



Intelligent O&MSM
by **Jacobs**

Smarter, more efficient water operations and maintenance.

15 use cases.

Intelligent O&M is deployed across 80+ wastewater uses cases. We have selected fifteen to demonstrate how our deployments have addressed the industry's biggest operational challenges.



Credit: iStock

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Primer: What Is AI for Wastewater in Treatment and Operations?

Wastewater (WW) and water (WTR) treatment is entering the digital age, and many of today's Wastewater Treatment Plants (WWTP) — also called Water Resource Recovery Facilities (WRRFs) — and Water Treatment Plants (WTP) rely on the latest technologies to operate safely, efficiently, and compliantly.

This digital shift is already transforming day-to-day WWTP operations and management for many plants, helping staff make responsive, real-time decisions about chemical dosage, blower setpoints, work order scheduling, and more. And with increasingly complex compliance requirements, extreme weather events, and skilled staffing shortages, WWTPs that have yet to make the digital shift sometimes struggle to keep up.

New breakthroughs in AI now offer a major advantage to WW and WTR plants that make the digital shift, helping operators adapt to this shifting landscape while saving energy, lowering costs, and supporting staff.

Combining AI with Jacobs' expertise managing wastewater treatment plant operations.

Our experience managing 300+ water and wastewater facilities helped surface the need for more intelligent O&M. Our AI is built to mine billions of historical and real-time signals from a treatment plant for opportunities to boost efficiency.



25%

Savings in
power consumption



20%

Reduction in specific
chemical inputs



15%

Savings on cost of
maintenance planning
and scheduling

Why Intelligent O&M?

Seasoned at deploying AI in the field

Jacobs' Intelligent O&M solution has been deployed across almost 100 use cases across the U.S. The technology pulls in the vast repositories of data already housed on disparate plant databases, in addition to industry best practices and external inputs, such as weather tracking. The deep-learning model then turns this noise into signal, which is provided to staff in the form of recommended dosing updates, blower power settings, work order scheduling, crew staffing, and more. Plant operators retain control over operations, but now they can proactively manage operations rather than react to problems as they arise.

Intelligent O&M is deployed across 80+ use cases



Use cases depicted in this eBook:

-  Chemical dosing
-  Energy efficiency
-  Asset maintenance and workforce scheduling
-  Equipment maintenance chat bots

Jacobs locations

-  Operations management and facilities services

Jacobs serves as a trusted digital transformation partner for water sector clients

Jacobs is an industry-leading solutions company for the global water sector, with a worldwide water team of over 9,000 consulting and technical experts. Our deep domain knowledge across the entire water cycle and asset lifecycle — from planning and design through to construction and operations — means that we have a unique view **on where digital solutions are best applied**. We recognize that every client will adopt digital technologies at their own pace, and we're there to support them at every step of their journey.

In this report, we'll look at real-world examples of how Jacobs' Intelligent O&M, **powered by Palantir**, is offering secure, cutting-edge AI for wastewater treatment to ensure that costs go down, efficiency goes up, and compliance is never compromised.



Credit: iStock

Intelligent O&M in Action: Use Cases

I.

Chemical dosing

II.

Energy efficiency

III.

Asset maintenance & workforce scheduling

IV.

Equipment maintenance chat bots

V.

Staff onboarding & training



Credit: iStock

Decreasing chemical usage based on bacteria inactivation

KEY OUTCOMES



49% cost reduction on disinfection chemicals



100% operator acceptance of recommendations



Perfect regulatory compliance with bacteria inactivation and chlorine residual

CHALLENGE

At the Agua Nueva treatment plant in Pima County, Arizona, operators needed to achieve bacterial inactivation but were unable to measure bacterial levels directly. Instead, they were forced to measure chlorine residual, with excess chlorine ensuring beyond a doubt that bacteria was completely inactivated. This approach resulted in setting a target residual chlorine value higher than what would actually be required to achieve bacteria compliance, thus overusing chemicals, which increased customer exposure and operating costs.



Agua Nueva Treatment Plant
Pima County, Arizona

“Jacobs used the Intelligent O&M suite of tools to analyze relevant real-time operating data throughout the treatment plant, and correlate it to years of successful operating history.”



Credit: iStock

SOLUTION

Plant operators knew that, on an ongoing basis, receiving more precise data on the level of chlorine needed to eliminate bacteria would bring costs down—reducing unnecessary chemical exposure to the environment.

To achieve this, Jacobs used the Intelligent O&M suite of tools to analyze relevant real-time operating data throughout the treatment plant, and correlate it to years of successful operating history. The software then used AI and data science to correlate historical data to ongoing performance and predict and advise the operations team on an appropriate chlorine feed rate to achieve full bacteria inactivation without excessive overdosing. At this site, the team was already familiar with the capabilities of Intelligent O&M from aeration controls (more on this below) and were ready for implementation. Setup was especially fast since the plant was already connected with the software.

RESULTS

Dosage improvements were immediate, with an average reduction of 49% in chemical feed rates since deployment almost two years ago. Plant staff trust these recommendations because they are based on their own past best practices and follow the push notifications on dosage nearly 100% of the time. They are especially fond of providing feedback to the data science team via the app's response feature. Permit compliance has been perfect, and being able to ensure bacteria inactivation based on a direct measure provides the staff with more control over maintaining their award-winning performance.



Credit: iStock

Decreasing costly and inefficient ferric chloride dosage

KEY OUTCOMES



Perfect compliance with phosphorus parameters



15% reduction in ferric usage vs. Two-year baseline



Significant room for continued cost reductions with additional process improvements

CHALLENGE

Ferric chloride is added to wastewater flow at the Woonsocket, Rhode Island, wastewater treatment plant to keep phosphorus within permit limits. The problem was that the rates of phosphorus flowing into the treatment plant are highly variable because they come from both normal influent sewer flows as well as the discharge from the contract biosolids facility next door. As a result, operators were forced to set ferric dosages very high to ensure permit compliance, adding tremendous cost to operations.



Woonsocket Rhode Island wastewater treatment plant

“Using Intelligent O&M, Jacobs scrubbed the operating history of ferric chloride dosage and correlated this to a wide range of influent monitoring points in the plant.”



