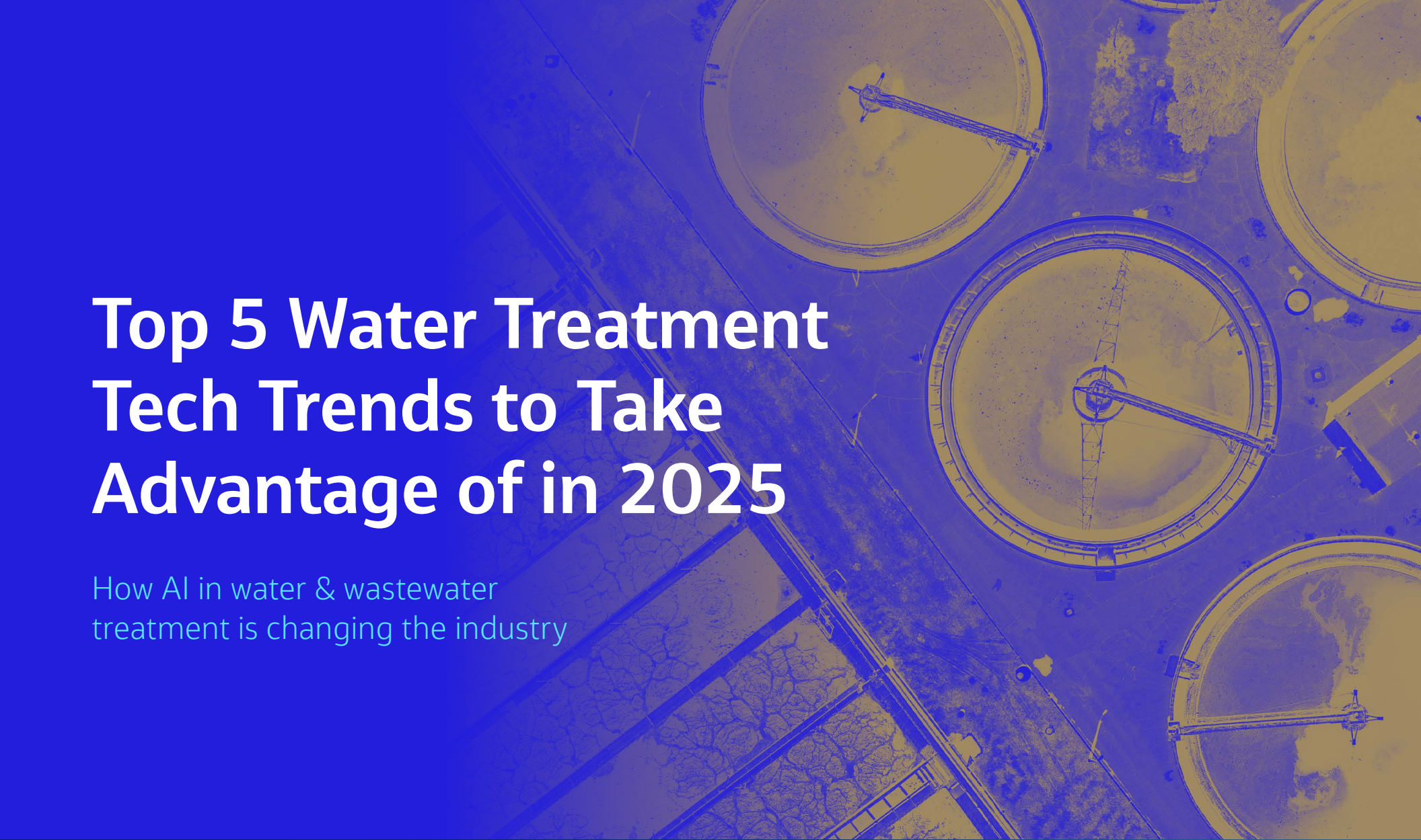




Top 5 Water Treatment Tech Trends to Take Advantage of in 2025

How AI in water & wastewater
treatment is changing the industry

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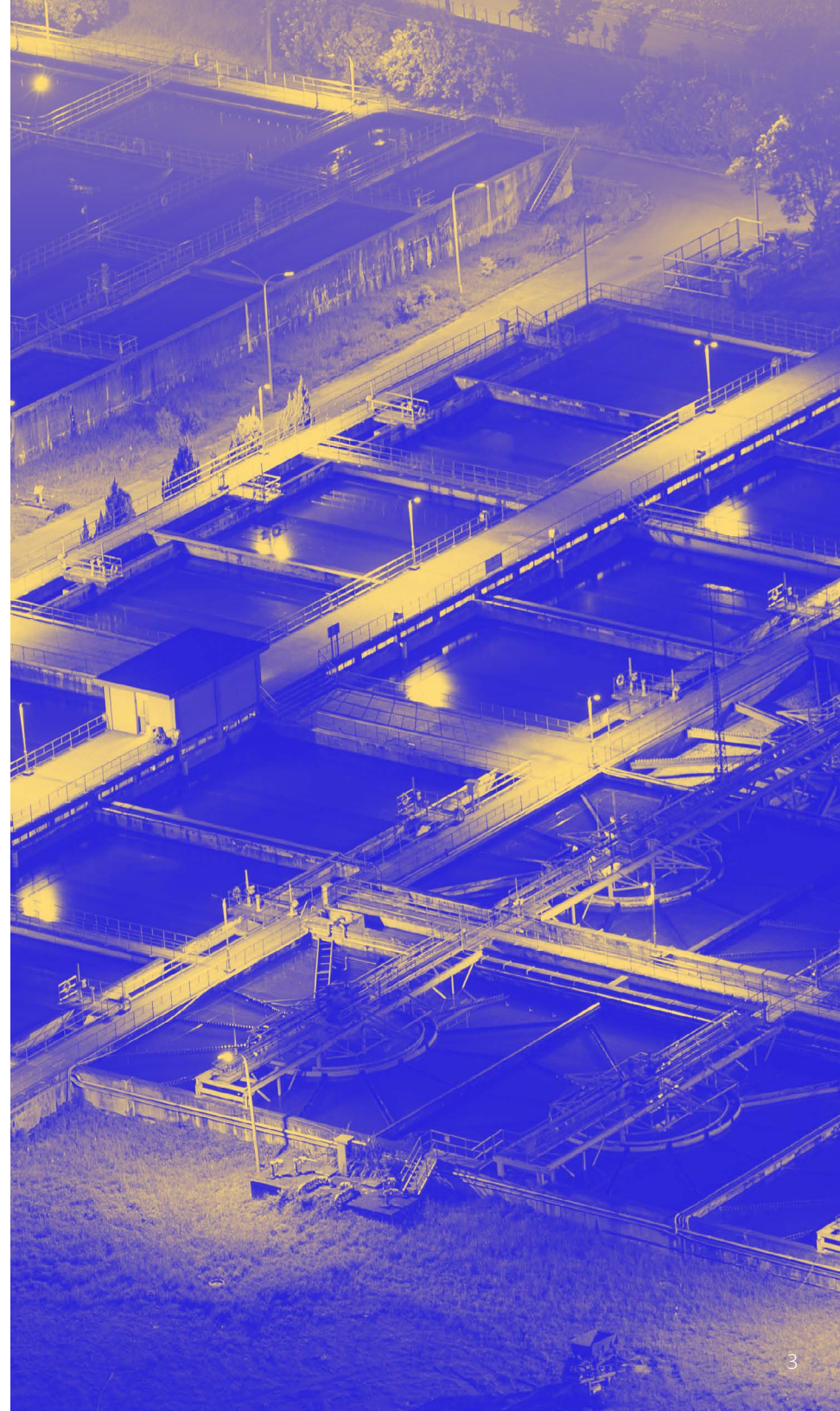
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How the Digital Age Is Changing Water & Wastewater Treatment

Water and wastewater treatment is entering the digital age, with more treatment plants relying on the latest technologies to operate safely, efficiently, and compliantly.

This digital shift has quietly transformed day-to-day operations and management for many plants, helping staff make informed decisions about chemical dosage, blower setpoints, and more.

