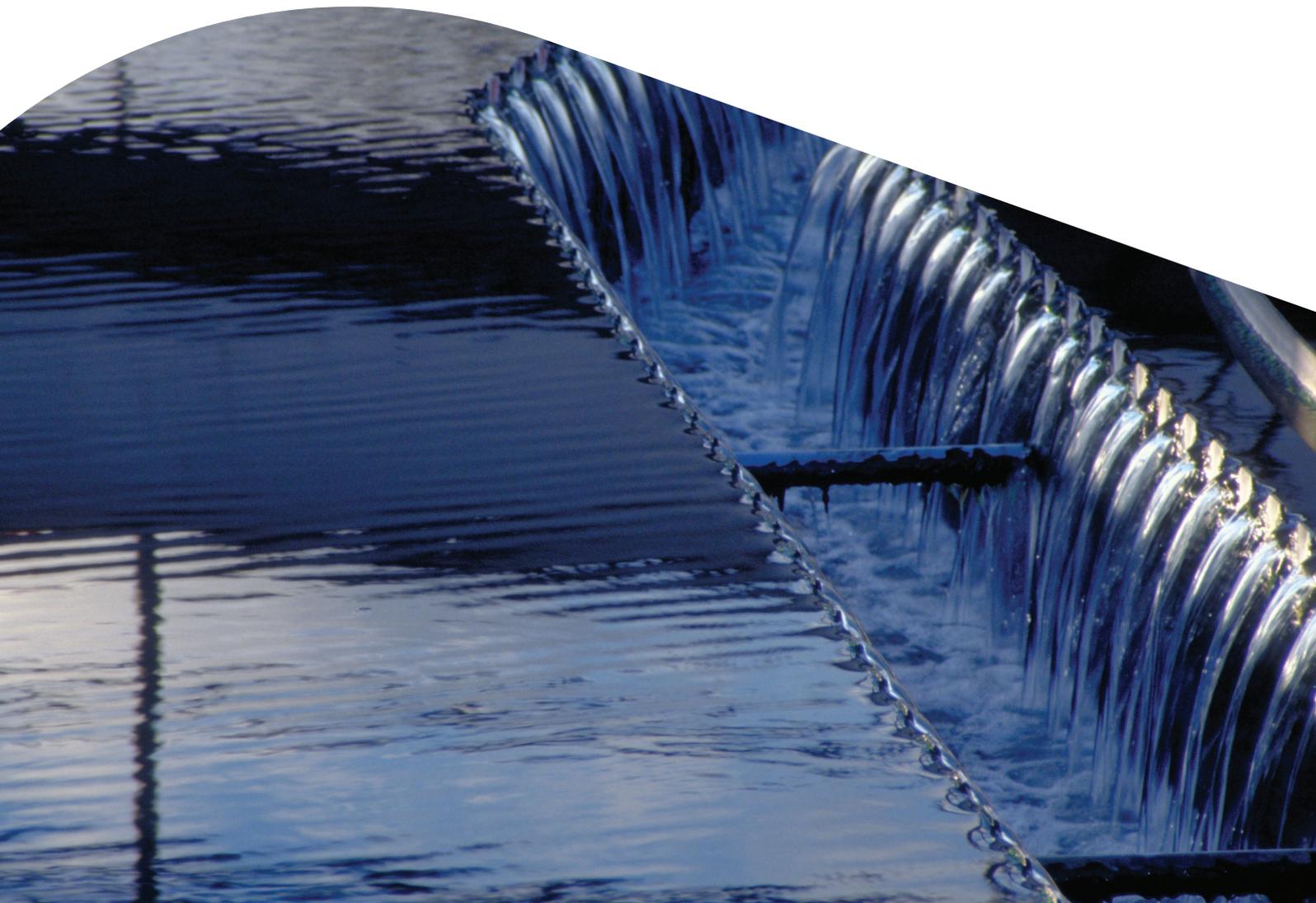


Reliability and condition monitoring solutions for the wastewater industry



Why partner with Bently Nevada?

We have earned your trust. For six decades the Bently Nevada product line has supported the most demanding applications in multiple industries. And even as we protect and monitor your machinery, we constantly strive to refine and improve our offerings—and help enable your success.