Credit: iStock

SOLUTION

Using Intelligent O&M, Jacobs scrubbed the operating history of ferric chloride dosage and correlated this to a wide range of influent monitoring points in the plant. This provided a relationship that could be used to predict proper dosages, which were sent to operators multiple times per day. The available instruments designed into the plant, and the data recorded in their SCADA historian, were already sufficient to support this objective, so no cumbersome new hardware implementation was needed.

RESULTS

Dosages of expensive ferric chloride have already been reduced by 15%, even with operators only adhering to recommendations about 40% of the time. As additional capital and process improvements are put in place to allow operators to follow push notifications with more consistency, dosage savings are expected to be higher while maintaining permit compliance with phosphorus limits.



Credit: iStock

Solving mystery of bacterial regrowth

KEY OUTCOMES



Data science helps identify bacterial regrowth issues



Model deployed with very limited data, conservative at first but more aggressive over time



10%-15% chemical savings

CHALLENGE

Jacobs designed, built, and began operations of the Spokane County Regional Water Reclamation Facility in Washington in 2009. The facility is a sophisticated 8 MGD plant that uses both a biological and chemical nutrient removal process. This is done via a membrane bioreactor, along with chemical and ultraviolet disinfection.

The permit required the plant to meet both total coliform and enterococcus bacteria inactivation. But the team struggled with conflicting data on bacteria removal. While there was no bacteria identified before water reached the contact basins, labs showed bacteria counts following water's passage through the membrane. This led to additional chemical usage out of an abundance of caution.



Spokane County, Washington
Regional Water Reclamation
Facility

“Plant staff used a focused bacteria sampling campaign to validate data science models on bacterial inactivation, and ultimately showed bacteria regrowth was indeed happening in the chlorine contact basins.”



Credit: iStock

SOLUTION

Plant staff used a focused bacteria sampling campaign to validate data science models on bacterial inactivation, and ultimately showed bacteria regrowth was indeed happening in the chlorine contact basins. Once these basins were manually cleaned, data science models were built to match effective performance. Initially, the models only had a few months of operating data, but historical data was augmented with a machine learning feedback loop after initial implementation of the data science solution. This meant recommendations became more aggressive as actual performance proved effective with reduced chemical dosages, while still maintaining perfect regulatory compliance at the award-winning facility.

RESULTS

Starting in October 2024, plant staff began following the new dosage recommendations, but with a conservative approach given the unusual historical performance. Permit compliance has been perfect, which has been the primary objective, in addition to being able to decrease dosages on two major chemicals by 10-15%. As with other implementations at this treatment plant, the operators were extremely diligent in applying recommendations, with over 80% adherence to push recommendations.



Credit: iStock

Achieving perfect phosphorous compliance amid changing daily conditions

KEY OUTCOMES



~100% staff adoption of push notifications



Perfect compliance with phosphorus parameters



20% reduction in ferric usage during off-season



Flexible data science and machine learning models to adapt to plant changes and innovations

CHALLENGE

At the same advanced Spokane water reclamation facility, phosphorus removal is extremely stringent, with a strict effluent limit that varies seasonally. Ferric chloride is used to bind phosphorus in the treatment process, and then it's removed using the state-of-the-art membrane bioreactor. Balancing the changing influent characteristics, including phosphorus loading, against these effluent limits is a daily challenge for the operators and one they take very seriously. But when the availability of ferric chloride was threatened with supply chain issues and skyrocketing costs, the focus of getting the dosage correct throughout the day based on seasonal conditions became paramount.

SOLUTION

Jacobs turned to Intelligent O&M and mined the rich history of ferric chloride dosage against phosphorus removal over years of careful operations. The available instruments designed



Spokane County, Washington
Regional Water Reclamation
Facility

“Jacobs turned to Intelligent O&M and mined the rich history of ferric chloride dosage against phosphorus removal over years of careful operations.”



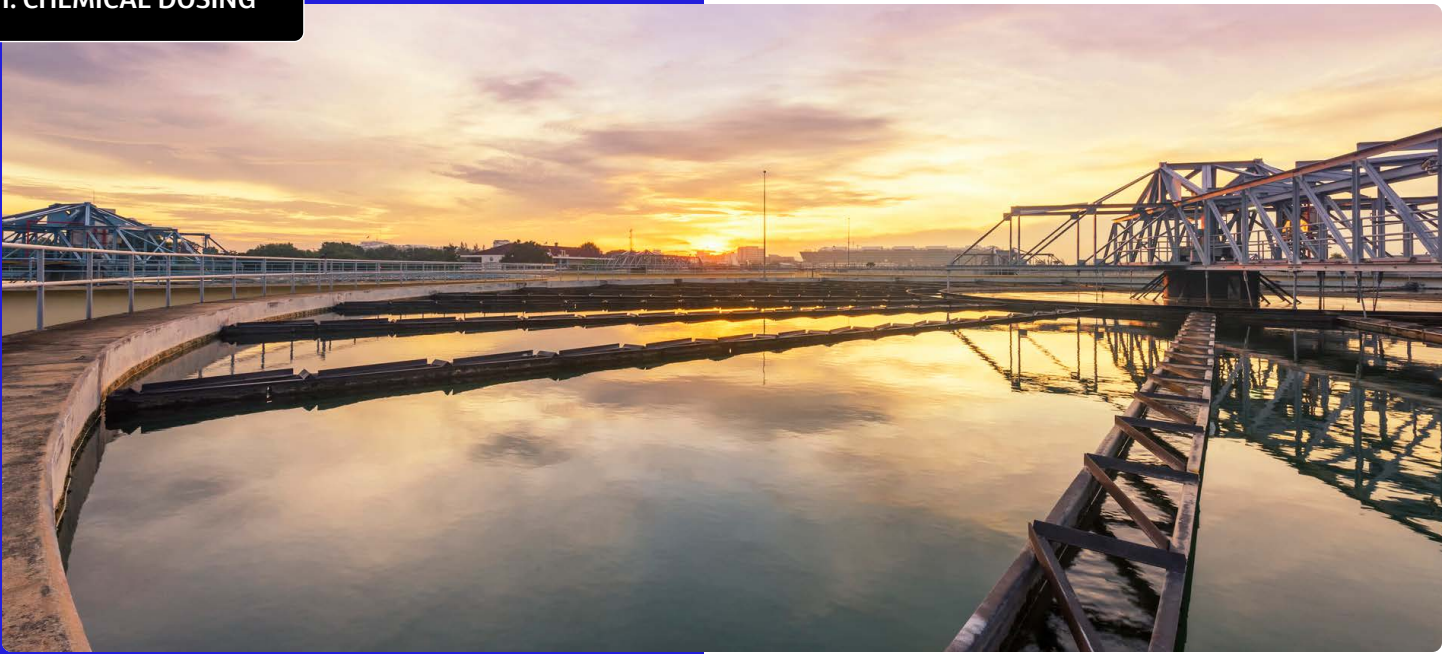
Credit: iStock

into the plant, and the data recorded in their SCADA historian, was already sufficient for this objective. No new instrumentation was needed.

