



Pall Corporation

Scientific and Laboratory Services
Your Partner in Innovation



Filtration. Separation. Solution.SM



Left: A standardized nebulization technique is used to monitor the bacterial removal efficiency of breathing circuit filters.

Right: A regional SLS engineer uses portable photomicrography equipment to examine filtered paint samples.



Pall Corporation

For over fifty years, Pall Corporation has applied its innovative technologies and scientific research to solving the complex filtration, separation, and purification problems of our customers in the Life Sciences and Industrial markets. While proud to have pioneered numerous technological breakthroughs, Pall's track record in serving the customer is equally as important. This singular focus on meeting and exceeding customer expectations is the cornerstone on which Pall has built, and will continue to build, its business.



Left: Atomic force microscopy is used to quantify bacteria size in a specific pharmaceutical product.

Right: Pilot scale laboratory tests characterize the performance of a liquid-liquid coalescer for the separation of difficult emulsions.





Left: Sample aliquots are removed from a simulated cardiopulmonary bypass circuit.
Right: SLS scientist examines sub-micron contaminants captured on membrane surface.

Our Mandate and Our Mission

To Provide Pall Customers With Unparalleled Scientific and Product Support

In 1962, this mandate was given to the newly-created Contamination Service Group. Since then, the name has changed, but the mission remains the same. Today, Pall's Scientific and Laboratory Services (SLS) has evolved into one of Pall's most valuable assets; its growth paralleling that of the many market segments Pall now serves. In on the ground floor when many of these industries were in their infancy, SLS is unique in what it brings to each industry, commanding a base of knowledge and experience so profound that it has become a leading international authority in the sciences of filtration, separation, purification, diagnostic monitoring and validation.

Our Most Valuable Asset - Our People

Pall's SLS staff includes over 400 scientists and engineers, most with advanced degrees in a broad variety of disciplines, including chemistry, biology, microbiology, physics, engineering, and medical technology. Many are internationally recognized as experts in their respective fields. They generally have years of experience investigating and solving the various and often complex problems of fluid clarification and membrane-based separation processes – from pharmaceutical, food and beverage manufacturing, to medicine, molecular biology, semiconductors, industrial chemicals, hydraulics, power generation, and aerospace applications.



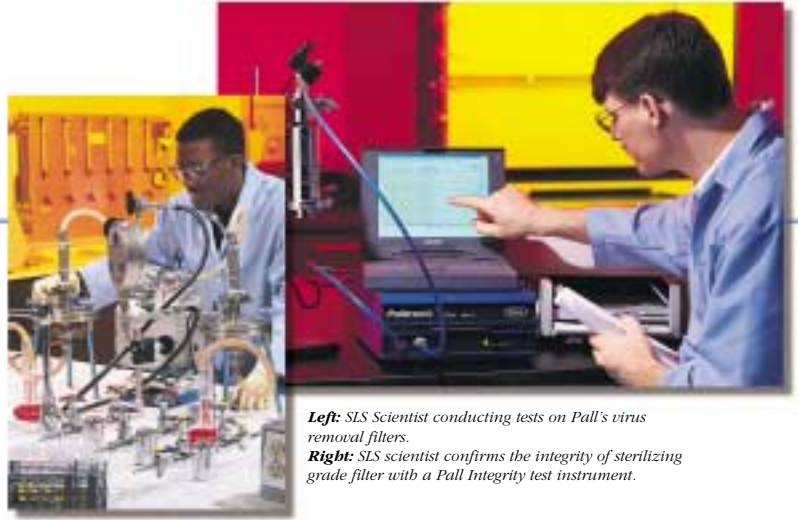
Across virtually every industry, SLS is exploring ways to improve performance and productivity...

