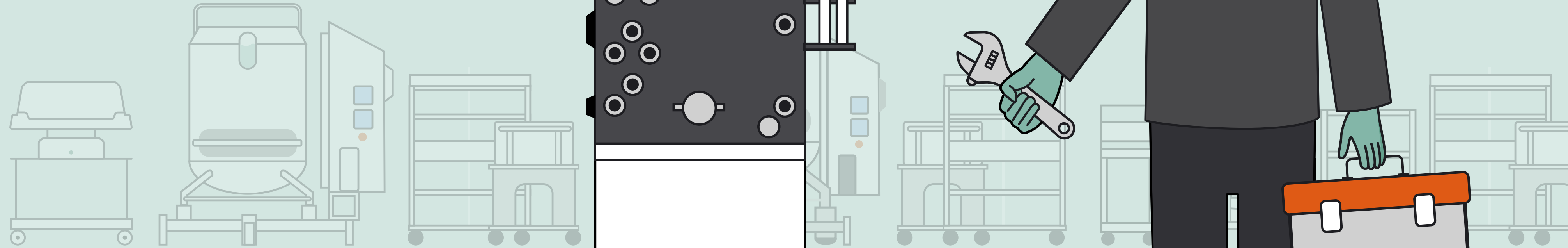


ebook



Maximizing uptime with equipment health checks

Learn how an effective strategy is key for reliable bioprocessing equipment performance.

