Ensuring availability of water treatment during plant refurbishment

How temporary, rental and mobile water solutions can benefit you.

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Contents

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Introduction

Across the globe, many industrial plants are ageing, having been operational for many decades or having equipment and processes that are reaching the end of their intended lifespan. As such, plant refurbishment projects are increasingly commonplace and provide a strategic way of delaying the need for costly replacements.

The goal of plant refurbishment is to extend the operational lifespan of existing facilities, improving their performance, enhancing efficiency and safety and helping businesses to comply with updated regulations. These projects can differ site to site and may involve equipment or facility upgrades; modernisation and retrofits.

No matter the size of the project, plant refurbishment presents significant challenges for heavy industry facilities, requiring careful management of operations while maintaining or improving production capabilities. For engineers and facility managers, these periods of transition demand meticulous planning and execution to minimise disruption while enhancing facility performance.

Water system upgrades require specialised water treatment expertise, particularly when modifying or replacing utilities, high pressure boilers, steam systems, or industrial cleaning processes. Process and boiler feed water must remain consistently available throughout the refurbishment period, meeting both existing operational demands and new specifications for upgraded equipment.

For professionals overseeing heavy industry sites, managing these complex transitions requires balancing current operations with refurbishment requirements. This delicate process demands careful coordination, technical knowledge, and systematic implementation to ensure successful facility modernisation.

Managing water availability risks

Water supply quantity is crucial during plant refurbishment. While maintaining regular operations, water systems must accommodate both existing processes and new equipment testing, often with multiple concurrent users.

Insufficient water supply during upgrades can lead to operational disruptions, equipment damage, and safety incidents. More commonly, limited water availability causes project delays, requiring schedule modifications and resulting in substantial cost overruns through operational losses and contractor rescheduling.

The costs associated with inadequate water supply often far exceed the investment in temporary water treatment solutions that provide adequate capacity for both existing operations and refurbishment requirements.

Water quality management becomes even more critical during facility upgrades, as new equipment often requires different or more stringent specifications than existing systems.

Quality parameters must be carefully monitored and maintained across both old and new systems, requiring comprehensive expertise in measurement, testing, and analysis. Upgraded equipment, particularly modern high-efficiency systems, typically demands stricter water quality standards, often necessitating enhanced treatment processes.

Failure to maintain proper water quality during refits can void equipment warranties, cause premature wear in new installations, create scaling issues requiring additional maintenance, and potentially lead to catastrophic failures in critical systems.

Modern plant refurbishments require sophisticated water treatment expertise alongside traditional engineering disciplines to ensure successful implementation and long-term operational reliability.

Key water quality considerations

A typical process specification often includes the following water quality parameters:

Important in raw water specification	Important for product water quality
Suspended solids (TSS) – a measure of filterable particles in water, removed with treatment processes such as media filtration or ultrafiltration (UF) Total organic carbon (TOC) – the amount of organic substances, typically undesirable in treated water Chemical and biological oxygen demand (COD / BOD) – a measure of biological and organic load in water, typically related to contamination Turbidity (NTU, FTU) – a measure of clarity and solids load in water Iron, manganese (Fe, Mn) – typical groundwater contaminants often necessitating further treatment such as coagulation, oxidation and filtration Silt density index (SDI, SDI_{15}) – a measure of water filterability and fouling potential	Total dissolved solids (TDS) – a measure of mineral substances and salts dissolved in water, often to be removed by separation processes such as reverse osmosis (RO), nanofiltration (NF) or ion exchange (IX) Hardness – a measure related primarily to calcium and magnesium salts, often necessitating treatment processes such as softening or reverse osmosis Conductivity or resistivity (µS/cm, MΩ×cm) – a measure of low level dissolved salts responsible for scaling risks in boilers and other process equipment – typically removed by reverse osmosis, electrodeionisation (EDI) or resin-based ion exchange Silica or reactive silica (Si, SiO_2) – a common contaminant of special interest for its potential to cause severe boiler scaling issues

The implications of plant refurbishment on water management

Plant refurbishment projects require careful orchestration of system modifications while maintaining essential operations. During this period, both existing and new systems must be managed effectively, with particular attention to water treatment infrastructure. This phase typically includes:

Systematic equipment transition planning

- Testing and performance validation of upgraded systems alongside legacy equipment
- Integration testing of new control systems with existing infrastructure
- Full operator training for new systems
- Maintaining continuous regulatory compliance and water quality parameters
- Optimisation of chemical treatment programmes

