Siemens Water Solutions

Downstream where clean water is critical
Integrated downstream water solutions

Meeting evolving challenges with an ecosystem of solutions

Clean water. It’s critical for human life and human health. It’s critical for business and economic growth. Yet it’s increasingly viewed as a limited resource. Meanwhile, shifts in technology and an evolving regulatory environment, coupled with increasing production and operational demands, pose new risks for the oil and gas industry.

From cost concerns to regulatory compliance, from environmental challenges to environmental protection, we’re here to partner with you—helping you meet your operational needs today and your vision for tomorrow. Together we’ll execute the customized end-to-end water solutions you need for a long-term strategy and lasting business results.

Wastewater discharge or reuse?
Process water treatment?
Spent caustic treatment?

With 80 years of experience designing, engineering, installing, and supporting hundreds of complex water treatment facilities around the world, we’ll help you meet the most stringent effluent discharge standards—all within the scope of your application.
Expertise matters

With our 360-degree knowledge of the oil and gas industry, we understand the challenges you face—beginning with your downstream activities.

<table>
<thead>
<tr>
<th>Total cost of ownership</th>
<th>Before you initiate downstream activities, consider engaging the Siemens Water Solutions team. They will assess the complete lifecycle of your project and tailor solutions that provide efficiencies, equaling long-term savings.</th>
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</thead>
<tbody>
<tr>
<td>Risk management</td>
<td>Siemens provides you with a proactive risk management system with a focus on safety. As experts at assessing possible—even unexpected—operational and environmental risks, we'll work with you to avoid and minimize your exposure.</td>
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<tr>
<td>Shared values</td>
<td>Innovation is imperative in our business, as environmental regulations and technology advances are always in flux. Our goal is to keep you ahead with solutions and expertise that help you—and your teams—live up to your values.</td>
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“Our Siemens has rich experience in oil and petrochemical wastewater treatment... and technology that can help conserve energy and protect the environment. In the long run, it can help us save on other operating costs to lower our total cost of ownership.”

—Zhu Yuzhong, Deputy Director of Sinopec Jiujiang Company’s Water Management Operations
Whether you’re looking for wastewater pretreatment, in-process water treatment, or spent caustic treatment, we’re here to help you find the right hydrothermal treatment solution. Our hydrothermal treatment solutions include extensive site studies for customization—and are proven by decades of process and application knowledge.

**Application: Highly toxic spent caustic**
The cleanest way to treat the dirtiest water: Zimpro® Wet Air Oxidation (WAO) and Wet Oxidation systems are designed for treatment of highly toxic spent caustic, making the effluent amenable for discharge to a conventional biological treatment plant for polishing.

**Application: Municipal and industrial wastewater**
Energy efficient, budget friendly, and able to recover 90% of spent carbon: Zimpro® Wet Air Regeneration (WAR) systems are an ideal choice to regenerate spent powdered activated carbon from our PACT® (powdered activated carbon treatment) systems and eliminate biosolids disposal in municipal and industrial wastewater treatment applications. And, WAR systems not only regenerate carbon and reduce sludge volume, but also convert recalcitrant COD to readily biodegradable COD.

**Application: Small volume highly toxic refinery spent caustic**
Easy, yet effective treatment for the toughest wastewaters: Zimpro® electro-oxidization technology (ZEO) uses electricity and long-lasting synthetic electrodes to oxidize/destroy highly toxic spent caustic, and other wastewaters. Only requiring electricity and cooling water, the process is economically attractive for smaller facilities.
Despite ever-increasingly stringent discharge regulations, constant developments in regulations, and the difficulties of managing variable and complex wastewaters, our customized biological treatment solution will help you exceed even the most challenging wastewater requirements.

With decades of experience, and an integrated water solutions lifecycle management approach, our solutions are reliable, durable, efficient, cost-effective, and extremely user-friendly.

**Application: The most challenging effluent standards or wastewater recycling**

**Oil and gas wastewater treatment simplified:** Streamline your process with the unique, all-in-one PACT® MBR system. Proven, available, and supported worldwide, the PACT® MBR system uses half the space of conventional methods and offers substantial cost savings. For especially difficult-to-treat wastewaters and high-quality reuse, PACT® MBR True Two Stage (T2S) systems can meet even the most stringent effluent requirements.

**Application: Enhanced biotreatment and reuse potential**

Combining biological treatments with an integrated, immersed membrane: Built with decades of industry expertise, the Petro™ MBR system combines various biological treatment processes with an integrated, immersed membrane. This system is ideally suited to a wide range of refinery, petrochemical and production water treatment applications including water reuse, upgrades, retrofits, and compliance-driven projects.

**Application: Challenging biological treatment and effluent toxicity**

Designed for diverse wastewater conditions: The PACT® system combines biological treatment and carbon adsorption into a single, synergistic treatment step, resulting in significant cost savings, toxicity reduction, and performance advantages over other systems, such as activated sludge and granular carbon. Additionally, coupling the PACT® system with Zimpro® Wet Air Regeneration (WAR) enables carbon regeneration, complete sludge destruction, and conversion of recalcitrant organics into readily biodegradable molecules.
Oil/water separation

We invented the API separator, and completed our first installation 85 years ago. Since then, we’ve installed hundreds of oil/water separators in petroleum refineries and petrochemical facilities around the world.

