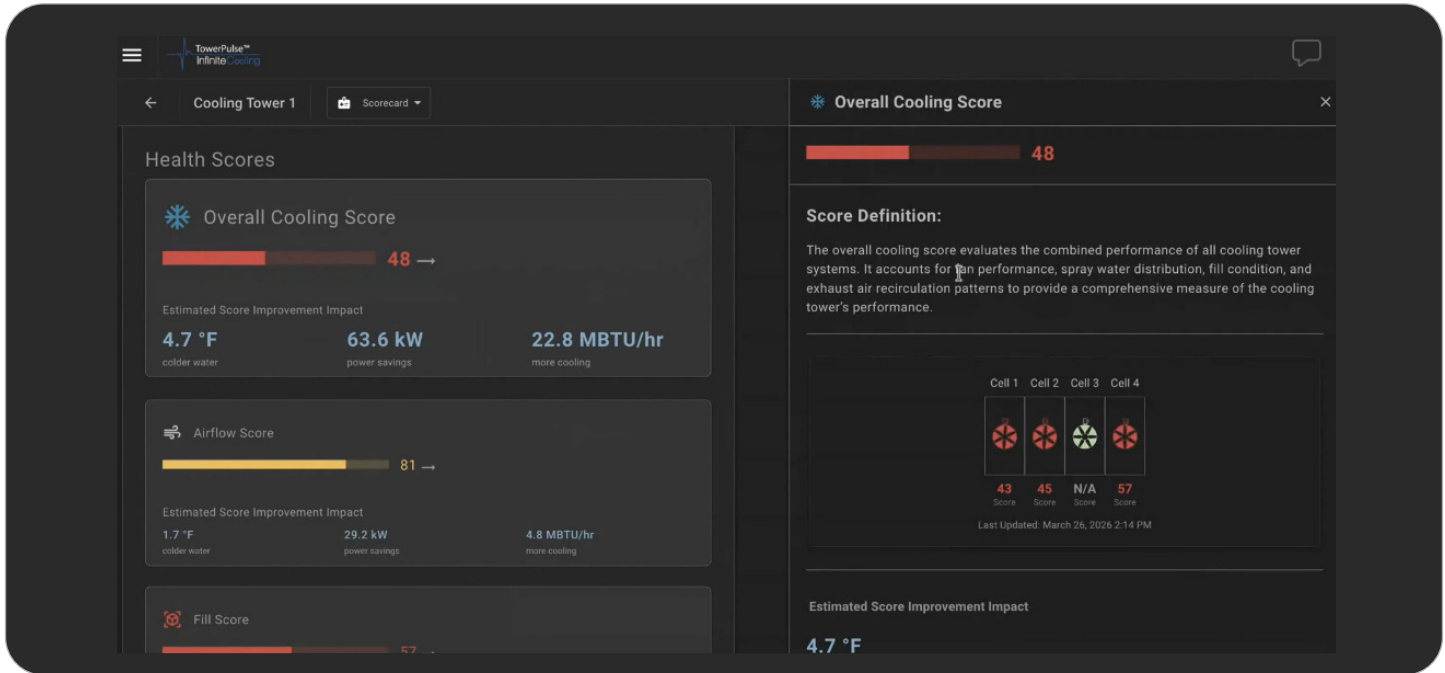
The TowerPulse scorecard provides an at-a-glance summary of the effective thermodynamic efficiency of a cooling system in its current state, including overall cooling score and real-time subscores, such as airflow, fill, and recirculation.

Using a simulated environment, TowerPulse then estimates—at both the overall and subscore levels—possible score improvements (i.e., reduced water temperature, lower energy consumption, increased heat load and water flow) if the cooling tower were operating at its designed condition. These scores allow users to pinpoint specific issues and understand their impact.