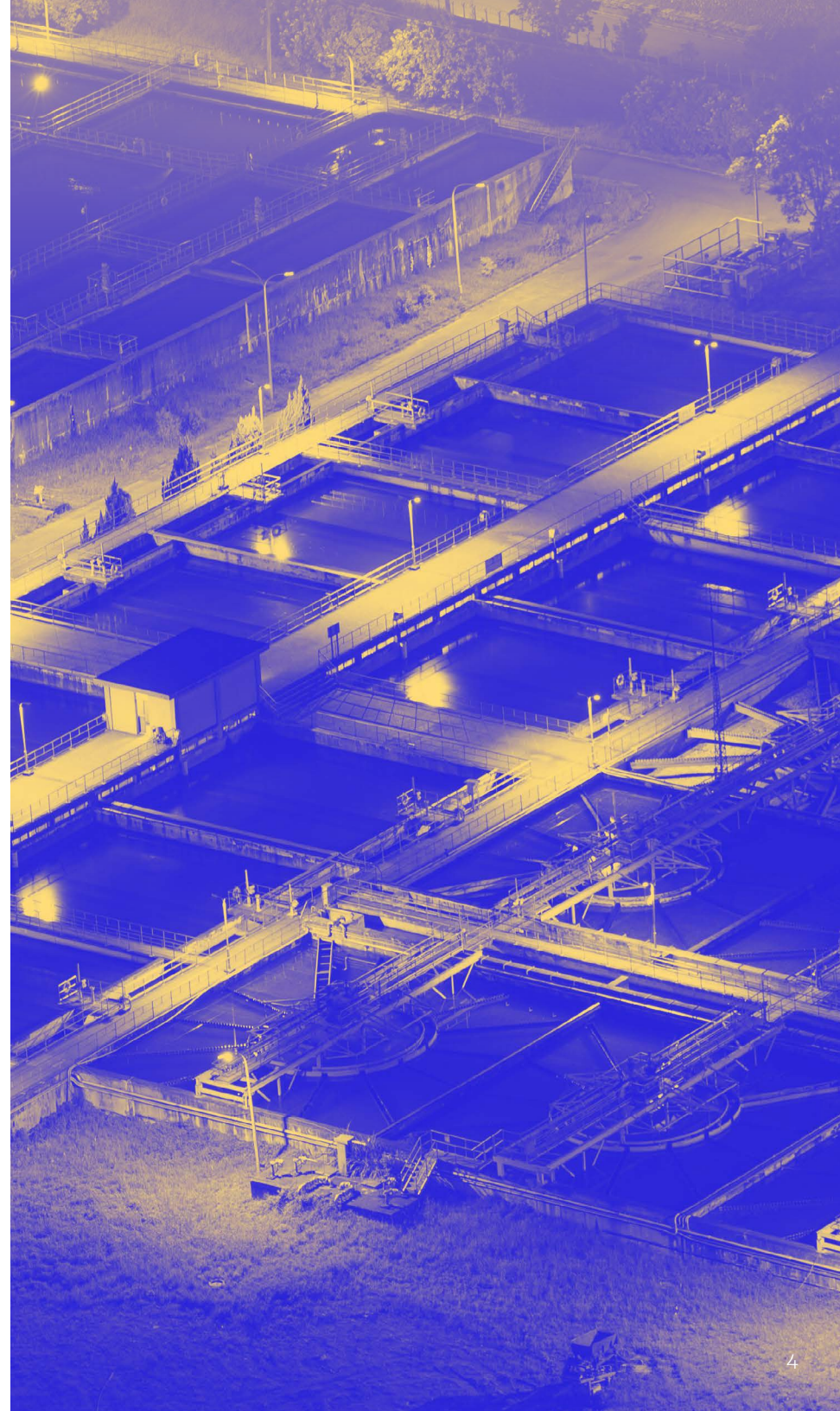




With an increasingly complex landscape of compliance requirements, extreme weather events, and skilled staffing shortages, facilities that have yet to make the digital leap sometimes struggle to keep up.

Meanwhile, surprising AI breakthroughs in recent months have already proven to offer a major advantage to plants that make the digital shift, **helping operators adapt to complexity while saving energy, lowering costs, and supporting staff.**

In the coming chapters, we discuss five trends in water and wastewater treatment technology, including the latest data analytics and Artificial Intelligence tools that will shape how treatment plant operations develop over the next several years. We also analyze some of the concerns that have kept operators on the sidelines.