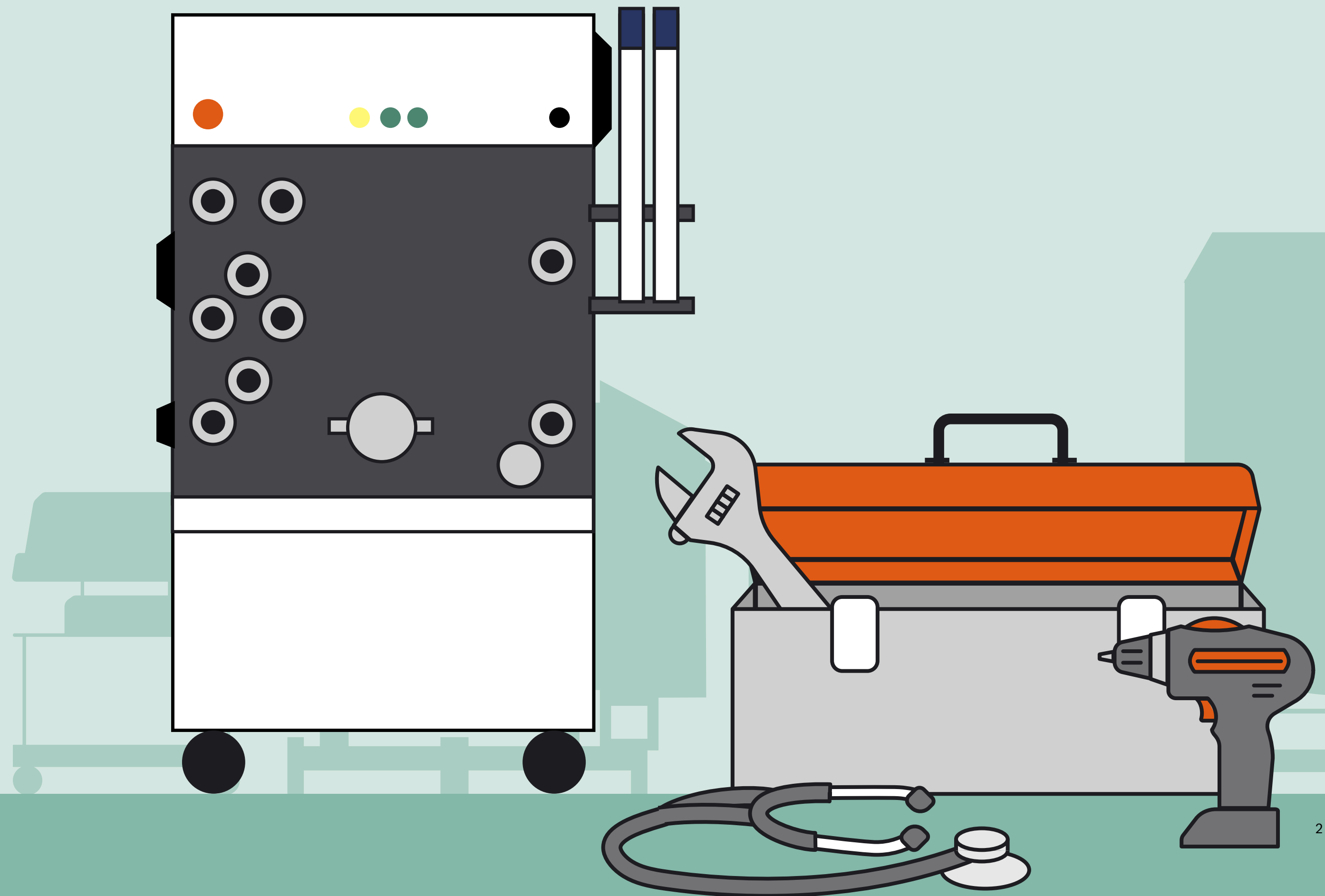


Introduction

In Formula 1 races, even the world's most elite cars can't cross the finish line without checks and adjustments. The same goes for your bioprocessing equipment. When you overlook health checks and troubleshooting, an issue can go undetected and derail an entire process, leading to costly downtime, wasted batches, missed deadlines, or compliance problems. Regular equipment health checks and quick, effective troubleshooting are essential to help maximize equipment uptime, by spotting warning signs early and allowing teams to act before production is affected.

Yet traditionally, health checks have been carried out at fixed intervals, relying on manual inspections or scheduled equipment maintenance to detect wear, calibration drift, and any other equipment issues. These periodic checks simply aren't sufficient for modern, high-scale operations. Leading life science companies are now adopting real-time digital monitoring tools that continuously track equipment performance, detect problems early, and alert teams before issues escalate. This shift from reactive to proactive monitoring helps maximize equipment uptime and supports consistently high-quality production.

In this eBook, we dive deeper into why equipment health checks and troubleshooting are important to your bioprocessing, and share practical tips to help you perform them with confidence and efficiency.