We design and deliver solutions for all of your monitoring needs—including sensors, distributed and rack-based monitors, software, and supporting services—with the following goals:

- Increased availability and production
- Lowered maintenance costs
- Reduced risk in terms of safety, environmental, and asset upsets
- Over 85,000 3500 Series monitoring systems installed globally
- Over 4 million sensor monitoring points

Quantifiable, proven results:

- Services support globally
- Over 60 years of innovation in asset protection and condition monitoring
- Over 1,600 System 1 software users worldwide
- More than 240 international patents issued, including over 150 in the U.S.
- More than 360 international patents pending, including over 95 in the U.S.

Industry challenges

Water and wastewater plants are an indispensable part of a country's infrastructure. Areas with growing populations face the difficulty of meeting increased demand for services with shrinking staffs and budgets. They may also find that increased demand has transformed formerly spare machinery into non-spared with little or no "back up" capacity when an asset fails. In contrast, other plants may find themselves in areas of declining population, but still face their own formidable challenges. Such plants are often required to meet demand with aging systems that must be kept up and running without the option of major capital investment in new assets.

The "more with less" challenge isn't unique to the water and wastewater industries, but that doesn't make it any less difficult. In an age of "lean" operations, most feel they're already asked to do too much with too few resources. How to meet these seemingly contradictory requirements?

Reliability: the key to a successful future

Unreliable assets have enormous consequences. What if your assets could consistently operate at or above their rated capacities, for a greater percentage of total hours each year, all while spending less money on maintenance? That's exactly what today's best companies have discovered how to do. Industry studies show that the average facility spends approximately 5% of its Replacement Asset Value (RAV) on maintenance each year. In comparison, best performers spend 60% less—just 2% of RAV—while enjoying better uptime, efficiency, and profitability. It's not about simply spending less on maintenance, it's about working differently—working smarter—to achieve more reliable production operations.

Benefits with Bently Nevada

Closing the gap between your reliability "goals" and what you are actually obtaining from your efforts typically involves the following three categories:

- **Processes:** Our comprehensive services help customers assess their goals, identify the reliability gaps in their current operations, and then implement the appropriate corrective actions.
- **Tools:** Our Bently Nevada product line is world-renowned for unsurpassed quality in rotating machinery condition

monitoring. Everything needed to address the assets in water and wastewater treatment plants is available, from sensors to continuous monitoring systems to wireless sensor systems to portable data collectors and analyzers. And, it's all brought together in a unified platform for asset condition monitoring and diagnostics—Bently Nevada's System 1* software. We also assist customers in integrating and using their already installed tools, such as computerized maintenance management systems (CMMS) and reliability software.

- **People:** Reliability is about more than just technologies and processes. Armed with even the most sophisticated tools and effective strategies, companies can fail to reach their reliability goals unless they are able to successfully change the way they work. Reliability is a company-wide effort that touches operations, maintenance, planning and scheduling, purchasing, management, and engineering. Bently Nevada is able to help customers change the way they work by addressing the organizational culture issues that keep companies mired in ineffective processes, helping them transform their businesses and balance sheets.

Because Bently Nevada is able to fully address each one of these, we are able to solve the whole problem—not just bits and pieces.



Condition monitoring

While condition monitoring may not be the only element in a successful reliability program, it is nonetheless an essential element. For years, we've been taught that the older an asset is, the more likely it will fail. As such, many plants have evolved elaborate and finely tuned maintenance schedules based on calendar intervals or running hours.

There's just one problem with that approach: time- or usage-based maintenance strategies alone are only valid for 10 to 15% of the assets in a typical industrial facility.

In other words, if you have applied a time or usage based only maintenance strategy to the majority of your equipment, most are getting "maintained" when they don't need to be. That's wasteful, and it's one of the major reasons that many companies are overspending on maintenance. In other cases, the asset may fail before it reaches its scheduled maintenance interval. Frustrated, Maintenance & Reliability staffs are left to wonder "what went wrong?"