01

Busting data silos to anticipate issues (not just react)

Today, water and wastewater treatment facilities often use data to inform plant operations and management, but that data is often siloed within their resource planning software, maintenance systems, lab samples, and sensors.

Individually, each of these data sources can help operators react to changing conditions. But **aggregating** these separate data streams into one place helps operators speed up those reactions by surfacing early performance indicators that help plants stay ahead of machine maintenance, chemical changes, and energy demands.

Once data silos have been removed, AI can help turn existing data streams about what has happened and is happening at a particular plant into predictions about what will happen, allowing operators to **proactively adjust energy and chemical usage, or anticipate machine repairs**.

For example, AI technologies can monitor what's happening with ammonia levels in real time, compare them to current compliance requirements, and proactively recommend that operators adjust blower setpoints to ensure those levels remain compliant.



01 Busting data silos to anticipate issues (not just react) (cont'd)

VIDEO

Optimizing Plant Operations at Scale

See how water and wastewater treatment facilities are using AI software like Jacobs' Intelligent O&M to leverage predictive operations.



02 Data-driven power management to reduce energy costs

Water and wastewater treatment are energy-intensive, requiring tens or sometimes hundreds of thousands of kWh of electricity every day, leading to high operational costs. Meanwhile, these high energy demands also contribute to greenhouse gas emissions.

But predictive treatment technologies can help operators **reduce energy usage without compromising safety or efficiency**. This also allows plants to meet regional sustainability goals.

For example, the Agua Nueva Wastewater Treatment Plant in Tuscon, Arizona used Intelligent O&M to identify opportunities to optimize blower setpoints, leading to a sustained 10-20% reduction in blower power usage and decreasing CO2 emissions by over 1,000 lbs.



02 Data-driven power management to reduce energy costs (cont'd)

AI IN ACTION

Energy Savings in Tuscon, Arizona

"We were using 2000 kWh of electrical per million gallons [7.57 kWh/m³] we treated and we're now down to the low 1500s [roughly 5.7 kWh/m³]... if we are able to optimize those with higher and lower [Dissolved Oxygen levels] where we're not running them as much, it causes our electrical cost to go way down."

Timothy Mason,
Operations Manager,
Agua Nueva Wastewater Treatment Plant



03 AI to help plant operators optimize chemical dosage

Chemical dosing is also a major expenditure for water and wastewater treatment plants, so reducing disinfectant or coagulant dosages can lead to significant cost savings. However, **plants often keep dosages higher than may be necessary** because safety and compliance are so important.

Predictive AI can help optimize these dosage decisions to meet safety and compliance thresholds while reducing costs and saving resources. These technologies can send automated dosage recommendations based on up-to-date information from labs and sensors, so operators can **confidently adjust dosage while maintaining compliance**.



03 AI to help plant operators optimize chemical dosage (cont'd)

AI IN ACTION

Smart Chemical Dosage in Wilmington, Delaware

THE CHALLENGE

The Wilmington, Delaware Wastewater Treatment Plant faced a common yet challenging task: optimizing disinfection chemical dosage without sacrificing the efficacy of bacteria elimination or violating permit limits.

THE SOLUTION

By analyzing historically effective dosages, including during stormy conditions, Intelligent O&M was able to deliver multiple daily push notifications with updated dosage recommendations based on real-time weather station data.

THE RESULTS

Because operators no longer had to exceed the necessary dosage out of an abundance of caution, they were able to reduce chemical usage by 20 percent.

This saved the plant around \$250,000 per year despite soaring market prices.



04 Solving staffing challenges with smarter training

Staffing has also been a consistent challenge for water and wastewater treatment plants in recent years. Though some new hires may have specialized skills thanks to university or vocational programs, many new operators rely on on-the-job training to develop the skills needed to successfully operate a plant. **Before a new staff member can operate successfully with minimal oversight, they must spend months learning the ins and outs of optimal operations.**

This challenge is often exacerbated by the complex, decentralized digital systems that plants use to track and update chemical dosage, blower setpoints, and more. Meanwhile, as compliance regulations become more stringent, these systems must also become more sophisticated to meet these objectives. With all this added complexity, onboarding can be a lengthy and difficult process, as new operators learn the intricacies of these advancing technologies.

