



Refining and Chemical Processing





Safety and Environmental Excellence

As part of our commitment to the Responsible Care* program, Solenis has set a global goal of operating with zero incidents. We believe every job can be executed safely and with minimal impact on the environment.

Our dedication to achieve safety and environmental excellence starts with our corporate culture. We embrace the value of our people and the environment. This influences our safety and environmental decision-making — how we interact with each other, how safety and environmental issues are prioritized, and how our achievements in these areas are driven.

We continue to drive our vision for excellence in EH&S performance through our focus on clear communication of safety expectations. As an organization, we are committed to learning from incidents through root-cause analysis; improving our tools, management systems and the condition of our facilities; training and developing our employees; and promoting a culture that maintains EH&S as a core value.

This culture extends into every facility in which our employees operate. Our sales and service personnel are expected to actively partner with our refining and chemical processing customers, participate in their safety programs and assume a leadership position in aspects of industry safety programs specifically designed for our products.

Because of our commitment to creating a world-class safety culture and to providing a workplace focused on safety, security and reduced environmental impact, Solenis has been recognized by *EHS Today* as one of America's Safest Companies.

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A Proud Tradition of Providing Solutions — and Results — to Refineries and Chemical Processing Plants

Since the early 1900s, Solenis' innovative water treatment programs and skilled professionals have been deployed in some of the largest refineries and chemical processing plants around the world. While we have had different company names over the years, including E. F. Drew & Company, BetzDearborn and Ashland Water Technologies, our commitment has remained steadfast — to help complex industrial operations stay productive and profitable while protecting mission-critical assets and adhering to local regulations.

Today, Solenis continues to have a strong presence in refineries and chemical processing plants. We treat two of the 10 largest refineries in the world and, in total, service more than 550 plants in 43 countries across the entire industry spectrum, including oil refining, coal to chemicals, petrochemical processing, specialty chemicals, fertilizers, and air separation.

Regardless of size or manufacturing process, refineries and chemical processing plants face significant challenges, including:

- Reducing freshwater withdrawals and accommodating municipal graywater in the plant makeup
- Monitoring and controlling critical unit operation chemistries to improve reliability even as staffing is reduced
- Safely and reliably extending run lengths between turnarounds
- Managing investments and controlling operating costs
- Predicting and preparing for ongoing regulatory, political and environmental regulation
- Complying with tightening discharge requirements and emissions limits
- Protecting existing assets and upgrading outdated infrastructure
- Implementing automation and digital technologies to improve service effectiveness and efficiency

Solenis has firsthand experience with these issues because our professionals have worked side-by-side with refinery and chemical plant management and operators for years. We have the right products — and the right people — to help today's refineries and chemical plants stay profitable and competitive.





Leverage Our Expertise to Gain a Competitive Edge

For more than 100 years, Solenis has been dedicated to helping the refining and chemical processing industries operate more efficiently and profitably. Achieving these goals requires innovative treatment chemistries, state-of-the-art monitoring and control systems and advanced analytics. Additionally, it requires extensive knowledge and expertise of both your unit operations and your plant's entire water system, including pretreatment, cooling, steam and wastewater treatment operations.

Your relationship with Solenis begins with an onsite field professional who works directly with your plant personnel and becomes familiar with every aspect of your operation. This includes understanding your water source (well/surface/graywater) and quality, your system design and operation, and your local regulatory requirements. Then they apply this knowledge to design a total system approach tailored to the specific needs of your plant, ensuring you remain in compliance with safety and regulatory requirements while maximizing production at the lowest total cost of

operation. Supporting the onsite field professional is a dedicated team of water treatment specialists who are experts in chemistry, thermodynamics, engineering and microbiology. They help troubleshoot problems and recommend best practice solutions.

Armed with the right products and a broad understanding of your process, our field professionals and water treatment specialists are uniquely positioned to help you establish new benchmarks for your operation. Whether your objective is to maximize production, increase time between turnarounds, increase asset life, or reduce waste and environmental footprint, you can count on our dedicated team to provide cost-effective solutions that exceed your expectations. And, just as important, we help you look beyond today's challenges to better prepare your operation for the future, whether it's employing advanced monitoring and control systems or providing intelligent insight on your plant's heat exchanger network.

Innovative Solutions for the Refining and Chemical Processing Industries

For refineries and chemical processing plants, water management is becoming increasingly important. One critical priority in many regions is making the most of lower-quality water sources, which requires innovative treatment programs. Another priority is reducing water consumption by maximizing cooling tower cycles and improving industrial wastewater reuse and recycle processes — all while still protecting heat exchangers and piping systems from the effects of scale, fouling and corrosion. At Solenis, solving these water treatment issues has been our calling for more than 100 years. We have deep experience in water-intensive industries and have one of the broadest portfolios of innovative chemistries and equipment technologies on the market.