SLS scientists and engineers provide our customers with the most advanced technology in filtration, separation, and purification, and in identifying and controlling microbial, particulate, and chemical contamination. To accomplish this, SLS works closely with our customers' scientific and engineering staffs. Frequently, this involves on-site testing as well as extensive work in SLS laboratories. In the Life Sciences market, SLS provides comprehensive support to medical, pharmaceutical, and biotechnology customers. In many instances the optimum filtration or separation solution for a process must be individually tailored to the specific customer. In the Industrial market, SLS supports such diverse applications as: advanced electronics technology; chemical, polymer, and petroleum processing; municipal and waste water processing; food and beverage production; industrial hydraulic and lubrication systems; and fluid systems in aircraft and marine, land, and space vehicles.



Left: Field test engineer monitors operation of backwash filtration system at refinery site.

Right: An oil multi-pass test stand is used to evaluate the efficiency and capacity of a hydraulic filter.



...and pioneer solutions based on a thorough understanding of customer processes and the applications in their markets.

The SLS team endeavors to develop a close relationship with every Pall customer. Armed with first-hand knowledge of the customer's process from start to finish, they anticipate where problems might occur and make appropriate recommendations to avoid them. Following policies and procedures that ensure the highest levels of confidentiality, they solve complex problems, evaluate new products in the early stages of development, and investigate break-through applications. Whether pushing the envelope to develop cutting-edge solutions or assisting with routine, day-to-day operations, Pall customers can count on SLS for a proactive response that is fast, effective, and efficient.

On the next few pages, find out how all over the world, the SLS team is developing cutting edge solutions to unique problems and applying existing and emerging technologies to critical applications.





National blood organization reduces leukocytes through in-line filtration

A national blood organization committed to leukocyte reduce all of its platelet products using in-line filtration.

To complement their efforts, they asked Pall's SLS CLIA certified laboratory to help them establish a Good Manufacturing Practice (GMP) program and to train their personnel at 17 blood centers in the proper use of the filtration system. As part of the GMP program developed by Pall, a unique preservative solution was created to ensure specimens transported between locations would maintain their integrity for up to 14 days. After several months and 1600 specimen analyses, the participants were qualified for this process. The next step in the GMP program was to develop and test a statistical analysis program to monitor the entire process from start to finish. So, SLS designed a program to detect a potential deviation within 20 sample submissions. Analytical techniques to qualify residual leukocytes were validated and a software program to generate data and reports was written. To provide for peer review comparison, all the results from this Process Validation program were entered into a database. In the event that an analysis is determined to identify a deviant process, SLS assists the customer in initiating immediate corrective action.

The Bottom Line: A satisfied customer with better educated personnel and a safer blood product for the public.

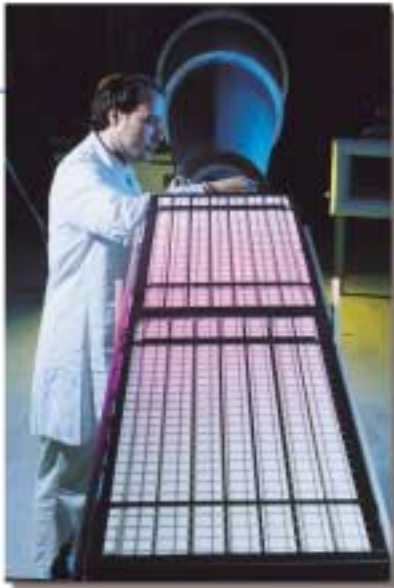


Major breweries stabilize and retain beer's natural flavors

Major breweries are successfully stabilizing and retaining the natural flavor of beer with cluster filtration systems (CFS) that use membrane filters. The approach employs a unique system of filter clusters, enabling on-line integrity testing of large installations with membrane areas as large as 320 m². During an initial evaluation, SLS determines the most effective combination of filter and prefilter. They then calculate the size of the system by factoring in the

customer's requirements for brewing schedules, process flow rates, and the particular characteristics of the beers being filtered. SLS works with the customer during installation, customer training and initial start-up, and continues to provide product and/or technical support on an on-going basis.