Our oil/water separation technologies are driven by modern process performance improvements, a greater focus on environmental awareness, and higher standards for worker health and safety-driven innovation. The result is enhanced performance, efficiency, safety, maintainability, and footprint utilization for proven efficacy and the best total value on the market.

The oil/water separators we offer today provide the same level of treatment in smaller, more cost-effective packages—and are completely contained and enclosed to meet all current air and water environmental requirements. These advancements also enhance worker health and safety due to exposure of harmful vapors and wastewater.

Applications
Our customized oil/water separator solutions address wastewater influent oil and TSS concentrations up to 20,000 mg/l and higher for each constituent, and achieve effluent oil and TSS concentrations as low as 5 mg/l.

Solutions
While the API and Dissolved Gas Flotation separators are the primary products used in petroleum refineries and some petrochemical plants, Siemens’ portfolio of oil/water separation solutions also includes:

1. CPI separators
2. IAF and IGF separators
3. Hydrocyclones
4. Walnut shell filters
5. PerforMedia filters

For all oil/water separator applications, we’ll evaluate multiple technologies—including ancillary components—to determine which may be the most cost effective, the most process efficient, and the easiest to operate.

The two API separators, each 70’L x 9’W x 10’H, were shop-fabricated and finish-painted to facilitate installation and assembly at the jobsite. Airtight and corrosion-resistant fiberglass covers were included for VOC containment, as was an activated carbon system to treat VOC emissions from the separators.
Exceeding expectations for China’s largest refiner

As far as water treatment challenges go, they don’t get much more complex than those faced by the Sinopec Jiujiang Company in Jiujiang, China.

Despite facing the government’s most aggressive environmental regulations, the Sinopec Jiujiang Company sought to increase production from 57 million barrels to 72 million barrels annually.

Current outputs included jet fuel, gasoline, kerosene, and diesel products—and a staggering quantity of oily, difficult-to-treat waterborne effluents.

Siemens implemented a complete wastewater treatment solution including:

1) Spent caustic treatment using the Zimpro® Wet Air Oxidation (WAO) system to drastically reduce pollutant concentration, eliminate odor-causing compounds, and increase its biodegradability.

2) PACT® technology for simultaneous biological oxidation of organic compounds, physical adsorption of recalcitrant and volatile organics onto activated carbon, and elimination of wastewater treatment odors, all in a single process step.

3) Wet Air Regeneration (WAR) technology to regenerate up to 95% of the PACT® system’s activated carbon and totally destroy the waste biomass, avoiding the substantial operating cost of replenishing this essential material, and the potential environmental liability associated with off-site disposal of waste by-products. (Our WAR technology significantly lowers the owner’s total cost of wastewater treatment facility ownership, and environmental risks associated with waste management.)

The project team successfully completed the design, engineering, installation, and commissioning of the three-stage water treatment process on time and budget. In fact, the water output from the combination of Siemens water treatment solutions has significantly exceeded the effluent quality standards set forth by the plant—allowing the Jiujiang refinery’s engineering personnel to build a pond near the facility, filled with post-treatment water and a thriving Koi fish population.

Tackling complex challenges and providing unique solutions for China’s largest refiner.
Customized solutions matter

No two downstream projects are exactly alike, which is why our multi-disciplinary team of in-house experts can design custom water treatment with your specific needs in mind.

Feasibility studies
Feasibility studies can be performed to facilitate the proper design of a solution that meets your cost and location requirements, helping you avoid costly mistakes.

Retrofits
Sometimes situations change and new equipment is needed, but occasionally seemingly outdated equipment can be made useful again. Siemens can help you successfully upgrade your current equipment to meet today’s demands.

Pilots
Sometimes the only way to determine the feasibility of a solution is to test it in the field. Our experts work collaboratively with you to determine the most effective pilot program that provides you with the confidence and data you need.

Service matters

Providing peace of mind to the oil and gas industry

While project deployments can take anywhere from a few months to a few years to complete, we understand your service and support requirements will run much longer. That’s why we’ve extended our own operating perspectives to plan—not just for the next few years—but for the next few decades.

Our Aftermarket Services are aimed at the entire life cycle of a project, from front-end engineering and EPC support to post-commissioning services during plant operations for years to come.

With Siemens as your long-term, day-to-day partner providing local service and global support, you reduce critical risk elements—especially unplanned downtime, safety, and environmental impacts—providing your operations with a smaller risk profile and you with peace of mind. Should downtime occur, you can be assured your Siemens Aftermarket team will help minimize it and get you back online as soon as possible.

Siemens Aftermarket Services include:

- Global network
- Consulting, reliability engineering, and maintenance
- Remote condition-based monitoring, diagnostics, and assistance
- Specialized expertise for individual systems
- Critical spare parts delivery
- Single point of contact for all systems
- Training and operational excellence
- Modernization upgrades and ongoing optimization
- Rental and leasing services

Contact us today at 1.800.826.1476 or 1.715.359.7211 for equipment maintenance, repairs, upgrades, expansions, parts, troubleshooting, and training.