Influent Treatments

As a vital resource for refineries and chemical processors, water is used to heat and cool critical processes throughout the plant. How raw water is treated affects the quality of the process, as well as the reliability of the utility system.

Because the quality of raw water varies greatly, Solenis' influent treatment programs are tailored to meet each customer's specific requirements. These programs employ advanced microbiological control chemistries and organic and inorganic coagulants and flocculants to deliver optimum clarification performance and a reliable supply of water that meets required quality standards.

Boiler Water Treatments

To ensure the optimum performance and safety of steam-generating systems, it is imperative that corrosion and deposition be addressed proactively. Solenis' boiler treatment programs combine application expertise with state-of-the-art chemicals to manage these issues and the multitude of problems they can cause.

Cooling Water Treatments

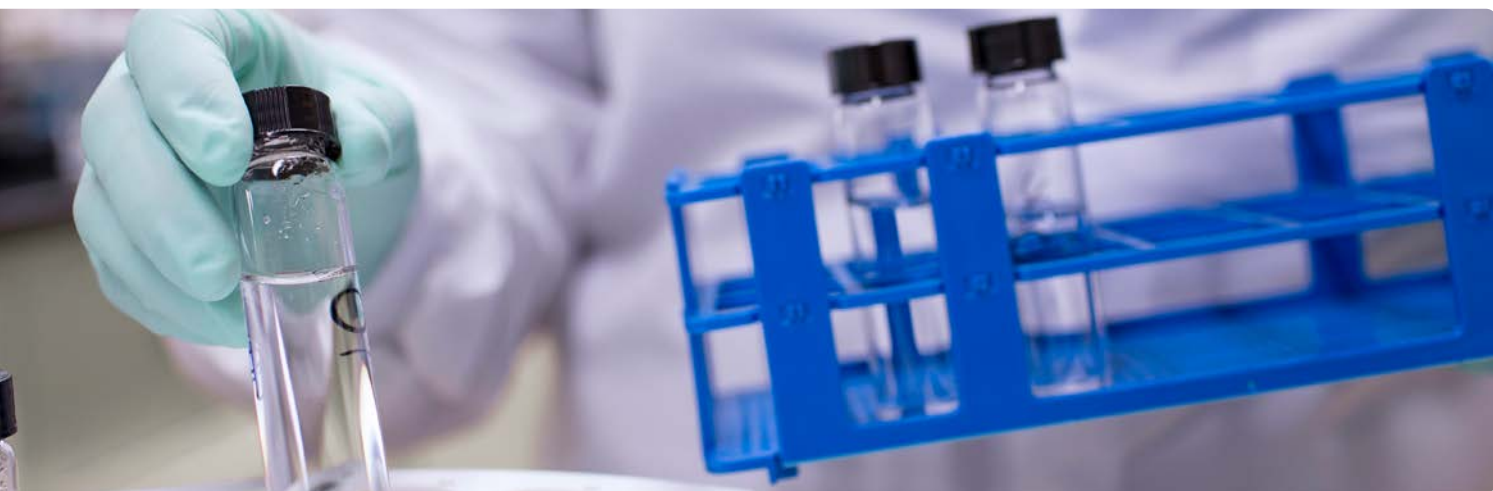
When corrosion, deposition and microbiological growth occur in a cooling water system, they can lead to reduced heat transfer, lower operating efficiency, higher maintenance costs, increased capital requirements and unscheduled outages. To help maintain the reliability and performance of cooling systems, Solenis offers a full line of treatment programs to meet each plant's unique operating conditions and performance goals.

Wastewater Treatments

As environmental regulations become more restrictive, improving the performance of a wastewater system becomes even more critical. To help customers achieve their environmental and operational objectives, Solenis offers one of the most advanced and comprehensive product lines for wastewater treatment along with a wide range of customer-focused services that help ensure the optimum performance of wastewater operations. Whether the goal is to maintain regulatory compliance, to minimize sludge handling and disposal costs, to recycle or reuse effluent or to improve wastewater quality, Solenis has the products and expertise to provide a cost-effective solution.