AI can help bridge the gap between an employee's current skillset and these highly sophisticated water and wastewater management systems. With predictive recommendations delivered directly to a smartphone or tablet, new operators get the guidance they need to work from day one. Meanwhile, senior staff can devote more time and attention to managing overall plant performance and optimizations.

Because technologies like Intelligent O&M by Jacobs deliver recommendations based on historical plant performance, new hires can immediately start learning best practices based on institutional knowledge that may otherwise be lost when more veteran staff leave the workforce.



04 Solving staffing challenges with smarter training (cont'd)

To realize these training benefits, choosing the right AI software is critical. Some AI software for treatment plants may directly implement changes to blower setpoints, chemical dosages, and other key decisions that operators would normally be responsible for, locking potential learnings behind a black box of automation. **For AI that truly assists in the training of new operators, look for AI software that delivers easy-to-understand recommendations (not automations)** directly to operators' tablets or mobile devices during their normal workflows.

WEBINAR

Outsmarting the Skilled Staffing Shortage at Water Treatment Plants

In this webinar, discover how predictive analytics can help you onboard staff faster, operationalize best practices for your specific plant, and equip operators with the tools they need to succeed.



05

Reducing maintenance costs while protecting safety

Leveraging AI to analyze historical and current data from maintenance systems can also help operators or maintenance teams schedule repairs, extend the lifespan of their machines, and reduce maintenance costs over time.

For many plants, maintenance is reactive; staff may only know a machine needs repairs or replacement when it breaks. Limitations with available staff, skillsets, and budgets can also compound these challenges, forcing maintenance managers to prioritize only the highest priority work orders.

And if the wrong part fails, it could force a plant to pause treatment, reduce output, or compensate with increased chemical dosages.

Using historical data to **automate and schedule ongoing machine maintenance** allows plants to be proactive rather than reactive, avoiding the complications caused by broken or malfunctioning machinery.



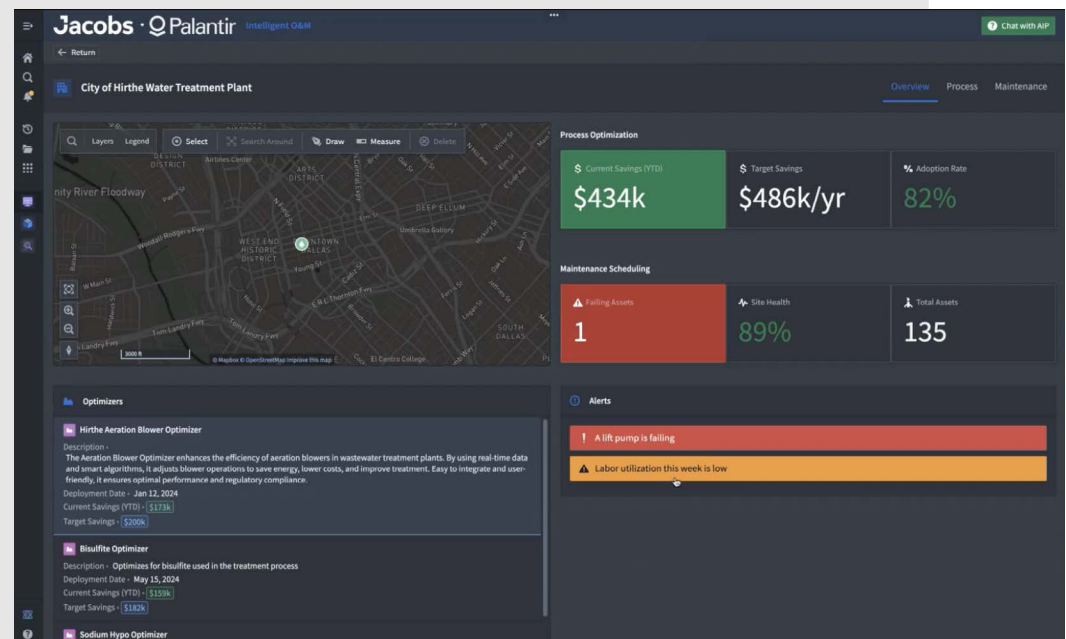
Scheduling maintenance reactively often leads to degrading machinery — and reduced plant performance. It also shortens the expected lifespan of machinery, leading to expensive replacement costs that could otherwise be avoided.

