



Built for Yesterday: Solving the Challenges of Aging Wastewater Infrastructure

Industrial wastewater systems are often viewed as non-essential infrastructure, receiving lower priority than production equipment. This is because treatment systems rarely fail in ways that outright halt operations. Instead, they degrade quietly, building costs that can hide for years. Over time, energy intensity climbs, effluent variability grows, and municipal capacity changes. A system engineered to meet permit limits and production volume 20 years ago is not only nearing the end of its useful life, it is running harder than ever to keep pace with a facility that has scaled around it. Now, the issue has shifted from whether to address aging wastewater infrastructure to how long facilities can afford to ignore it.

Yesterday's Treatment, Today's Problems

Industrial on-site wastewater systems began popping up in the 1970s under the original wave of Clean Water Act compliance pressure. These systems were designed to meet the specific permit standards and production volumes of the time. However, operating conditions have changed significantly since then, leaving many systems out of date. While wastewater treatment equipment has a typical lifespan of 15-20 years [EPA], the average wet manufacturing facility in the US is now over 40 years old [JLL].

This discrepancy is driving new risks for facilities holding on to underperforming systems and temporary fixes to keep production moving.

Finding the Right Partner for Your Data

For many industrial sites, the risks posted by their aging infrastructure are exacerbated by the major funding gap for publicly owned treatment works (POTWs). Of the 17,000+ POTWs in the US, a growing share are facing the same issues: shifting hydrological conditions, new treatment protocols, and ballooning costs for materials and equipment. With federal funding for wastewater infrastructure dropping by 50% in the last 40 years [ASCE], POTWs are passing more costs along to their industrial clients, accelerating the capital and regulatory challenges faced by older facilities.



Component-level malfunctions are often ignored despite creating significant long-term costs.

Addressing System Decay

As noted above, industrial wastewater systems rarely fail all at once. Instead, decay is spread across equipment and consumable components. Often, this presents in ways that represent bigger-picture issues but can be resolved with quick fixes. Lower lifespans for membranes, reduced biological treatment efficiency, higher energy costs, and increased chemical dosing requirements all serve as bandaids for the larger issues of under-built or aging treatment systems.

Eventually, over time, these short-term solutions become insufficient. While operations teams typically find suitable workarounds for daily procedures, problems arise when these become routine. The system's baseline performance, now materially worse than its design specification, gets redefined as normal. Equipment needing a new component two years ago now needs a full replacement, and hovering near permit limits eventually turns into permit exceedance, increasing operating costs and reducing system reliability.

Recently, at the Industrial Water Solutions conference in Chicago, we heard from leaders across industries about how they prioritize projects and manage growing budget requirements. While this varies by sector, the through line was clear: defining and quantifying risk is the fastest way to make major projects happen, but it requires a collective effort across the organization. Wastewater teams rarely have the power to justify large infrastructure investments on their own, while finance and operations teams cannot accurately define their operating expenses without robust data on system performance and compliance costs. The organizations prioritizing such cohesion today will be the most resilient against the shifting conditions on the horizon.

Compliance is Resilience

When the costs of industrial systems' malfunctions are disconnected from production-based calculations, facilities can be caught off guard by changes to their discharge permits. Because POTWs are also operating aging infrastructure with limited capacity, budget constraints regularly force them to reflect costs back to industrial dischargers. This is usually done through surcharges or disposal limits for high-strength streams, though in some cases it can also require facilities to purchase or replace equipment to reach a sufficient level of on-site pretreatment. Either way, the cost to retroactively solve compliance challenges are far higher than doing so incrementally based on performance and cost monitoring.

The sites facing the greatest risk exposure are those running systems configured to older permit terms. A treatment train designed around a 2006 NPDES permit likely face materially different requirements compared to their 2026 renewal, even if the production process hasn't changed. This is especially true in regions where municipal infrastructure and local watersheds are most constrained. In these areas, pretreatment requirements and withdrawal limits are far stricter, as POTWs must balance their efforts to meet the needs of the local population and the businesses reliant on their services. With this knowledge, industrial facilities who take a proactive approach to data collection and compliance are seeing less disruption to production and more predictable costs over time.



Dwindling federal funds have accelerated the decay of POTW infrastructure in recent decades

Capital Restraints

While industrial wastewater infrastructure competes directly with production equipment for capital, it rarely takes precedence, especially at corporate-level budget planning. This is understandable, as upgrading production equipment provides clear returns and keeps business active, while wastewater systems can represent an endless cost center when not tracked carefully. For facilities taking a hands-on approach to managing their wastewater, the upsides are clear: fewer emergency hauling events, reduced surcharge exposure, components lasting longer, and water reuse creating flat cost reductions. Unfortunately, these costs are challenging to identify on paper, receiving a lower priority than key production-related issues.

The most common result of this practice is systematic deferral. Aging components get patched rather than replaced, and systems designed for lower production volumes run at chronic overload, raising the likelihood of malfunction during peak production. Additionally, equipment past its design life stays in service because replacement capital isn't available, or because the decision keeps being passed around with no end in sight. When every upgrade must compete on its own merits against other uses of the same capital, wastewater almost never wins.

Designing for the Long Haul

For the facilities that have gone this route, the infrastructure itself rarely needed to be rebuilt from scratch. It just needed to be managed differently. When treatment systems operate under a model tied to actual performance rather than internal budget cycles, the costs that had been climbing for years tend to stabilize, and the compliance exposure that had been accumulating starts to clear. In some cases, a system overhaul also enables the reuse of water or energy recovery, cutting costs further and building more resilient operations for the future. That's the opportunity sitting inside most aging industrial wastewater systems right now.

If you're treating water on site, you may be sitting on untapped value. Cambrian helps you unlock it, with no risk and no upfront cost.

Let's Talk

Whether you're exploring a new operational model or looking to upgrade without the capital, Cambrian is ready to partner for long-term success.

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