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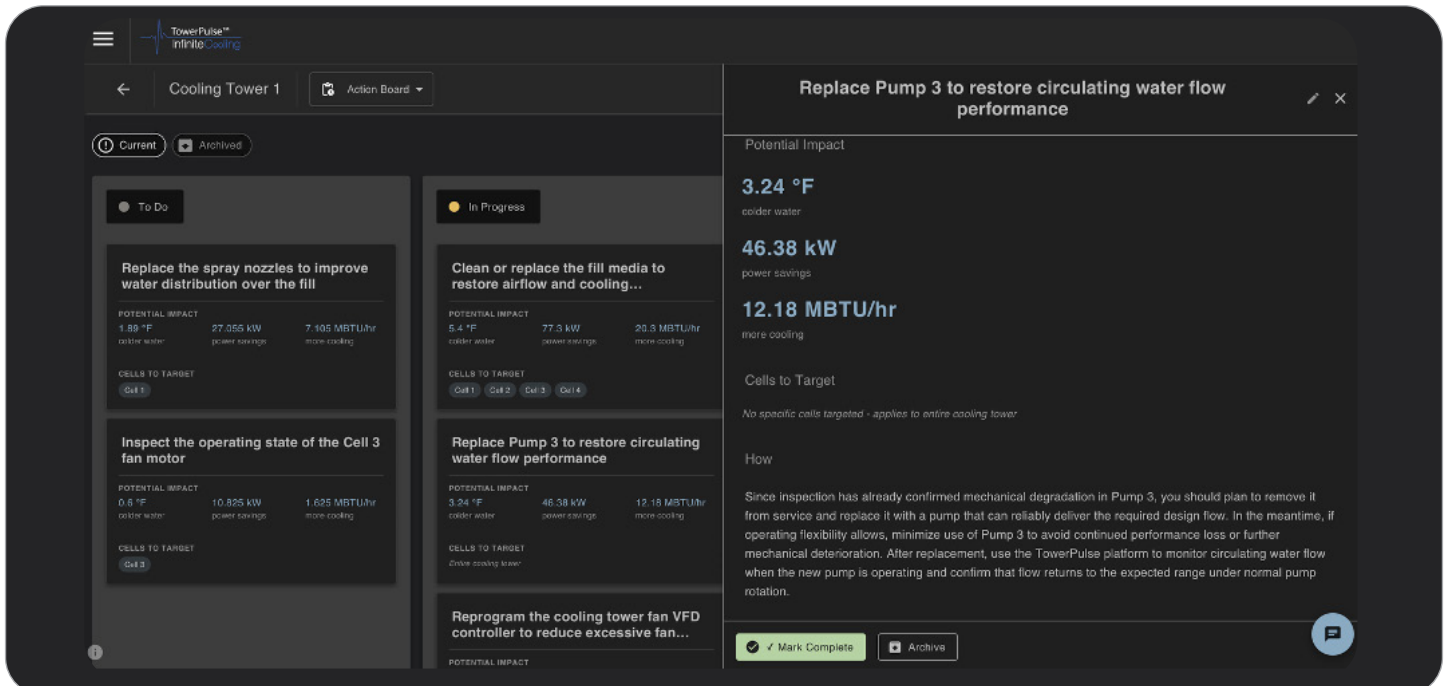
Figure 4: The scorecard displays current performance and estimated improvements



Integrated, targeted recommendations

Every score in the scorecard is accompanied by a set of recommended actions for improving those scores. A built-in standard project management interface allows users to interact with and monitor system actions and measure resultant savings.

Figure 5: Each score comes with targeted solutions



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Agentic AI extends resources

An AI-powered chatbot assistant allows users to leverage Infinite Cooling's knowledge base to provide human-readable responses to system-specific questions, making information more accessible and actionable without requiring deep technical specialization. And as the knowledge base continues to grow, the chatbot will grow even more sophisticated, adding greater value.

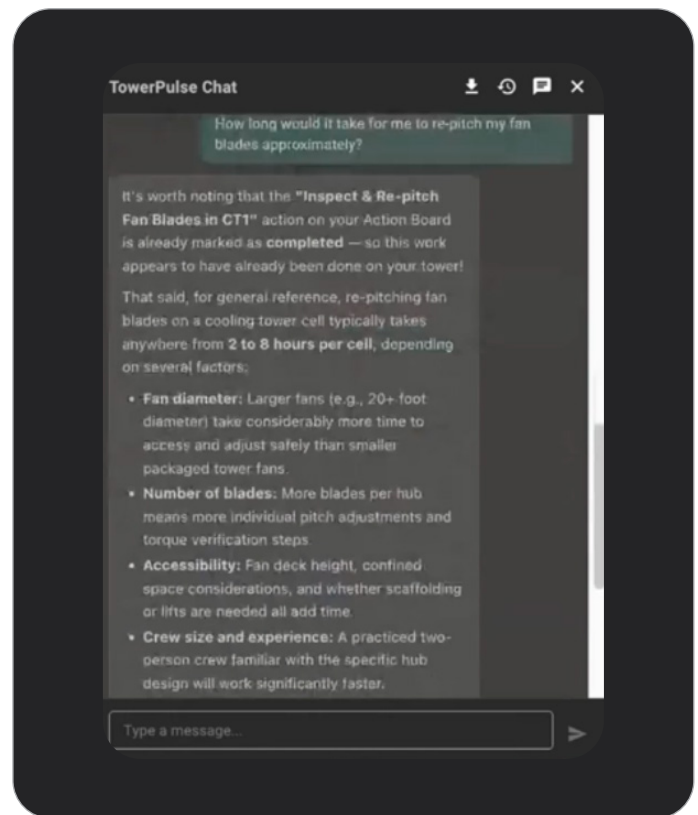
“All of Infinite Cooling’s knowledge and modeling capabilities are embedded in here. Types of questions that—especially early on with our product—I would have had to answer manually with our modeling engineers . . . can now really be at the fingertips of our customers.”