05 Reducing maintenance costs while protecting safety (cont'd)

VIDEO

Intelligent Operations and Maintenance for Water & Wastewater Treatment

See how AI software like Jacobs' Intelligent O&M flags necessary maintenance and helps operators prioritize and schedule repairs to save time and money while avoiding disruptions.



Discover how Intelligent O&M can boost the performance of your plant.



25%

Savings in
power consumption



20%

Reduction in specific
chemical inputs



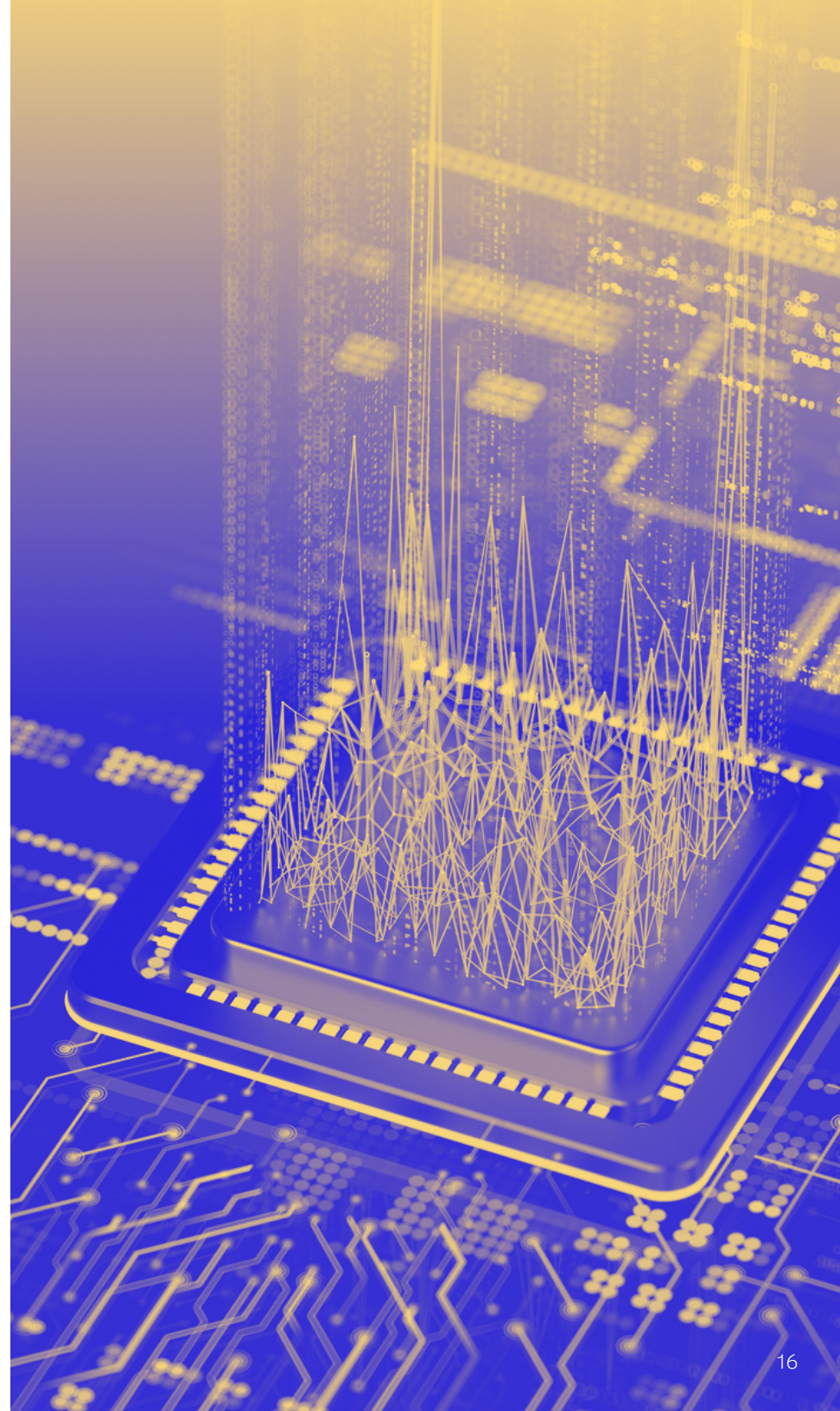
15%

Savings on cost of maintenance
planning and scheduling

Pulse Check: Is AI Safe & Worth the Investment

As Artificial Intelligence becomes more integral to workplace operations in many industries, a few common concerns accompany its proliferation. Plant operators may wonder: Will AI compromise a plant's cybersecurity? Is AI replacing humans in plant operations? How long does it take to get AI software up and running? **And is my data even good enough to bother with AI?**

The answers to these questions might (pleasantly) surprise you.



Pulse Check: Is AI Safe & Worth the Investment (cont'd)

a Is my data 'good enough'?

When considering adopting AI for water or wastewater operations, it's common to wonder if your plant really generates enough quality data for AI to learn from. But the answer is almost always, "Yes, it does."

In fact, the quality of your data may be much higher than you realize. Because a plant's various data streams tend to be siloed within resource planning software, maintenance systems, lab samples, and sensors, each data silo offers limited information to inform operational and management decisions. Once these data streams are combined within a centralized AI platform, it becomes much easier to recognize patterns in performance, maintenance scheduling, and other factors that inform optimal plant operations.

One of the great advantages of AI is that it makes your existing data work much harder than it otherwise could.

b Protecting your cybersecurity

Cybersecurity is a common concern when considering AI adoption. If I feed an AI model data about my plant, who has access to that data? And what are the repercussions?