Upgrading or retrofitting boilers and process equipment involves:

1. Pre-modification assessment: evaluation of existing systems and upgrade requirements
2. Creating decommissioning and installation procedures
3. Cleaning, flushing, and steam blows for new plant
4. Comprehensive pressure testing of new connections and components
5. Instrumentation and control integration, alarm and safety device testing
6. Staged startup procedures for modified equipment
7. Performance verification comparing new capabilities against upgrade specifications

For water treatment system refurbishment, key focus areas include:

- Coordinated system transitions to maintain continuous operation
- New membrane installation and conditioning (for RO/UF system upgrades)
- Recalibration of chemical dosing systems
- Integration of new online analysers with existing monitoring systems
- Verification of enhanced water quality parameters
- Updated wastewater discharge compliance procedures

This systematic approach ensures minimal disruption to ongoing operations while successfully implementing facility improvements.

Common plant upgrade and retrofit challenges

Projects that involve the refurbishment of water treatment systems can encounter several key challenges:

Operational Continuity Pressure

One of the most significant challenges during plant refurbishment is maintaining consistent production output while implementing system improvements. Facility managers must carefully orchestrate refurbishment projects to minimise disruption to ongoing operations, often requiring complex scheduling and phased implementation approaches. This delicate balance becomes particularly crucial in water treatment systems, where continuous supply is essential for plant operations.

Managing system shutdowns and changeovers requires precise planning and execution. Teams must identify critical operational windows where modifications can occur with minimal impact on production. This often means conducting work during planned maintenance periods, utilising nights and weekends, or creating temporary bypass systems to maintain water supply during upgrades. The complexity increases when dealing with interconnected systems where changes in one area can affect multiple production processes.

Coordinating multiple contractor activities during live operations presents another layer of complexity. Different specialised contractors - from pipefitters to electrical engineers to control system specialists - must work in harmony while navigating around active plant operations. This requires complex scheduling, clear communication protocols, and robust safety management systems to prevent conflicts and ensure worker safety in an operational environment.

Meeting production targets during transition periods remains a constant pressure point. Stakeholders typically expect minimal disruption to output, even as significant system changes are being implemented. This often necessitates the development of creative solutions, such as temporary treatment systems, staged implementations, or alternative production schedules to maintain throughput while accommodating refurbishment activities. Success requires careful planning, flexible approaches, and close coordination between operations, maintenance, and project teams.

Technical Complexities

The technical challenges of integrating new equipment with existing infrastructure during plant upgrades create complex engineering scenarios that require careful consideration. Modern water treatment equipment must often be seamlessly connected to ageing systems, requiring creative solutions for pipe connections, electrical systems, and control interfaces. This integration process frequently reveals unexpected compatibility issues that weren't apparent during the planning phase, necessitating real-time engineering solutions and modifications.

Managing water quality presents a challenge to plant managers, as consistent water quality parameters must be maintained in transition. This often involves running parallel systems temporarily, carefully monitoring quality indicators, and making rapid adjustments to treatment processes. The complexity increases when new equipment introduces different treatment capabilities or requires stricter water quality parameters than existing systems were designed to achieve.

Control systems integration of new plant with existing infrastructure, e.g. in SCADA (supervisory control and data acquisition) systems requires additional resources for programming, testing, and validation to ensure reliable operation and accurate data communication between new and existing plant areas. New instruments and control systems must be precisely tuned to operate within the facility's specific conditions, often requiring multiple iterations of testing and adjustment.

Chemical dosing in physico-chemical water treatment often needs significant adjustment to accommodate changes in process flowsheets, flow rates, or new chemical products in use. . This optimisation process typically involves advance preparation (on-site and laboratory bench scale testing), and preparatory work to determine the best combination of new chemicals and dose rates.

Legacy system compatibility issues often become a major focus during modernisation. Older infrastructure may have undocumented modifications, obsolete components, or operating parameters that conflict with new equipment specifications. Resolving these compatibility challenges requires upfront investigation, creative engineering solutions, and sometimes the development of custom interfaces to bridge the gap between old and new technologies.

Compliance and Documentation Challenges

Maintaining regulatory compliance during facility upgrades presents a complex challenge that requires careful attention to evolving environmental regulations while managing system modifications. Water treatment facilities must continue meeting existing discharge permits and quality standards throughout the transition period, even as systems are being modified or replaced.