Beginning in August 2023, push notifications for dosage recommendations went live to field staff. Gradually at first, but with increasing confidence, the staff have been following the predictive recommendations to ensure regulatory compliance at all times without excess ferric addition. A dashboard provides up-to-date tracking of the cumulative phosphorus removal to meet seasonal limits, so plant staff have full visibility throughout the year on whether they are meeting permit requirements.

RESULTS

All phosphorus removal parameters have been in perfect compliance since deployment of the Intelligent O&M push notification strategy. Full operator engagement with this approach has been the key to this success, with staff routinely at or near 100% adoption of multiple setpoint recommendations pushed to them every day. Even more impressive, ferric dosage is just one of five Intelligent O&M implementations employed at this treatment facility. And as a testament to staff satisfaction, each of these implementations is near perfect compliance. The staff continues to investigate other methods of phosphorus removal, such as trials with rare earth minerals, and the Jacobs data science team supports them in these investigations and innovations.



Credit: iStock

Implementing responsive dosing based on weather conditions

KEY OUTCOMES



250,000 saved per year already in chemical costs



100% compliance



Eight daily push notifications correspond to staff rounds

CHALLENGE

The wastewater treatment plant in Wilmington, Delaware, typically processes around 60 MGD but can handle nearly three times that capacity for secondary treatment during storm events. The plant faced a common industry problem of determining an appropriate dosage for the disinfectant chemical sodium hypochlorite. Since labs typically take one to three days to determine bacteria levels, plants must take a conservative approach where dosages are increased to ensure they stay within permit limits, and there is no immediate feedback loop on bacterial inactivation to determine if doses can be lowered.



Wilmington, Delaware
wastewater treatment facility

“Jacobs used Intelligent O&M software to develop a model that analyzed historical plant data, including effective dosages from past experiences, even during stormy conditions.”



Credit: iStock

SOLUTION

Partnering with Palantir Foundry to accelerate the site's digital transformation and unlock predictive operations across the plant, Jacobs used Intelligent O&M software to develop a model that analyzed historical plant data, including effective dosages from past experiences, even during stormy conditions. Real-time weather station data enabled the team to anticipate upcoming events and respond to changes in weather patterns.

With this data, staff now receive eight daily push notifications that coincide with their operator rounds, recommending optimal dosing based on ongoing conditions. These setpoint recommendations now precisely forecast the dosage needed for bacteria elimination, moving away from the previous practice of relying on overly conservative residual setpoint goals.

RESULTS

The data-driven approach allowed the plant to significantly lower its chemical consumption without compromising bacteria inactivation efficacy. Despite fluctuations in weather and operational conditions, the plant consistently meets permit requirements. The recommendations have the plant on track to save around \$250,000 per year in chemical costs while still maintaining perfect compliance—a 20% improvement that has come just in time given the recent spike in chemical pricing.



Credit: iStock

Making predictive polymer dosage recommendations

KEY OUTCOMES



10% cost savings in polymer from baseline



~70%+ adoption, despite dynamic operating plan



Excellent collaboration between O&M staff, data scientists, and engineers

CHALLENGE

Jacobs operates two wastewater treatment plants for Vancouver, Washington, across the Columbia River from Portland, Oregon. The West Side WWTP is a 28 MGD capacity plant that uses a biological nutrient removal process, followed by centrifuge dewatering and incineration.

Optimizing polymer dosage for solids thickening or dewatering is an especially challenging problem for the industry, with at least a dozen potential variables to consider, including feed solids concentration, flow rate, polymer dosage and concentration, temperature, and more. The operations staff already fully understood the complexity of the challenge. They were forced to manually track and tweak various settings in the system



West Side WWTP,
Vancouver, Washington

“The team was also able to leverage recent upgrades to the SCADA control systems designed by Jacobs to support the capture of real-time data for accurate dosage predictions.”



Credit: iStock

every day, all while balancing the demands of polymer usage cost, solids concentration, and incinerator fuel costs.

SOLUTION

With additional support from Jacobs dewatering experts, the team used Intelligent O&M software to build a carefully crafted model. It incorporated data mining to match the biggest drivers of polymer dosage against actual dewatered cake solids content values, based on multiple daily data points from several years of operations. The team was also able to leverage recent upgrades to the SCADA control systems designed by Jacobs to support the capture of real-time data for accurate dosage predictions. Starting in May 2023, push notifications for dosage recommendations went live to field staff.

RESULTS

Gradually at first, but with increasing confidence, the team has been following the predictive recommendations and seeing excellent results with less effort—and just in time, given the huge increases in chemical pricing in recent years. Now, compared to the baseline of the previous two years of operations, the new predictive data science approach to polymer dosage control is saving around 10%, a substantial improvement on a budget of over \$600,000 per year in polymer. The model deployment method is also flexible, and the data science team supports the site staff every week as they perform trials with different polymers and injection points. This collaboration further improves staff adoption and trust in the data science approach.



Credit: iStock

Improving filter coagulation management while keeping staff expertise front-and-center

KEY OUTCOMES



20% reduction in average polymer usage



10%-15% reduction in average alum usage



Outstanding operator adoption of push recommendations



Predictive recommendations aligned with jar testing methods



Perfect compliance with water quality standards

CHALLENGE

Jacobs began operating the newly commissioned water treatment plant for the Woodland Davis Clean Water Agency in 2016. It is a 30 MGD surface water treatment facility that uses Actiflo, ozone, filtration, and finished water disinfection. Shifting raw water quality from the Sacramento River posed a challenge at the facility for managing filtration. To address this, Jacobs built sophisticated data science models to manage the ferric chloride coagulant and provided guidance on dosage via the control room dashboard.