		Process Data Analysis	Portables	Wireless, scanning	On line, continuous CM or Protection	On line continuous CM and Protection
Consequence of failure ↑ Higher	High Critical	→				
	Critical	→				
	Medium to Low Critical	→				
Lower						



Today we understand that the probability of an asset failure is often highest just after it has been placed in service (or undergone maintenance). Following this “infant mortality” period, its probability of failure becomes constant and does not rise linearly over time. This means that running hours and calendars are poor “predictors” of failure. How do you know when such assets will fail if the time-based intervals can’t be trusted? By measuring the mechanical condition of the asset, using vibration, temperature, efficiency, oil chemistry/particulates, and other physical parameters. In other words, condition monitoring.

This approach results in maintenance being performed only when the condition indicates the asset is failing. Further, failure progression can often be trended quite accurately, allowing maintenance intervention at exactly the right time—not too soon, not too late. And, condition data can be remarkably precise, indicating not just that the asset is failing, but exactly what is wrong, even identifying root cause and mitigating failure completely.

Different assets, different approaches

Not all assets are created equal. Some, such as aeration blowers, are highly critical to operations. Other assets are less critical. And still others have little impact on safety, environment or production, with only maintenance costs as the primary consideration. As such, a variety of condition monitoring products and approaches are required.

Services

Reliability improvement: Whether your facility has all the tools it needs or is just getting started, BHGE can add value through far more than just a collection of condition monitoring products. In fact, our Reliability Consulting Services offering is designed to function independently of the condition monitoring products you may have chosen—whether our own or someone else’s. It provides a holistic approach to your reliability efforts by reviewing your entire program and benchmarking you against world-class performance. Where gaps exist, we show you what to do about them and the financial benefit you can expect via a clear ROI.

We also go beyond just making recommendations and actually help you implement the improvements you’ve chosen. For example, perhaps a gap has been identified that you aren’t using your Condition Monitoring Systems to its full potential. We’ll help you get there with training and system integration support. Or, perhaps you are using interval-based maintenance on assets where run-to-failure is actually a better strategy. Or, you may find that most of your time is spent “reacting,” leaving insufficient time to be proactive in your maintenance—and you don’t quite know how to get out of this vicious cycle.

Or, your spare parts inventory may be problematic and you need help developing a rational strategy for what parts to stock and what quantities. Every one of these can be addressed through our comprehensive portfolio of reliability services.

Finally, we help you change the way you work. Many organizations invest in technology and have excellent strategies, but neglect the most important factor: the human factor. When people understand the role of reliability and can feel the difference it makes in not just their jobs, but the balance sheet, they are better able to embrace new ways of doing things. We understand how to tackle these often difficult, but vital, organizational culture issues in ways that get everyone playing on the same team and working towards common goals.