Monitoring and Control Systems

Due to the dynamic nature of refineries and chemical plants, continuous monitoring of critical process and utility systems is essential. Solenis' portfolio of monitoring and control systems represents the latest innovations in chemical monitoring and process control instrumentation. This portfolio includes a range of proprietary analyzers and controllers and an online monitoring and data management service that allow for around-the-clock surveillance and control of process and water treatment programs. When used in conjunction with Solenis' process and water treatment chemistries, these technologies can help improve productivity, reduce water and energy use, increase the longevity of plant assets and ensure compliance with environmental regulations.



Research and Development

In recent years, R&D at Solenis has been transformed with the addition of a number of world-class scientists working together with our seasoned veterans in a collaborative global network. Today, Solenis has more than 250 highly qualified professionals focused on developing new chemistries, market-changing technologies and customer-driven solutions at key centers located strategically around the globe.

Some of our most exciting innovations can have direct impact on the day-to-day operations of refineries and chemical processors. Some of these innovations, which are unique in the industry and only available from Solenis, include:

OnGuard™ *i* Controller

The OnGuard *i* controller is a powerful automation tool that provides both performance-based and knowledge-based chemical control of water treatment programs. When used in conjunction with Solenis' state-of-the-art analyzers and water treatment chemistries, this monitoring and control innovation ensures the optimal performance of the treated system.

By combining hardware and proprietary software into one water treatment equipment package, the OnGuard *i* controller enables plant managers and engineers to customize chemical feed and control parameters. Standard chemical feed algorithms can provide basic control, or advanced performance-based and knowledge-based algorithms can provide more sophisticated control.

Either way, the OnGuard *i* controller is an intelligent machine capable of learning about a plant's unique operational environment and making real-time adjustments to minimize system upsets. Plant personnel can view the system remotely by connecting directly to Solenis Cloud™, a secure online platform that centralizes essential water treatment data and displays performance scores in easy-to-read technical dashboards for rapid decision-making.

HexEval™ Performance Monitoring Program

The complex series of processes, from heating, cooling and condensing to evaporation and separation, that occur daily in refineries and chemical plants require reliable heat exchanger monitoring. To calculate heat exchanger efficiency versus design specifications, plant operators measure a number of parameters, such as process and water flow, temperature profiles and pressure differentials across the system, but these indicators may not provide early identification of scale or fouling problems.

Solenis developed the HexEval performance monitoring program specifically to provide a diagnostic "window" into critical heat exchangers. The HexEval program uses a proprietary algorithm built on data taken from thousands of heat exchangers operating in a variety of conditions and environments. HexEval not only monitors actual exchanger performance against design, but it also evaluates all exchangers and identifies those that are most susceptible to scale, corrosion and fouling given current operating conditions and exchanger design. When used in heavy industrial applications, the HexEval performance monitoring program can help extend equipment life, reduce costs and save hours of manpower and time.

ClearPointSM Biofilm Detection and Control

Biofilm by nature is insulating and corrosive and when it forms in an industrial cooling water system it can impede heat transfer efficiency, reduce plant productivity, and damage heat exchangers, pipes and process equipment.

Solenis' ClearPoint biofilm detection and control program brings together innovative monitoring equipment, advanced chemical treatments and expert service to provide a comprehensive safeguard against biofilm. While the chemistry and service components play a pivotal role in the success of the ClearPoint program, the monitoring device is what truly sets the program apart. The device, which is marketed as the OnGuardTM 3B analyzer, detects the onset of biofilm earlier than any other commercially available technology and then intelligently doses the right combination of chemistries to disrupt and destroy the insulating and corrosive biofilm before it can negatively impact the system. The device provides online, real-time monitoring with advanced reporting and



customized dashboards, including fouling factor trending, comparative analysis, biofilm thickness trending and optimized biocide dosing.

Use of the ClearPoint program ensures optimal heat transfer efficiency, peak plant productivity and prolonged asset life.

Innovation and Beyond

While Solenis is committed to pioneering new chemistries and programs, we also recognize the tremendous effort — and collaboration — required to bring these innovations to the market. That's why we support our R&D function with a network of analytical and applications-focused teams.



Analytical Science: The Analytical Science group at Solenis is the heart of the company's effort to turn breakthroughs in chemical and biological science into products that can be commercialized for the marketplace. Solenis maintains its largest analytical science laboratory in Wilmington, Delaware.

Applications Development: Our Applications Development group helps develop technical packages for new product offerings and transfer technology from one market to another. Solenis has applications development personnel at regional laboratory facilities around the world.

Customer Analytical Laboratories: Regional laboratories have been established to provide timely customer water analysis and product screening. Customer Laboratories are also able to develop testing procedures to provide customized product, equipment or process recommendations.



To learn more about how Solenis can help address your toughest challenges and more, please visit [solenis.com](https://www.solenis.com)