The model did an excellent job of predicting the proper chemical dose, but the dashboard interface was cumbersome for operators to use when they were in the field and away from the control room. Also, once supply chains were disrupted and ferric chloride was no longer available, plant staff needed to convert to an alum coagulant, which made the original model obsolete. The team needed a better way to



Woodland Davis Clean Water Agency, Woodland, California

“Providing these user driven features to meet the team’s needs further supported staff expertise and engagement and improved overall performance.”



Credit: iStock

manage and operationalize dynamic chemical usage to ensure top-quality finished water.

SOLUTION

In partnership with Palantir, Jacobs applied a new alum-based data science model but with the added power of the Foundry platform and Intelligent O&M software to push notifications directly to operators wherever they work, not just in the control room. The model was also expanded by combining it with the polymer dosage data history and an added feature allowed operators to select between two optimization approaches at their request: one based on target turbidity, and another based on unit filter run volume.

Providing these user driven features to meet the team’s needs further supported staff expertise and engagement and improved overall performance—a major goal of the Intelligent O&M approach of keeping operators embedded in the process.

RESULTS

The model successfully aligns with manual jar testing results, but is predictive rather than reactive, so it gives operators’ advice on the best coagulant dosages ahead of time. As a result, chemical savings are routinely between 10-20% better than the historical baseline, all while maintaining strict water quality standards at all times. The operations team at the site has enthusiastically embraced this approach and has been an active participant during weekly update calls and for periodic model updates.

Intelligent O&M in Action: Use Cases

I.

Chemical dosing

II.

Energy efficiency

III.

Asset maintenance & workforce scheduling

IV.

Equipment maintenance chat bots

V.

Staff onboarding & training



Credit: iStock

Reducing blower power usage at large-scale facility

KEY OUTCOMES



90% acceptance rate of recommendations by operators



10-20% reduction in blower usage



CO₂ emissions reduced by 1,000 lbs per megawatt-hour of power saved

CHALLENGE

The Agua Nueva WWTP specializes in nutrient removal and produces 25 MGD of high-quality reusable water. Despite its advanced design, power costs at this large-scale facility remained a significant concern, primarily due to the energy-intensive aeration blowers. Even after optimizing the blowers and implementing traditional power management actions, an alternative approach was needed to further reduce power costs.

“Using Intelligent O&M software, the team analyzed historical plant data to identify areas for improvement in the plant’s blower operating scheme.”



Credit: iStock

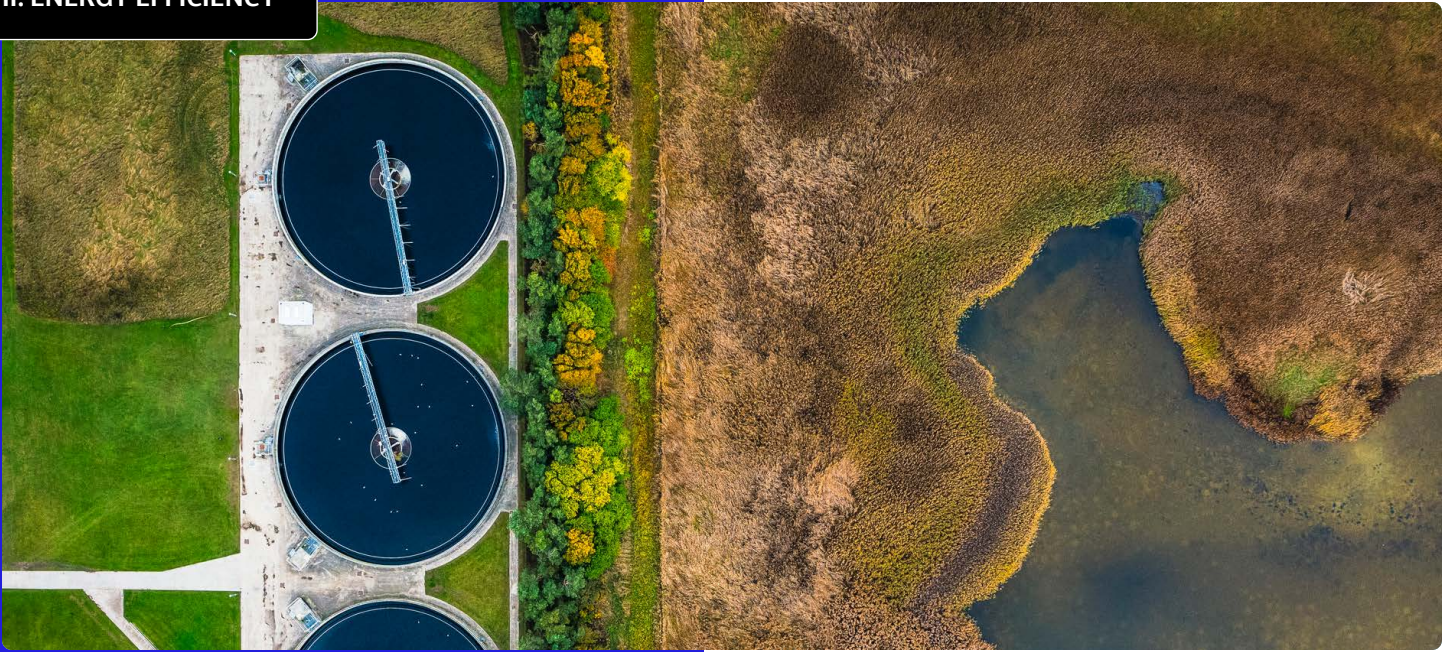
SOLUTION

The Jacobs team integrated with Palantir’s Foundry platform to apply data science to boost energy efficiency, simplify operations, and offer predictive guidance. Using Intelligent O&M software, the team analyzed historical plant data to identify areas for improvement in the plant’s blower operating scheme.

As part of the effort, the new model results did not just sit on a dashboard but were pushed directly to field staff via their smartphones or tablets during their shifts. These notifications, timed to planning meetings, allowed them to quickly take action recognizing blower optimization for maximum power savings.

RESULTS

Within a month after the new solution going live, the plant staff began routinely accepting blower setpoint recommendations based on predictive needs in the wastewater plant. The results have been astounding. Blower power usage has declined 10-20%, which in turn supports Pima County’s greenhouse gas reduction goals. For every megawatt-hour of power saved, their CO2 emissions decrease by over 1,000 lbs. Electricity usage went from ~2,000 kWh per million gallons treated to ~1,500 kWh per million gallons treated.