These questions are particularly relevant when dealing with open AI models like ChatGPT, where training data and architecture are publicly shared.

Given the high stakes for critical infrastructure like water facilities, which must be compliant and operational 24 hours a day and pose a clear and present target for nefarious actors, open AI models should be avoided — but that doesn't mean you can't safely benefit from AI software specifically designed for water facilities.

Intelligent O&M, for example, is a closed AI software, which keeps all your data private. All integration happens locally and is highly specific to *your* plant. Even after your data is ingested by the AI software, your plant retains sole ownership and access to the data.

Pulse Check: Is AI Safe & Worth the Investment (cont'd)

c AI's impact on your workforce

Many people worry that Artificial Intelligence will be used to replace workers by automating decisions and processes a human would normally be responsible for. In some industries, AI is already being misused in this way.

To keep your operators in control, look for AI software that focuses on guidance, not automation. While some AI software may function like a self-driving car, automating decisions out of operators' hands, others keep operators in the driver's seat and offer turn-by-turn directions for them to consider.

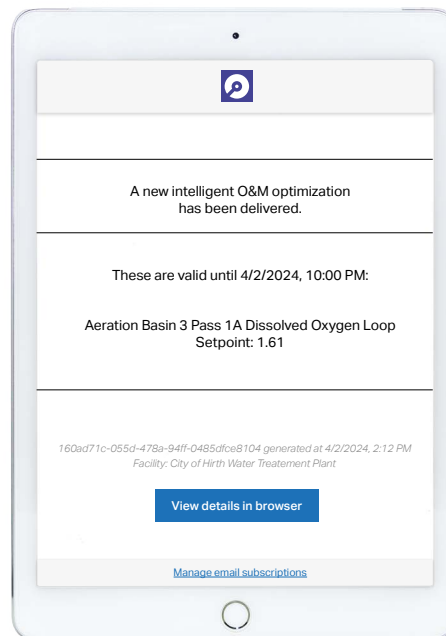
For example, Intelligent O&M is specifically designed to generate recommendations sent as push notifications to human operators' mobile devices or tablets, which they can choose to act on or not. It does not automatically implement these recommended changes, meaning your operators remain in control and your plant still benefits from their on-the-job expertise and problem-solving skills.

d Time to value

Adopting a new technology and the process changes that come with it can be time-consuming. For a plant that needs to run continuously and compliantly, without disrupting output levels or safety, a lengthy adoption process can sometimes be more trouble than it's worth.