– Karim Khalil, PhD, Infinite Cooling

Simple and secure implementation

TowerPulse is designed to integrate with existing systems, such as building management and SCADA systems, via APIs. Deployment is quick, and achievable without shutting down operations. The platform adheres to modern cybersecurity standards, with end-to-end encrypted data and strict access permissions.

Figure 6: A built-in chatbot provides environment-specific information



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Case Study: Food and Beverage Bottling Plant

How TowerPulse reduced a cooling system's average energy consumption by 40%

At one of the world's largest food and beverage bottling sites, located in Arizona, tower inefficiencies were bottlenecking cooling capacity—especially in warmer seasons. However, the facility operated at a very high-capacity factor practically year-round, making detailed diagnostics challenging.

The facility quickly deployed TowerPulse on a four-cell cooling tower, which remained online throughout. TowerPulse measured system efficiency at only 40%, leaving room for improvement.

TowerPulse identified fill maintenance needs to restore capability and reduce cold water temperature by 5° C, almost doubling cooling tower heat rejection capacity in certain conditions. The platform also detected an anomaly in fan motor controls that was leading to excessive cycling—replacing the motor and gearbox avoided large recurring annual replacement costs—and detected a leak in the water system, which led to significant water savings.

By identifying and remediating these inefficiencies, the plant ultimately avoided a planned \$1M capital upgrade for extension cooling towers that would support the bottling load by increasing the cooling capacity of existing cooling towers.

Infinite Cooling ties cooling system efficiencies directly to overall facility operations.

Traditional maintenance approaches rely heavily on reactive fixes or general preventive schedules, often missing performance-related issues. By enabling continuous monitoring and data-driven prioritization, TowerPulse allows engineers to focus on the true issues and avoid wasting time on incorrect assumptions, while real data—not best guesses—provides critical justification for budget approval.

Infinite Cooling is focused on delivering value to customers, constantly adding new features to support greater operational efficiency. In addition to optimizing energy and capacity, TowerPulse also monitors and measures water usage. The platform can detect excessive water use due to leaks, basin overflows, and abnormal blowdown, automatically raising alerts to enable rapid response.