The Bottom Line: The automated CFS design provides enhanced product quality and reduced cost.



Filtered cabin air enhances health and comfort of passengers and flight crews

Demand for greater fuel efficiency and less engine emissions has motivated the design of modern aircraft with ventilation systems that recirculate about 50% of the air in passenger cabins. However, governments, flight crews and passengers are concerned about the potential of recirculated air transmitting infectious diseases.

Working with leading aircraft manufacturers and major airlines, Pall's SLS scientists have taken leadership roles in technical organizations charged with investigating and writing standards for cabin air quality. In addition, they

developed test methods for evaluating the ability of cabin air filters to remove bacteria and viruses. These developments have led to the deployment of cost-effective filters that provide the microbial equivalent of fresh air.

The Bottom Line: Cabin air filters are benefiting the health and comfort of passengers and flight crews and contributing to more efficient airline operation.



Chemical system OEM delivers ultra-pure chemicals to sensitive wafer surfaces

A major chemical systems OEM supplier with very aggressive purity specifications asked Pall SLS for assistance. Filters were required to maintain chemical purity and efficiently remove detrimental contaminants from the process stream. SLS used its analytical capabilities (including advanced ICP-MS), in combination with its understanding of the semiconductor manufacturing processes to make the appropriate recommendations.

They tested filters under actual conditions, including concentrated acids at extreme temperatures to 160°C. As faster microprocessors and higher density memory chips continue to push technology limits, SLS is interacting closely with this customer to determine the next phase of reduced contamination levels required.

The Bottom Line: No matter how stringent purity requirements become, Pall and SLS will be ready with a solution.





Semiconductor manufacturer minimizes water usage and reduces CMP waste

A major semiconductor facility asked SLS to assist in water usage and chemical mechanical polishing (CMP) waste minimization. SLS worked closely with the customer in the feasibility testing, pilot testing, sizing and start up of an ultrafiltration system designed to concentrate (400-500 fold) all suspended solids of oxide and metal mixed CMP wastewater. The system enables the customer to decrease waste disposal levels and reuse the water for other processes. Through in-house testing with actual waste samples, combined with an understanding of the solids, sizing, concentrations and chemistries, SLS interacted with sales, engineering, and the customer to develop operating protocols, including processing and cleaning steps. SLS provided startup support and operator training and continues to work with the customer to further minimize water usage and waste disposal.

The Bottom Line: A positive impact on expenses and the environment.



Major paper mill reduces bearing failures

A major paper mill was experiencing frequent bearing failures on its paper machines. Pall SLS was invited to help find a solution. First, it was determined that the oil was highly contaminated with abrasive particles. This was causing the lube oil flow controls to plug up and accelerating fatigue wear of the bearings. Preliminary attempts to implement finer filtration were hindered by the poor filterability characteristics of the paper machine lube oil which accelerated filter plugging. SLS contacted the oil supplier and worked closely with them to find a product more compatible with the filtration required. SLS then recommended system modifications to reduce ingress of dirt and water in order to achieve clean oil and a longer service life.

The Bottom Line: The customer totally eliminated flow control problems and experienced a significant reduction in bearing failures.



Biopharmaceutical manufacturers enhance virological safety

Several major manufacturers of biotechnology and plasma-derived products are using filtration systems to enhance virological safety. Since biologicals are high premium products which could be potentially contaminated with viruses such as HIV and hepatitis, it is essential to ensure that product potency loss is minimized and high levels of recovery are obtained post filtration. Working with a specific customer's process and product, SLS first conducts filterability testing to optimize flux rates and product recovery, and then provides viral reduction validation testing support.

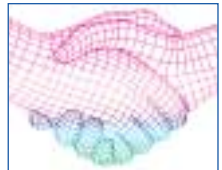
The Bottom Line: Customers are receiving the hands-on assistance they need in this area of "leading-edge" technology.