With Intelligent O&M, AI integration can happen in as little as two weeks, rather than the months or even years some technologies require. That's because you already have the data the software needs to learn from, and the AI model is able to quickly ingest millions of datapoints, recognize deep patterns, and start generating recommendations in real time.

Integrating these recommendations into your existing workflows is a key focus of the Jacobs experts behind Intelligent O&M. For example, push notifications can be timed to coincide with regular meetings and task times so operators get the information they need when they need it, further streamlining the adoption process.





Can you afford *not* to use AI?

To determine if AI is right for your plant, it's important to consider the potential Return on Investment (ROI). But just as important are the lost opportunity costs that come with falling behind the pace of industry changes. As operating costs and staffing challenges increase, do you have the tools you need to keep up?

Not adopting AI could make your plant vulnerable to:

- Unchecked rate increases that impact your customers
- Losing valuable institutional knowledge as veteran staff leave the workforce
- Increased need for efficiency due to rising costs (e.g. chemical, energy)
- Premature machinery degradation and high repair costs due to reactive maintenance cycles
- Falling out of compliance as operators struggle to balance the needs of efficiency with complex regulations

The transformative impact of AI in water and wastewater treatment

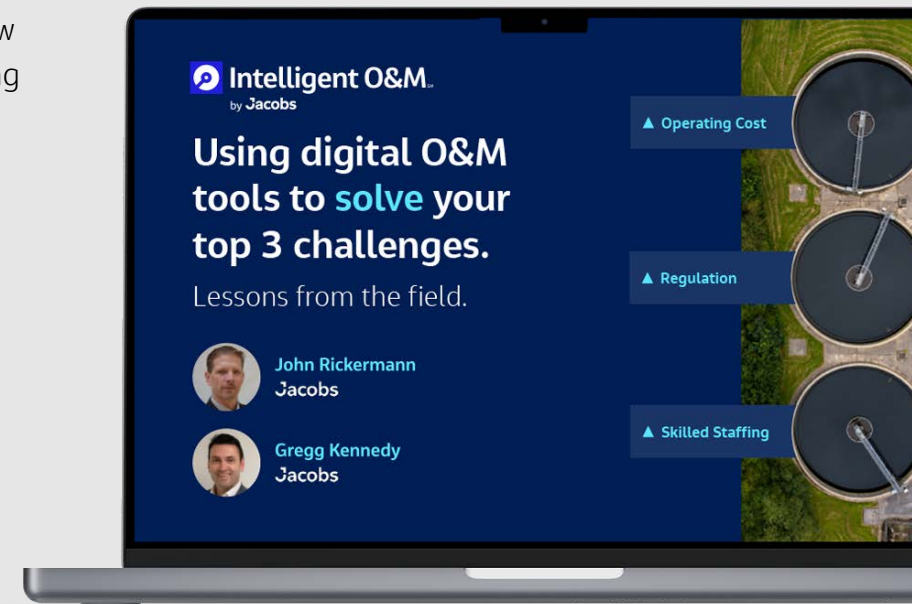
By ingesting millions of datapoints from previously siloed data streams, AI is helping water and wastewater treatment plants **optimize chemical and energy usage, improve reliability, keep machinery working consistently, and bridge the skilled staffing gaps** many plants are facing. For these reasons, we expect to see more and more plants adopt AI technologies in 2025 and beyond.

To learn more about how other facilities are using AI, watch our webinar on [Using Digital O&M Tools to Solve Your Top 3 Challenges in Wastewater Management](#).

WEBINAR

Using Digital O&M Tools to Solve Your Top 3 Challenges in Wastewater Management

In this webinar, find out how Intelligent O&M is surprising even the most state-of-the-art water treatment plants with 25% savings in operating costs.





Intelligent O&M by Jacobs combines AI with Jacobs' expertise in managing more than 300 water and wastewater treatment plant operations to power smarter, more efficient water operations and maintenance. Our AI is built to mine billions of daily signals from your treatment facilities and surface opportunities to boost efficiency, leading to reduced chemical, energy, and maintenance costs while remaining 100% compliant. For more information, please visit:

intelligentOandM.jacobs.com