Meeting updated environmental standards often serves as a primary driver for plant refurbishment, yet achieving these stricter requirements while maintaining operations requires careful planning and execution. Modern environmental regulations frequently demand enhanced monitoring capabilities, improved treatment efficiency, and stricter control of discharge parameters.

Facility managers must ensure that upgrade projects not only meet current standards but also provide flexibility for anticipated future regulatory changes.

System documentation must capture not only the technical specifications of new installations but also the operational impacts, maintenance requirements, and performance parameters. Thorough documentation of factory acceptance testing (FAT) and on-site performance tests proves essential for regulatory compliance, future troubleshooting, and subsequent upgrade projects.

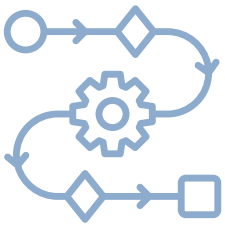
Additionally, existing documentation must be updated with risk assessments (RAMS), operating procedures and chemical handling procedures (e.g. COSHH) to reflect new equipment capabilities, changed operational parameters, and modified maintenance requirements. This process requires input from operators, maintenance staff, and technical experts to ensure procedures are both accurate and practical.

Managing stakeholder expectations throughout the upgrade process requires clear communication to various groups including site leadership, local authorities, environmental agencies, and facility personnel. Each stakeholder group typically has different priorities and concerns that must be addressed, from financial performance and regulatory compliance to operational reliability and environmental impact.

Revalidating permits and certifications following system upgrades must demonstrate compliance with regulatory requirements. Facilities shall verify that modified systems meet or exceed permitted parameters, which may require additional monitoring, specialised testing, or third-party verification. This revalidation process can be time-consuming but is essential for maintaining good operation and demonstrating environmental responsibility.

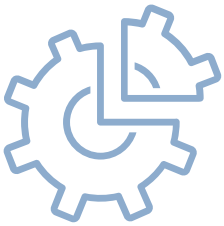
Common issues during projects

During plant refurbishment, several critical factors can lead to significant operational disruptions, cost overruns, and compliance challenges.



System modification complications

- Often arise when integrating new components with existing infrastructure.
- Include pressure testing failures and delays, requiring additional repairs and verification, and unexpected incompatibilities between new and existing piping systems.
- Water quality disruptions frequently occur during system modifications, as disturbed scale, corrosion products, or debris from construction work contaminate process streams, necessitating additional cleaning and flushing cycles.



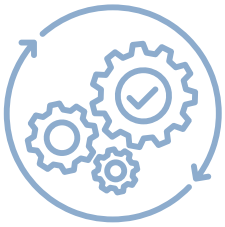
Technical integration challenges

- Commonly emerge when upgrading legacy systems no longer supported by original manufacturers, with obsolete or missing documentation.
- When upgrading membrane systems, facilities often encounter complications with physical compatibility between legacy and new membrane products, necessitating the use of adapter and retrofit kits.

Control system upgrades

- Include differences in technical specification and communication protocols between old and new generation equipment (e.g. PLCs, SCADA systems), with potential difficulties calibrating new sensors alongside existing equipment such as pH monitoring, conductivity measurement, and flow metering systems.

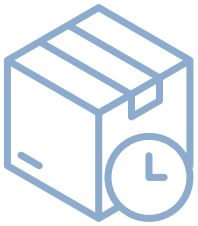
- Chemical dosing systems can face significant adjustment periods, especially when new dosing equipment must work in conjunction with legacy systems or when chemical dosing protocols injection points are modified to accommodate upgraded processes.



Operational challenges

- Frequently arise from the need to train staff on new equipment while maintaining existing processes, incomplete documentation of system modifications, and the learning curve associated with operating hybrid systems during transition periods.

- Changes in raw water quality or treatment requirements can impact both existing and new treatment processes, requiring careful monitoring and adjustment of operational parameters.



Logistical issues

- Often cause significant delays, including uncertain lead times for specialised equipment delivery, supply chain and export delays, unexpected mechanical complications during installation, and the discovery of additional required modifications during the upgrade process.

- Regulatory compliance verification can become more complex during refurbishment, as facilities must demonstrate continued compliance while implementing system changes.

As heavy industry leaders face increasing pressure to maintain production while implementing necessary upgrades, mobile water treatment has emerged as a strategic solution to these challenges.

Mobile systems can provide temporary treatment capacity during upgrades, ensuring continuous operations and allowing for more flexible implementation of system modifications.