Remote monitoring optimizes processes and detects potential problems

Pall's SLS has developed the ability to remotely monitor and control in-house and field test units. For example, in the rapidly growing water processing market, long term tests at customer sites are required to demonstrate the effectiveness of Pall's separation technologies. Remote monitoring provides SLS with the required tool to simultaneously manage multiple field trials at various customer locations. The remote monitoring and control functions on test equipment can be customized to provide valuable information for specific applications. Through automation technology, it is possible to view process parameters and make real time test parameter changes. This can be done on site with a portable lap top computer or remotely via the home or office computer. In addition, alarm conditions can be communicated by direct notification through a paging service linked to the on-board computer. High-resolution test data, including current results and historical trends, are immediately available and automatically displayed.

The Bottom Line: SLS engineers and scientists have access to a process optimization and troubleshooting tool which can: monitor and control multiple applications from home, field, or office; track and establish trends; and obtain test data.



Scientific Liaison Program

From consultation to education and trouble-shooting to product validation, SLS provides a broad spectrum of services to customers all over the world. And to ensure proactive support as well as advance the sciences of filtration, separation, and purification, SLS invites leading edge customers, technical organizations and academic institutions to participate in the Scientific Liaison Program. Through the close working relationship between scientists at Pall and at participating companies and institutions, the intent of the Scientific Liaison Program is to develop and expand our customers' fundamental understanding of all contamination control, fluid filtration and separation principles. Conducted by SLS scientists and engineers, who are supported by a worldwide network of laboratories and staff, the Scientific Liaison Program provides substantial benefits for Pall customers in both process improvement and economy of use. Customers also benefit from participation in one or more of the following activities: seminars, symposia, requirement reviews, plant surveys, joint studies, technical reports, joint technical papers, and training visits to Pall facilities. Developing innovative solutions based on a thorough knowledge of customer applications, customer processes, market trends and Pall products is what sets SLS apart. They are experts in their industry.



Left: An SLS scientist in one of our wind tunnels evaluating the performance of an aircraft cabin air filter.



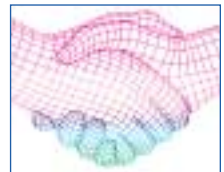
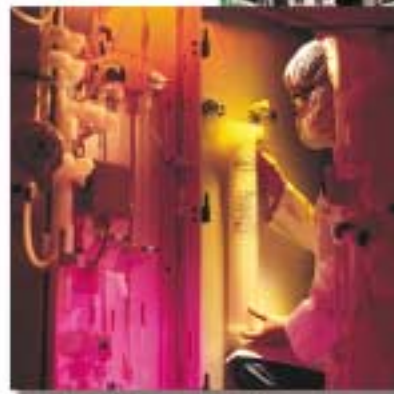
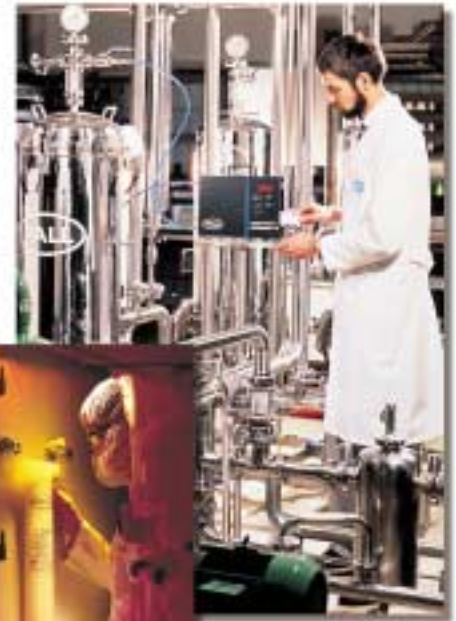
Right: A Karl Fischer automatic titration instrument measures the water content in an oil that has been dehydrated by our portable fluid purifier.