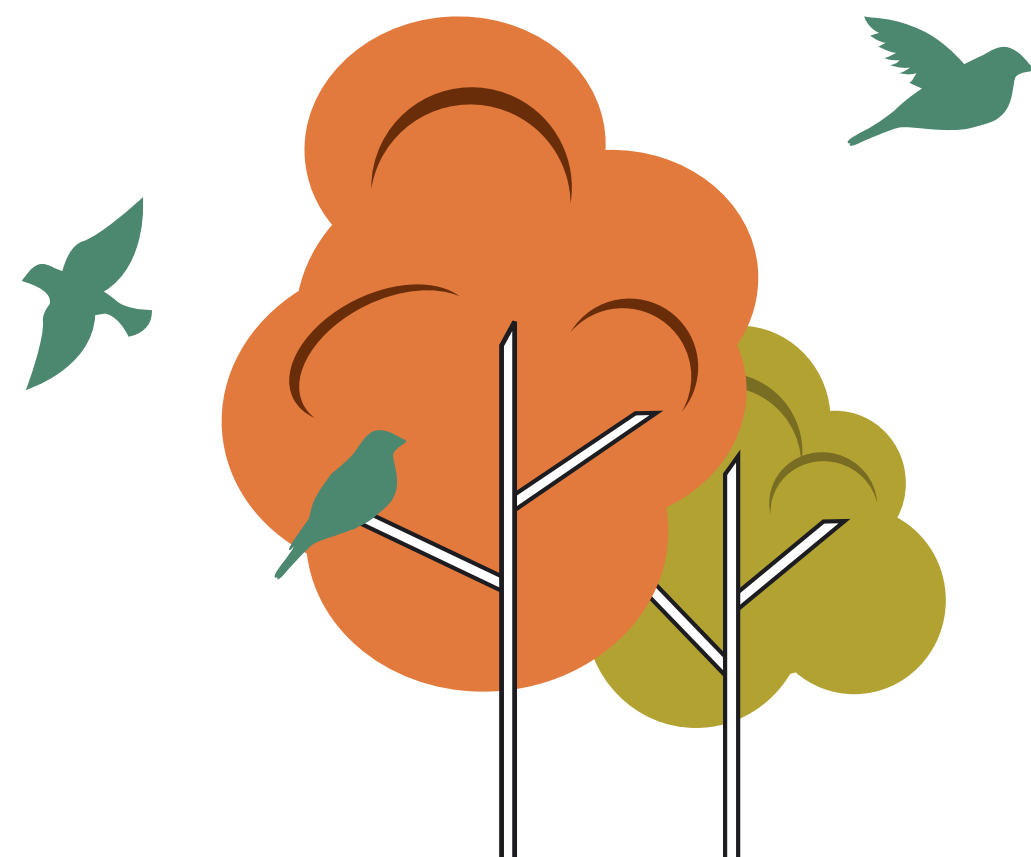


Reasons why you need ongoing equipment health checks and troubleshooting

1 Increasing complexity of bioprocessing systems

In recent years, the demand for complex biological products, including modern biologics and cell therapies, has surged. These products demand more advanced bioprocessing systems and are highly sensitive to changes in their environment. Even slight variations in temperature, pressure, or pH can affect the final product's quality, safety, or potency. To achieve the required precision, specialized manufacturing equipment must provide exceptional control over sterile conditions, temperature, and material handling.

But as these systems become more advanced, with more equipment components and tighter operating windows, this increases the potential for issues to develop. Small problems, like gradual wear, loose seals, or drifting calibration can silently creep in and build up over time, affecting important process conditions without any obvious warning signs. This makes routine equipment health checks, paired with effective troubleshooting, essential to detect issues early, verify that systems remain within specification, and prevent small problems from escalating into costly process failures or compliance risks.



Top tip #1: Establish routine health check schedules

Set up a consistent schedule for equipment health checks based on vendor recommendations and real-time performance data. Digital monitoring tools can provide a continuous overview of equipment condition, helping you adjust maintenance frequency according to actual performance rather than fixed timelines. Regular health checks should include checks for wear or damage, verification of calibration accuracy, and assessment of environmental conditions such as temperature, humidity, and pressure. Over time, analyzing the data from these checks can help you refine maintenance intervals and increase equipment lifespan.

Top tip #2: Train staff in troubleshooting protocols

Well-trained operators are your first line of defense against equipment issues. Make sure your teams can recognize common warning signs, such as abnormal readings, fluctuations in flow or pressure, or unusual sounds, and know when and how to escalate concerns.

Provide structured biomanufacturing troubleshooting procedures supported by up-to-date standard operating procedures (SOPs), equipment manuals, and maintenance logs. These resources are essential for ensuring that staff follow consistent, validated methods when investigating issues, reducing the risk of errors and supporting compliance with good manufacturing practice (GMP) standards. Ensuring access to remote support tools is also important, letting you quickly connect with expert engineers who can often diagnose and resolve issues without an on-site visit, helping to efficiently restore equipment uptime.