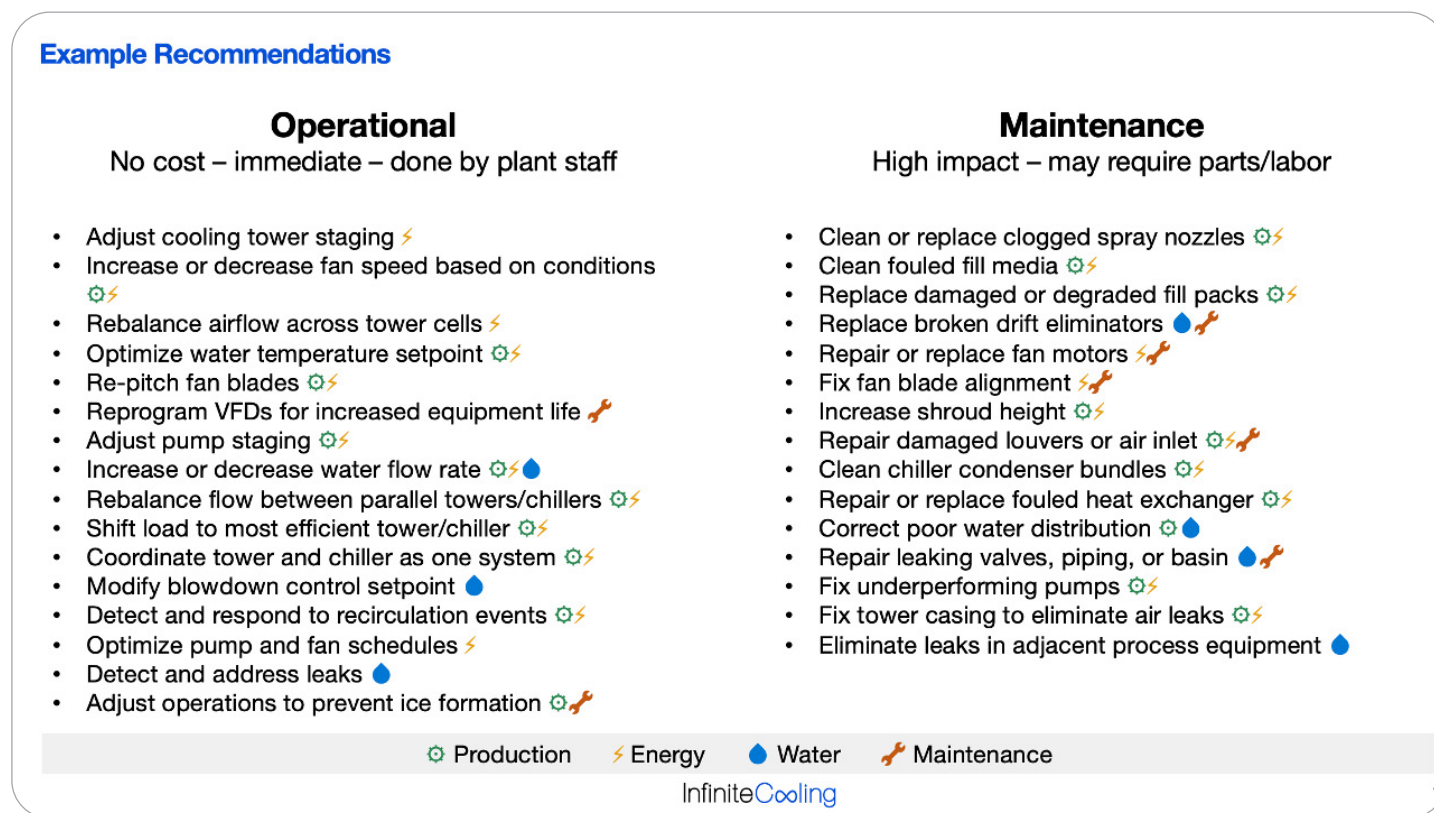
TowerPulse also provides direct feedback on the thermal impact of blowdown rates and water chemistry, allowing operators to optimize blowdown while maintaining performance. For some Infinite Cooling customers in hot climates, facilities reduced annual water consumption by 17% by moving from three to five cycles of concentration.

Facilities often increase blowdown to reduce cold water temperature when the ambient temperature is higher, and thermodynamic inefficiencies can have a dramatic impact on water consumption. TowerPulse identifies root causes, enabling operators to improve cooling tower performance while reducing annual water consumption by up to 10%, which is especially valuable in water-scarce regions.

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Figure 7: TowerPulse enables savings across multiple operational areas



ADDITIONAL INFORMATION

To learn more, visit [Infinite Cooling](#)

BIOGRAPHIES



Bob DeBorde

POSM Technical Manager
LyondellBasell

Bob is responsible for strategic planning and goal setting to drive benchmarking and gap closure efforts in alignment with commercial strategic plans at LyondellBasell. His team is responsible for maintaining flawless process safety performance; implementing projects to improve production, quality, and reliability metrics; and drive optimization efforts based on market demands to maximize profitability. He holds a B.S. in Chemical Engineering from Texas A&M University.



Karim Khalil, PhD

CTO & Co-Founder
Infinite Cooling

Karim leads all hardware and software engineering at Infinite Cooling. He holds a Ph.D. in Mechanical Engineering from MIT, where his research focused on thermal fluid systems and energy efficiency enhancements for large industrial processes such as steam condensation and desalination. Karim's undergraduate studies were completed at Duke University, where he majored in Mechanical Engineering and Material Science with a concentration in Energy & the Environment.