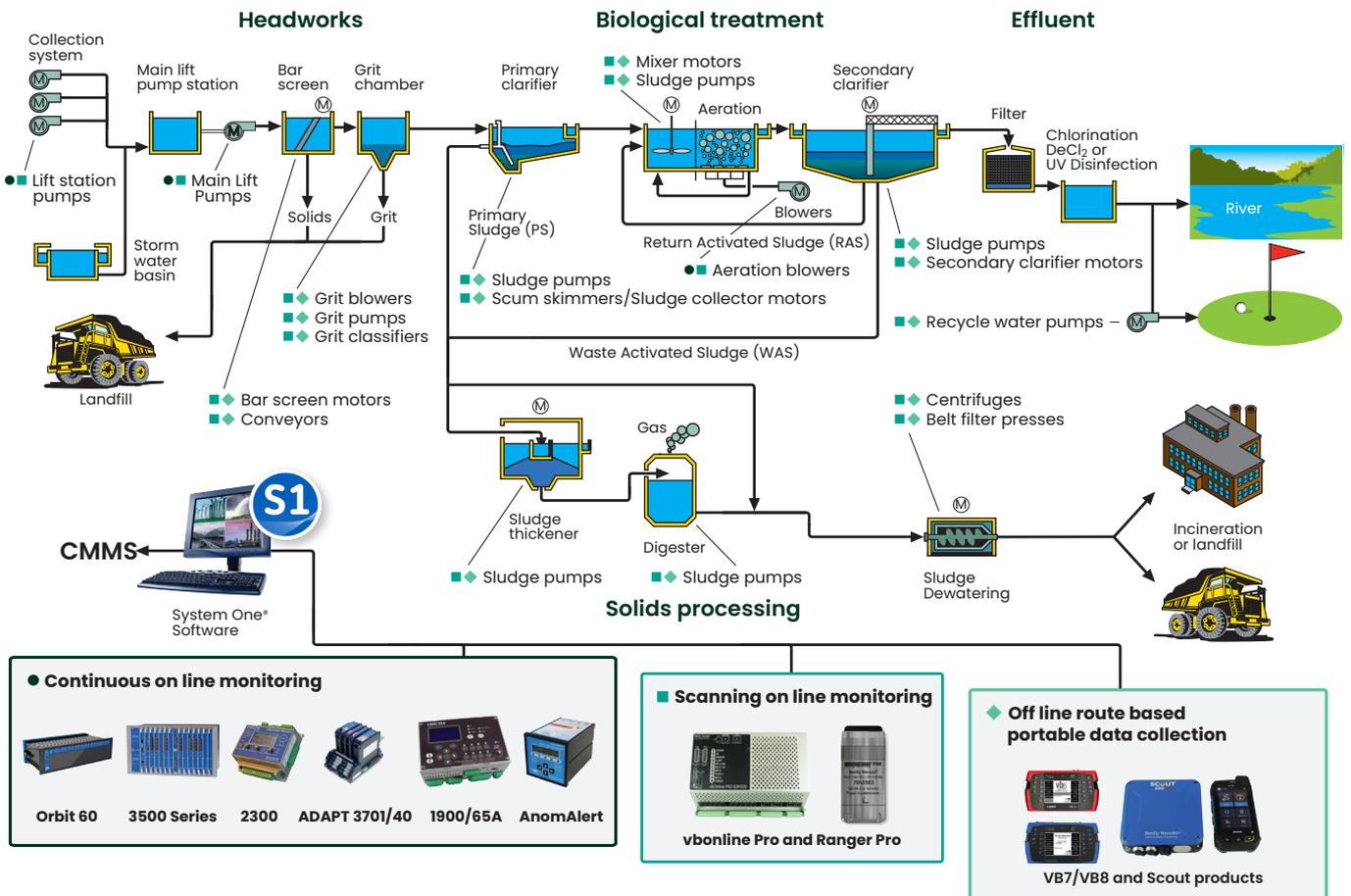
Installation: Our extensive project capabilities combine our services with our hardware and software to deliver fully installed, fully engineered solutions in your plant—solutions that are tailored to your specific requirements, tested, configured, commissioned, and completely ready to use. And, they're available for every product we offer.

- Scope based on your needs, from 100% turnkey to coordination with and use of internal plant resources for selected functions—design-only services also available upon request
- Compliance with plant IT standards including cyber security, hazardous area requirements, and country-specific certification agencies
- Outstanding record for safety, timeliness, and adherence to budget

Machinery diagnostics: Since 1972, we have been helping customers interpret their condition monitoring data, helping them isolate not just machinery problems, but root causes. These services are available globally through a team of more than 150 specially trained engineers, and can be delivered either locally or via remote access using System 1® software.

Training: We believe in helping customers help themselves. Each year, we train thousands of customers worldwide on topics ranging from operation and maintenance of our instrumentation systems, to machinery balancing and alignment, to reliability awareness and improvement, to machinery diagnostics.

Condition monitoring applications in wastewater



- 50 technical training centers around the globe—on-site training also available
- Hands-on training using real-world case histories—ensures underlying theory and practice are mastered
- Students consistently rate their Bently Nevada training as “outstanding” and “exceptionally practical”

You can rely on us

For more than 40 years, we've been supplying condition monitoring solutions to machinery-intensive industries. We also bring two decades of experience conducting reliability improvement projects. Customers turn to us for a simple reason: lasting value. Our solutions demonstrate their worth, day in and day out. We combine the highest quality products and responsive customer support with a service team that takes the time to understand the uniqueness of your plant, your personnel, and your goals.

Our products can be found in many of the world's water and wastewater treatment plants, often supplied as standard by the OEM on highly critical equipment such as aeration blowers. Today, many of those same plants are turning to GE for a more comprehensive solution to their needs, moving beyond just machinery protection instrumentation on a few assets to plant-wide strategies and systems for improved environmental compliance, safety, asset production, quality and reduced operation and maintenance costs.