2 Adoption of single-use systems and continuous biomanufacturing

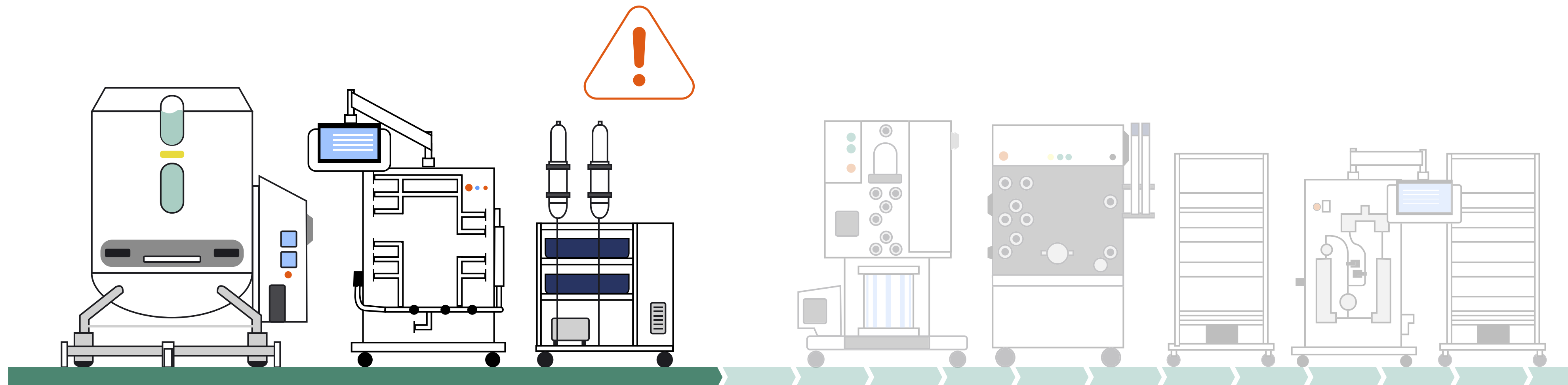
The growing adoption of single-use technologies has transformed how facilities operate, but it has also introduced new challenges for equipment health checks and troubleshooting. Single-use systems remove the need for cleaning and sterilization between batches, helping to speed up turnaround times and reduce contamination risks. However, as they're typically made from less strong materials, they can be more prone to wear, stress, or connection issues during setup and operation, particularly under pressure or temperature changes. This introduces new potential points of failure, including leaks, compromised seals, and sensor drift. Without ongoing health checks, these issues can often go unnoticed until they begin to affect performance.

Continuous biomanufacturing is another innovative approach for increased efficiency and scalability. But this presents unique problems, as equipment needs to operate reliably for long, uninterrupted periods. Unlike traditional batch processes, where checks and maintenance can be performed between runs, continuous systems rely on constant monitoring and rapid troubleshooting to keep production on track. Standard routine health checks just won't cut it. Teams need real-time visibility into system performance using remote monitoring tools and well-defined procedures for identifying and resolving issues as soon as they arise.

Top tip: Align biomanufacturing troubleshooting with process control systems

To build more resilient operations, use remote monitoring tools that feed equipment performance data into your laboratory information management system (LIMS) or manufacturing execution system (MES). Centralizing process information, performance trends, and equipment maintenance history in one platform gives you full visibility into system health. This makes it easier to trace deviations, review past actions, and make faster, more informed decisions when issues occur.

You can then use this connected data to develop and maintain clear records of how faults were identified and resolved for each system type. This creates a valuable reference for operators and engineers so that they can spot recurring issues, improve troubleshooting steps, and prevent the same problems from happening again.



3 Integration of automation and digital monitoring tools

Automation and digital monitoring have completely changed the way bioprocessing facilities run, driving smarter operations, faster innovation, and tighter process control. However, these systems introduce new considerations for equipment maintenance and troubleshooting. Automated operations depend on accurate sensors, reliable software, and stable network connectivity, so faults in any of these areas can disrupt production just as much as mechanical equipment issues. This means health checks must now cover digital elements such as firmware, software settings, and device connectivity, and troubleshooting needs to assess both hardware and software.

Top tip: Implement real-time monitoring and diagnostics

Use real-time monitoring to connect key pieces of equipment to sensors and cloud-based analytics software that continuously track parameters such as temperature, pressure, and flow. Continuous data collection gives you a clear, up-to-date view of how each system is performing and makes it easier to detect small changes that could signal wear, drift, or malfunction, so you can act before production is affected.

You should also set up automatic alerts to flag when readings move outside normal ranges. Alerts should be tailored to your process, such as specific thresholds for critical control points or customized escalation steps, to ensure teams are notified when necessary. Integrate your monitoring data with your other lab management systems to keep everything connected and easy to access in one place.