In a heavy industry plant, downtime can cost as much as $59 million a year - 1.6 times higher than in 2019

[Siemens “The True Cost of Downtime” 2024]

The strategic advantage of mobile water treatment

Mobile water treatment solutions are portable, containerised systems that can be rapidly deployed to any location. These self-contained units have a relatively small footprint but are equipped with advanced filtration, purification, and treatment technologies that can process water from various sources to meet specific quality requirements.

Mobile water treatment systems can quickly begin treating water for industrial processes, emergency situations, or supplemental supply needs. The units are commissioned, operated and maintained by water treatment specialists, requiring minimal infrastructure or labour from the client site.

Mobile water services provide a range of advanced and proven water treatment technologies, for all critical industrial applications – in a compact, portable footprint.

Benefits of incorporating mobile water treatment systems into your plant refurbishment strategy		
Risk mitigation	Mobile water treatment systems provide essential operational continuity during plant refurbishment. Temporary systems maintain water quality and quantity while existing equipment is modified or replaced, protecting production schedules and uninterrupted water supply.	• Maintain production during system modifications • Enable phased implementation of upgrades • Provide additional and backup capacity during critical transition periods (e.g. steam blows) • Support equipment testing (e.g. additional water for vessel pressure testing)
Compliance management	During facility upgrades, mobile water and wastewater treatment units help maintain environmental compliance while existing systems undergo modifications.	• Ensure uninterrupted water quality compliance during system upgrades • Allow extended testing of modified equipment
Implementation flexibility	Mobile water solutions enable a more methodical approach to upgrade projects by maintaining essential services while modifications are implemented. This reduces pressure on engineering teams and allows for thorough testing and optimisation of upgraded systems.	• Accommodate unforeseen delays and water needs • Support gradual process transitions, free up site operators and engineers • Maintain water quality during integration • Allow time for thorough site performance testing

Success stories - Refinery boiler commissioning

Challenge:

During the commissioning of new high-pressure boilers, a European refinery needed a reliable temporary demineralised water supply of 210 m^3/hour. With their existing demineralisation plant under refurbishment and no external DI water sources available, they required an immediate solution to ensure successful boiler commissioning.

Solution:

A mobile water treatment system combining Reverse Osmosis (RO) and Electrodeionisation (EDI) technology was deployed. The system utilised continuous self-regenerating EDI units that could handle varying flows while maintaining strict water quality standards.

Outcomes:

The solution delivered both operational and environmental benefits, including significant cost savings, reduced CO_2 emissions, and eliminated chemical usage. The smaller footprint addressed site space constraints, while simplified operations enhanced safety by reducing chemical handling and vehicle movements. The system successfully supported the boiler commissioning while the permanent plant was being refurbished.

Success stories - Emergency water supply for chemical manufacturer

Challenge:

During the commissioning phase of a new demineralised water treatment plant, a major chemical manufacturing facility encountered a critical situation when they anticipated losing their condensate return feed to their steam boiler. This temporary gap in water treatment capability threatened to disrupt the entire production process, as the boiler system required high-quality treated water to operate safely and efficiently.

With the new permanent installation still undergoing testing and validation, the plant needed an immediate interim solution to bridge this critical period, maintain water quality standards, and ensure uninterrupted operations until the new system could be fully commissioned.

Solution:

A comprehensive mobile reverse osmosis (RO) treatment system was rapidly deployed to meet the facility's immediate needs, providing capacity for 70 m^3/h of high-purity water production. The mobile solution consisted of an integrated treatment train including pre-treatment cartridge and GAC filtration systems, and a single-pass RO unit, supported by sophisticated chemical dosing systems for scale prevention.

Advanced digital monitoring capabilities were implemented to enable real-time system oversight and performance optimisation. The service package included twice-weekly visits from specialised technicians who performed regular maintenance and system optimisation to ensure peak performance throughout the deployment.

Outcomes:

The mobile water treatment solution delivered exceptional results, consistently producing water with conductivity below 50 µS/cm and achieving greater than 95% salt rejection. The system maintained 95% availability throughout the deployment period, providing reliable service to the plant's operations.

Integration with the existing plant infrastructure was accomplished seamlessly, with rapid deployment and installation completed within days of the initial request.

The flexible rental terms allowed the facility to extend the service based on their evolving needs, while professional operation and maintenance ensured consistent, reliable performance throughout the deployment period.

Success stories - Supporting ageing infrastructure and flood recovery at a refinery

Challenge:

A major oil refinery faced two significant water treatment challenges. Initially, the site's ageing water treatment technology struggled to consistently deliver the required volume of high-quality, low conductivity water for its boiler system.