Credit: iStock

Reducing blower power usage at small-scale facility

KEY OUTCOMES



100% permit compliance



15-25% aeration power reduction



75% or higher operator adoption rate

CHALLENGE

Jacobs has been operating the Water Reuse Facility in Clovis, California since the team designed and built it in 2007. The plant produces up to 2.8 MGD of high-quality reuse water with advanced membrane treatment, ultraviolet disinfection, and state-of-the-art SCADA controls. While the Clovis site is small and already highly efficient, Jacobs believed Intelligent O&M solutions could still help optimize aeration blower power consumption, which is critical given very high electricity costs in California.



Water Reuse Facility
Clovis, California

“Similar to other large sites, the data science team collected Hach WIMS and SCADA information and pulled it into Palantir’s Foundry platform.”



Credit: iStock

SOLUTION

Similar to other large sites, the data science team collected Hach WIMS and SCADA information and pulled it into Palantir’s Foundry platform. The data science models then made predictions of actual aeration needs to the system based on this historical data. Still, the team believed further power savings could be unlocked, so they installed one ammonia probe in the aeration basins to provide a better leading indicator of aeration needs in the system and fine-tuned the model. To date, this is the only instrument added to any site supported by an Intelligent O&M data science model.

RESULTS

There has been an impressive 15-25% reduction in unit blower power on an already well-optimized plant, all while maintaining perfect regulatory compliance. Staff adoption of push notifications of predictive blower setting recommendations has been very strong from the beginning, typically over 75%, despite the many demands on the small team.

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I.

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Staff onboarding & training



Credit: iStock

Automating work-order maintenance scheduling

KEY OUTCOMES



10% overall improvement in maintenance metrics



Alignment with ISO55001 asset management methods



Dramatic reduction in time spent on weekly work order scheduling

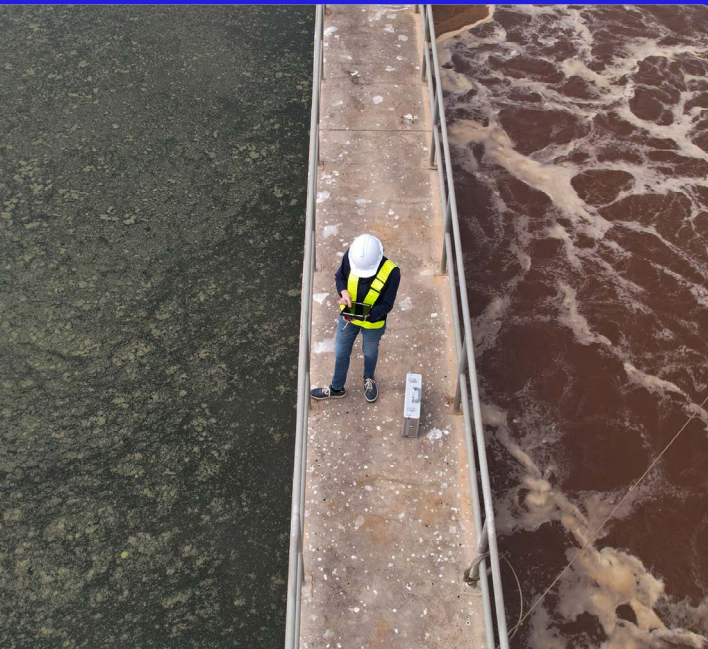
CHALLENGE

Jacobs operates both the 10 MGD water and 3.7 MGD wastewater facilities for the city of Ontario, Oregon. With limited resources for labor and materials, the team is tightly focused on preserving assets and staying within budget. The existing CMMS could store work orders and asset information, but like many CMMS databases, it was not advanced enough to proactively prioritize work orders for the maintenance team based on asset performance. Instead, this labor-intensive effort was left to the maintenance manager who had to assign reactive work orders when problems arose, rather than anticipating critical maintenance needs.



Ontario, Oregon

“Using Intelligent O&M software, the team analyzed historical plant data to identify areas for improvement in the plant’s blower operating scheme.”