4 Expansion of contract manufacturing and multi-site operations

To keep up with the increasing demand for complex biological products, companies are scaling up and out. This brings many challenges for equipment health checks and troubleshooting, with different sites often using different types of equipment, maintenance routines, or documentation systems, which can make it difficult to keep everything consistent and compliant. Standard health check and troubleshooting procedures are vital to ensure every site follows the same approach and meets the same quality standards. Using shared digital records, centralized health check systems, and remote troubleshooting tools also makes it easier for teams to work together and fix problems quickly, so that equipment runs reliably across all locations.

Top tip: Collaborate with vendors and service providers

Strong partnerships with equipment vendors and service providers are key to maintaining smooth, consistent operations across multiple sites. Make full use of remote diagnostics and support to resolve equipment issues faster and more efficiently. With real-time visibility and guidance from qualified engineers, problems can often be corrected remotely, helping avoid unnecessary call-out costs and extended downtime.

You could also consider implementing site-wide or multi-site service contracts. These guarantee faster response times, consistent service quality, and access to expert technical support wherever and whenever it's needed, giving you peace of mind that help is always within reach.

5 Heightened regulatory scrutiny and data integrity requirements

Regulatory expectations for equipment qualification, maintenance, and documentation continue to rise as biomanufacturing becomes more complex and technology-driven. Authorities such as the U.S. Food and Drug Administration (FDA), European Medicines Agency (EMA), and UK Medicines and Healthcare products Regulatory Agency (MHRA) now expect organizations to maintain validated maintenance logs and complete traceability for every piece of equipment, ensuring each system operates within specification and remains in a qualified state throughout its lifecycle.

To meet these expectations, equipment health checks must be documented in alignment with good practice (GxP) standards. Each inspection, calibration, or repair should provide clear evidence of what was done, when, and by whom. Troubleshooting activities must also protect data integrity. This means that every action taken to identify or correct a fault should be accurately recorded, time-stamped, and linked to the person who performed it, with records stored securely and protected from unauthorized edits. This level of traceability ensures equipment maintenance and troubleshooting data remain complete, consistent, and reliable. Failing to maintain this level of documentation can jeopardize compliance, and can lead to product quality issues, or even product recalls.

Top tip: Maintain detailed service logs and audit trails

Digitally document all equipment health checks, maintenance, and troubleshooting activities to create a clear, traceable audit trail. Digital systems are faster, more reliable, and easier to maintain than paper-based records. They reduce the risk of lost information or manual entry errors, plus they're a much more sustainable option! Comprehensive digital logs not only demonstrate compliance, but also make it easier to identify the root cause of recurring issues by highlighting patterns in performance data. These insights can inform smarter maintenance decisions and help optimize equipment performance.

The path towards agile and efficient bioprocessing

To stay ahead in today's fast-moving, high-stakes bioprocessing environment, it's essential to keep checking your equipment is healthy and solve any issues as quickly as possible to avoid downtime. As technologies evolve and systems become more complex, even small problems can disrupt production, delay timelines, or affect product quality. That's why regular equipment health checks and strong troubleshooting processes, supported by real-time digital monitoring, play such an important role.

Real-time digital monitoring helps you stay proactive and maintain equipment uptime by spotting early signs of wear or parameter drift, rather than reacting after something goes wrong. This is especially valuable when working with single-use systems, automated equipment, or continuous biomanufacturing, where uninterrupted performance is critical. When paired with clear procedures and remote support tools, issues can often be diagnosed and resolved before they escalate.

As more companies operate across multiple sites or partner with CDMOs, keeping health check and troubleshooting processes consistent becomes even more important. Shared digital records, standardized maintenance routines, and centralized platforms help achieve this by ensuring everyone works the same way. At the same time, growing regulatory expectations mean every action must be properly documented, accurate, and easy to trace back. Digital systems make this much simpler by automatically storing secure records in the cloud and reducing manual data entry errors.

Ultimately, putting the right equipment health check and troubleshooting steps in place will help keep your systems running smoothly and help you maximize equipment uptime. Companies that stay proactive will be the ones dominating the bioprocessing industry and consistently delivering high-quality results.

Ready to level up your health checks and troubleshooting?
Visit [our website](#) to learn more about how we can support your equipment maintenance.





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