This situation was dramatically compounded when catastrophic floods hit the facility, with 250mm of rainfall in two hours leaving a metre of standing water contaminated with hydrocarbons across the site.

Solution:

The refinery implemented a two-phase mobile water treatment approach. First, mobile reverse osmosis (RO) and media filtration units were deployed to support the existing water treatment system.

Following the flood, specialised mobile water treatment equipment – including dissolved air flotation (DAF) and activated carbon filtration units – was rapidly deployed to process the contaminated flood water.

Outcomes:

The initial mobile water treatment units successfully supplemented the ageing system, ensuring consistent water quality for the boilers.

When disaster struck, the emergency flood response equipment processed contaminated water at a rate of 400m3/hr, enabling quick removal of flood water from storage tanks. The rapid deployment of mobile units proved crucial, as the refinery was able to swiftly return to pre-flood production levels.

Most importantly, the solution prevented environmental impact by containing contaminated water within the site, demonstrating how mobile water services can provide both planned and emergency support for industrial operations.

How to choose a mobile water service partner

When implementing mobile water solutions during plant refurbishment, selecting the right service provider can mean the difference between a smooth modernisation process and costly delays. There are several critical qualities to evaluate when choosing a mobile water treatment partner.

- They should have comprehensive geographic coverage with strategically located service centres and local technical support to ensure timely assistance during the refurbishment process.
- Look for deep technical expertise including specialists experienced in refurbishment projects and water chemistry domain experts.
- The provider should offer diverse treatment solutions with varying capacities and technologies, while maintaining service flexibility to accommodate changing needs during the refurbishment period.
- Essential operational capabilities should include remote monitoring, robust data management, and quality control systems to ensure smooth operations.
- Verify their financial stability and long-term viability, along with their commitment to environmental innovation and implementation of best available technologies (BAT).
- The partner should have documented industry experience with relevant industrial plant refurbishment case studies and references.
- Friendly and informative communications, transparent reporting, and comprehensive engineering support including operator training and technical consultation are crucial for successful plant refurbishment projects.

Finally, ensure they maintain proper quality assurance systems, safety protocols, and environmental management practices, supported by clear contract terms and service level agreements.

Veolia mobile water services: responsive, reliable, reputable.

As the global water technology experts of Veolia, we deliver on both performance and sustainability without compromise. We provide you with peace of mind knowing your business and communities are safeguarded, efficient and resilient. Together we protect, preserve and reuse resources, tackling today's environmental challenges while creating the water treatment and process solutions of tomorrow.

We offer two distinct mobile water service models:

Planned:
Flexible rental options
from days to 12 months

Multi-year:
Long-term partnerships

As a complete solution provider, Veolia offers:

- Equipment and systems
- On-site services
- Chemical solutions
- Performance optimisation
- Maintenance support

Key facts

54	17,500	38	€5 B	14,000+
COUNTRIES	GLOBAL EMPLOYEES	PRODUCTION SITES	GLOBAL REVENUE	CUSTOMERS WORLDWIDE

We are a global pioneer in water and wastewater treatment, with a core focus on technical excellence:

- 4,400+ patented technologies
- 26 research centres and innovation laboratories
- Comprehensive chemical solutions
- Advanced monitoring capabilities
- Integrated service approach

Veolia's commitment to sustainability and approach to ecological transformation aligns with modern industrial needs through:

Decarbonisation initiatives
Water recycling and reuse solutions
Pollution reduction strategies
Resource optimisation
Environmental protection measures

Modernise your plant for tomorrow’s needs

Plant refurbishment projects represent critical milestones for your site, where proper water treatment can mean the difference between successful expansion of operational lifespan and costly delays. Mobile water solutions offer a strategic advantage by providing flexibility, reliability, and expert support during these complex projects. As demonstrated throughout this guide, the right mobile water partner can help mitigate risks, ensure compliance, and optimise the refurbishment process while protecting your bottom line.

Veolia's mobile water services combine global expertise with local presence, offering emergency response capabilities, flexible rental options, and comprehensive technical support. Our proven track record across industries ensures you receive world-class support during your plant refurbishment projects.

Don't let water treatment challenges compromise your modernisation timeline. Contact Veolia's mobile water services team today to discuss how we can support your specific needs. Our experts are ready to provide a detailed assessment and tailored solution that aligns with your refurbishment requirements.

Resourcing the world

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