Credit: iStock

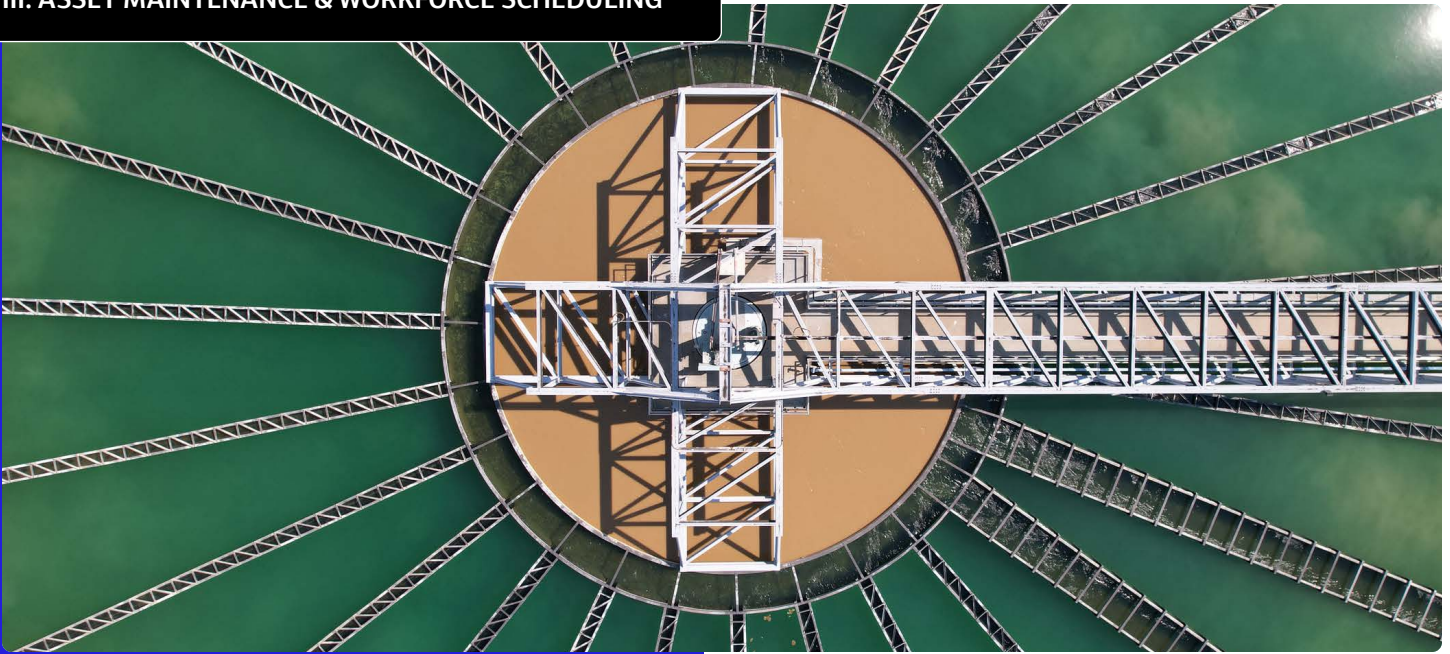
SOLUTION

The team wanted to optimize limited maintenance resources, including labor and parts, to maximize KPIs and drive down costs. The most direct way to achieve this was through proper planning and scheduling, but this work is complex, requiring a scheduler or maintenance manager to hold several competing metrics or variables in mind simultaneously.

Using Intelligent O&M's suite of tools the team turned maintenance planning best practices into an algorithm, which helps inform the maintenance manager as he sets the schedule, assigns the labor pool, prioritizes work orders, and issues the plan to staff. There are numerous filters and analysis tools that can be used to optimize metrics, which were co-developed with Palantir based on ISO55000 principles and Jacobs' expertise.

RESULTS

Within 2 months of implementation of the new tool, maintenance metrics shot up 10% for on-site health scores—a composite of several maintenance key performance indicators. At the same time, the maintenance manager reports that time spent setting up weekly work order schedules has been reduced from hours to minutes, allowing staff to focus on other key tasks.



Credit: iStock

Enabling proactive lift station management

KEY OUTCOMES



15% reduction in callout overtime from two-year baseline



22% reduction in lift station callouts from two-year baseline



Cultural shift towards proactive maintenance management

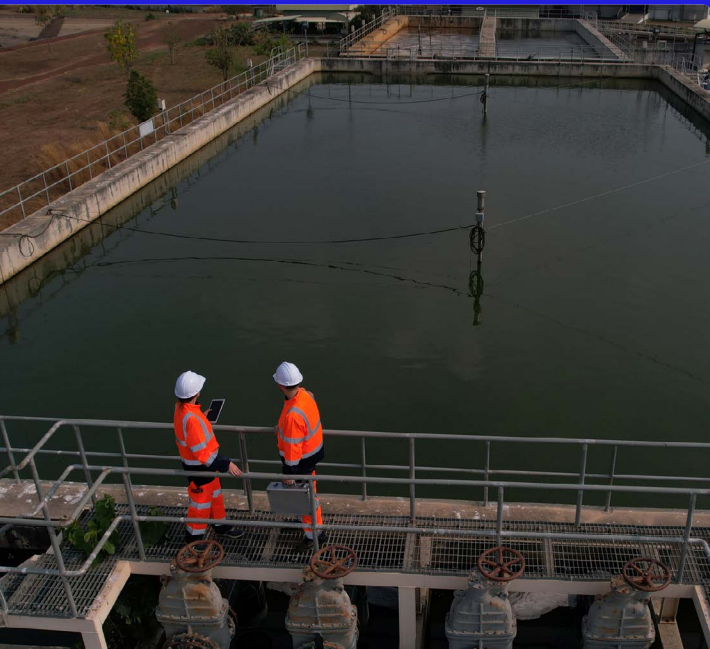
CHALLENGE

Large collection systems, like the one managed by Jacobs for the city of Pembroke Pines, Florida, present a unique set of challenges for maintenance crews. With dozens and sometimes hundreds of lift stations to maintain across an expansive geography, it is vital that limited staffing resources stay focused on stations with the highest risk to compliance and community impacts. Ideally, this means teams should take a proactive approach to maintenance, rather than adhering to inflexible or routinized schedules, or simply reacting to failures. Unfortunately, most CMMS can only store work orders and asset information, but they typically do not have any way to optimize prioritization for the maintenance team, especially based on any conditions analysis.



Pembroke Pines, Florida

“Through real-time monitoring of identified issues, the tool can now provide predictive recommendations to staff on which stations need attention first, before violations or failures occur.”



Credit: iStock

SOLUTION

The first step to developing a more responsive system for prioritizing work orders was to review historical data on lift station callouts and alarms over several years to identify risk profiles of each site. Intelligent O&M software ingested this data and further correlated it to weather events, alarms types, locations, customer-served numbers, and other variables. Through real-time monitoring of identified issues, the tool can now provide predictive recommendations to staff on which stations need attention first, before violations or failures occur.

RESULTS

This approach marked a significant change in the team's handling of maintenance work orders, and it did not happen overnight. Indeed, the technical aspects of the change were relatively simple compared to the cultural changes needed to move the team away from purely reactive to more proactive maintenance practices. It also resulted in changes to shift schedules to align staffing with what the data science showed as the days and times when support was most often required in the field. But the results have been excellent, with the maintenance teams gaining confidence in the system, resulting in a reduction in overtime and callouts at critical lift stations.



Credit: iStock

Deploying AI-based planning, scheduling, and technical support tool

KEY OUTCOMES



25% reduction in maintenance overtime from two-year baseline



25% reduction in contracted maintenance support from two-year baseline



Site health score (maintenance rollup KPI) rose from bottom quartile to company average

CHALLENGE

When Jacobs asked our O&M staff the biggest challenges they faced each day, maintenance management and work-order planning were high on the list, as failure to optimize these functions leads to reduced asset life and higher maintenance costs.

To test an AI-based solution to the challenge, the Woonsocket, Rhode Island, wastewater facility was selected as the first site for a planning and scheduling support tool, developed in partnership with Palantir. Since it was an older plant, requiring a tremendous amount of contracted support, Jacobs knew that improving the current maintenance management process could reap significant benefits.