Globally and regionally, SLS offers Pall customers rapid response and reliable results

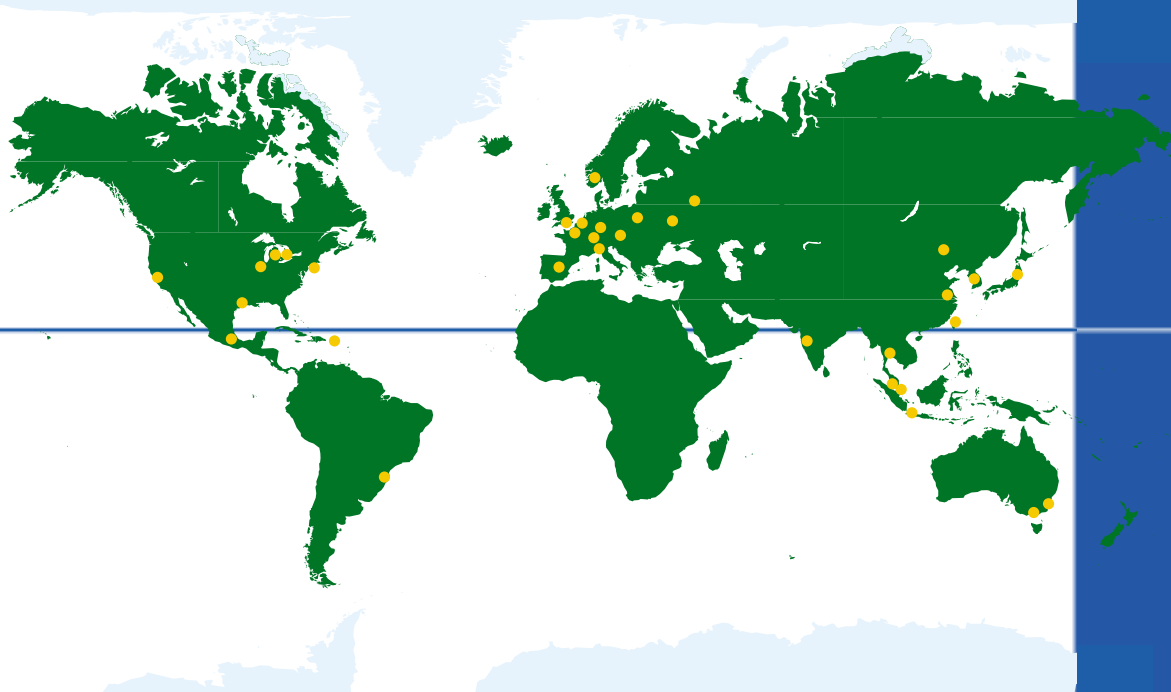


Pall's SLS laboratories are second to none in the filtration and separation industry. Forty computer-networked SLS facilities are strategically located throughout the world. From Pall's principal labs in Port Washington, New York, USA; Portsmouth, England; and Tsukuba, Japan; SLS conducts long-term diagnostic, analytical testing and modeling procedures. In regional labs, SLS focuses on solving customers' problems locally. Sophisticated analytical methods performed include particle counting and contamination analysis, oil analysis, chemical compatibility testing, gas and liquid chromatography, microbial and endotoxin challenge testing, microbial identification, hematology, and biochemical diagnostic testing, as well as all aspects of filter performance evaluation. Many widely recognized techniques for filter performance testing originated at Pall Corporation. Pall SLS also maintains a close affiliation with the international scientific community. With ready access to the latest information on test methods, product performance, regulations, market trends, and other important data, SLS offers a level of service that enables customers to produce success stories, regardless of location, application, or market.

SLS : It's not about Pall products. It's about Pall's promise to be your partner in innovation.



Top: At a customer's facility, an SLS technician samples hydraulic fluid from a Pall filtered system.
Left: SLS Scientist performing filter testing on customer's chemical mechanical polishing system.
Right: An SLS technician performs an evaluation of a wine stabilizing filtration system at a winery.



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