SOLUTION

Developed based on the Jacob's OMFS "Maintenance Resource Guide," this innovative approach placed guidance from ISO55000, IIMM, and other best maintenance



Woonsocket Rhode Island
wastewater treatment plant

“Developed based on the Jacob’s OMFS “Maintenance Resource Guide,” this innovative approach took guidance from ISO55000, IIMM, and other best maintenance management practices and placed it into one document for Jacobs’ maintenance staff.”



Credit: iStock

management practices into one document for Jacobs’ maintenance staff. Palantir then developed an algorithm using the Foundry platform for optimizing maintenance work order assignments. This was built as an overlay on top of the existing CMMS, offering something far easier for field staff to use. A series of tools were built to support field staff and managers:

- **Maintenance Scheduler:** This tool helps the planner or maintenance manager set the schedule, revise the labor pool, revise work orders, and issue the plan to staff. There are filters and analysis tools designed to empower the planner to make customized revisions as circumstances change, such as adapting to an emergency.
- **Technician Portal:** This stripped-down interface for field mechanics and electricians only shows their specific work assignments. They can see details about each work order and complete or fail work orders from the module. This simplifies demands on the team for data management and training for mechanics, since now technical information is clear, straightforward, and at staff’s fingertips.
- **Site Health Dashboard:** This tool helps managers see progress on KPIs, compare facilities, and evaluate adherence among other capabilities.

RESULTS

The deployment at Woonsocket began in fall 2022. Adoption of the technology was incremental at first, as improvements were made to the user experience. Over time, the maintenance culture shifted from purely reactive to more proactive, now that preventive maintenance work orders receive much more attention. Costs have significantly improved with a reduction in maintenance overtime and contract support.



Credit: iStock

Customizing work planning specialized by department and site

KEY OUTCOMES



Site health score improved from bottom quartile to company average



Culture shifted towards proactive maintenance management

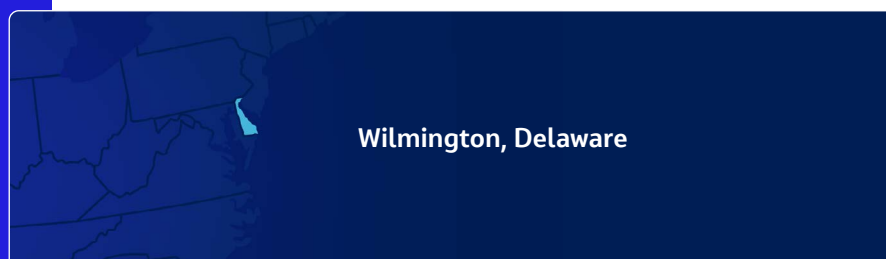


1,000 work orders assigned through planning module per month

CHALLENGE

Even large treatment plants with a dedicated scheduler struggle with optimizing work order assignments every week. So often, priorities are assigned based on only corrective work, or work that is routinized and straightforward.

The Wilmington, Delaware, WWTP is a 1950's era 168 MGD dry weather capacity plant facing this challenge, and even with a strong crew, they struggled to move beyond reactive maintenance. Maintenance KPIs were towards the bottom of the rankings across Jacobs O&M sites, even though everyone was working extremely hard. A change was needed.



"A series of workshops helped ensure proper deployment that reflected the complexity of managing maintenance at a large facility."



Credit: iStock

SOLUTION

After refining the approach at the first demonstration in Woonsocket, Rhode Island, the Intelligent O&M team focused on supporting the Wilmington crew next. The sites were very different in scale and culture, so a "copy-paste" approach wouldn't work. Instead, the deployment and site teams worked together to customize the solutions specific to Wilmington's plant and team. This included different work planning methods for the very specialized and high-performance electrician team, and the ability to work directly in the source CMMS mobile application with support from add-on Intelligent O&M tooling. A series of workshops helped ensure proper deployment that reflected the complexity of managing maintenance at a large facility.

RESULTS

Within 2 months of implementation of the new As of the second half of 2024, there was a marked improvement in maintenance metrics. The site was in the bottom quartile for KPIs only a year ago and is now at—and even slightly above—the average across all Jacobs O&M sites. Attendance to weekly coordination calls is at 100%, and the attention to work order planning has been elevated. The maintenance teams have embraced the approach, and the planner now has a powerful tool to support their very challenging job.

Intelligent O&M in Action: Use Cases

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Chemical dosing

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Equipment maintenance chat bots

V.

Staff onboarding & training



Credit: iStock

Digitizing and AI-enabling site-specific equipment repair assistant

KEY OUTCOMES



Hundreds of location-specific vendor manuals available for queries



Tens of thousands of work order comments can be reviewed and analyzed



Key asset management tasks done in a fraction of the time

CHALLENGE

Wastewater treatment facilities have thousands of assets, and nearly every one of them comes with an equipment manual that defines types of lubricants, repair parts, preventive maintenance, and other details critical to maximizing the life of the product. The most essential information is often built into the computerized maintenance management system (CMMS), but the maintenance team still often refers to hundred-plus page vendor manuals regularly. Given the total number of assets at a plant, a mechanic is often faced with finding a needle in a haystack of information. The same kind of problem happens digitally, when scrolling through equipment repair histories in CMMS databases.

SOLUTION

A new module added to the Intelligent O&M suite of tools uses large language model (LLM) artificial intelligence on the Palantir Foundry platform to ingest and read only a specific plant's asset documentation and give users



Spokane, Washington regional wastewater treatment plant

**“The AI assistant uses
this library for answering
questions and only
provides answers relevant
to the location.”**



Credit: iStock

a search engine style interface to ask plain English questions on maintenance. The module then provides answers in seconds.

First deployed at the Spokane, Washington, regional wastewater treatment plant, the system can upload data in any format—CMMS, electronic manuals, PDF files, Word documents, scanned documents, CAD drawings, etc.—but is populated only with site-specific information. The AI assistant uses this library for answering questions and only provides answers relevant to the location.

RESULTS

With this tool, the maintenance team has been able to access vast stores of relevant information at incredible speed. Questions like “What are the safety concerns when working with the microturbine?” are answered with a few summary bullets, and reference pages are listed and linked. Referencing is a vital step in building trust in the validity of results.

The system also can pull in site-specific operational data, allowing the AI assistant to answer questions like, “What five pumps require the most maintenance based on work order history since 2017?” or “List the top ten most expensive repairs in Building 6.” The assistant can answer these questions based on a combination of data from the CMMS and financial databases. Finally, years of mechanics comments written into closed work orders can now be analyzed to answer questions like, “Which preventive maintenance activities do electricians believe are the most effective?” or “What are the most common complaints about Clarifier No. 2?” The ability to leverage years of collective wisdom has been unlocked.

Intelligent O&M in Action: Use Cases

I.

Chemical dosing

II.

Energy efficiency

III.

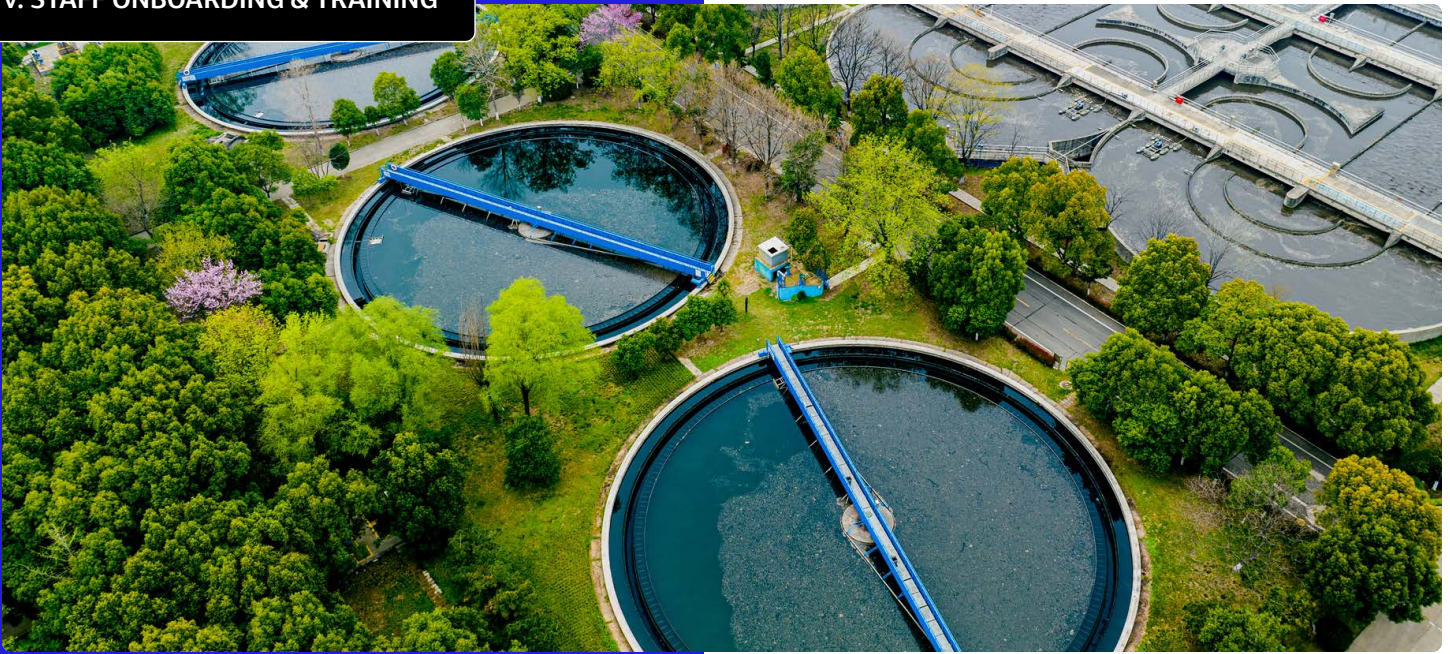
Asset maintenance & workforce scheduling

IV.

Equipment maintenance chat bots

V.

Staff onboarding & training



Credit: iStock

Solving the staffing shortage with AI-enabled training and in-field support

KEY OUTCOMES



Faster time to onboard



Ensured regulatory compliance despite reduction in skilled staff



Improved resource allocation of reduced workforce to where they're needed most



Reduced costs on new hire training and staffing

CHALLENGE

Water treatment plants are facing significant challenges due to a persistent shortage of skilled staff and the accelerated retirement of tenured staff. The complexity of modern, highly automated systems makes it increasingly difficult to train new operators effectively. In particular, operators struggle with:

- 1. Staffing Shortages:** Water treatment plants are perennially understaffed, making it difficult to maintain optimal operations.
- 2. Training Difficulties:** The advanced technology used in modern plants requires extensive training, which is hard to provide given the staffing constraints.

“What Jacobs has brought to its wastewater operations is tools powered by both machine and human learning that are radically improving the effectiveness of operators.”

— **John Rickermann**,
Operations Management, Jacobs

Watch the webinar for observations from the field:



SOLUTION

Intelligent O&M tools introduced by Jacobs deliver real-time recommendations directly to operators' smartphones or tablets, guiding them on adjustments such as pump set points, chemical changes, and blower speed calibrations. The recommendations are based on plant-specific past performance under similar conditions, effectively transferring institutional knowledge to the staff. This means new staff can get up –to speed faster and can do more learning on the job, as they have a 'co-pilot' guiding them in their work.

RESULTS

During the implementation phase, Jacobs conducted a series of webinars and training sessions to demonstrate the capabilities of the Intelligent O&M tools. Operators were shown how to use predictive analytics and machine learning tools to capture best practices for equipment repair and chemical adjustments.

- 1. Improved Onboarding:** New staff members were onboarded more effectively and quickly, thanks to the real-time guidance provided by the Intelligent O&M tools.
- 2. Enhanced Efficiency:** Operators could make more informed decisions, leading to improved operational efficiency and reduced downtime.
- 3. Cost Savings:** The use of predictive analytics helped in better resource allocation, resulting in significant cost savings.
- 4. Regulatory Compliance:** The tools assisted in meeting regulatory requirements by providing digital directions to staff, ensuring consistent and compliant operations.

Watch the webinar at left to see how.

About Intelligent O&M

Intelligent O&M leverages artificial intelligence (AI) and real-time analytics to optimize water and wastewater operations, reducing energy use, minimizing costs and improving reliability. By transforming complex data into actionable insights, it empowers teams to make smarter decisions, enhance system performance and drive long-term operational excellence.

For more information, please visit:

intelligentOandM.jacobs.com