

The real benefits of standardizing on an enterprise-level integrated informatics solution

Pemex relies on Thermo Fisher™ SampleManager™ LIMS software for data integrity, process improvement, operational harmonization and industry compliance.

About Pemex

Pemex is the largest company in Mexico, and one of the largest and most influential across all of Latin America.



The company's operations span the whole value chain of the oil and gas industry, from exploration and production (upstream), to industrial transformation, logistics and marketing (downstream), with a geographic presence across all of Mexico and in nearly every state.

Pemex is one of the few fully integrated oil companies in the world and an integral part of Mexico's economic and social development. With an enormous operation in terms of scope, Pemex carries out extensive exploration and extraction projects every year, generating approximately 2.5 million barrels of oil daily and more than 6 million cubic feet of natural gas; 6 refineries, 8 petrochemical complexes and 9 gas processing complexes, where the company produces multiple refined products in order to meet the specific needs of their customers.

Introduction

One of the greatest ongoing challenges for the oil and gas and petrochemicals industries is the automation of laboratory data capture and analysis. While elimination or reduction of manual processes related to data management leads to considerable product quality improvements, these efforts can also improve compliance with increasingly complex industry guidelines and



environmental regulations. As a result, companies that wish to improve their business operations and shareholder returns and achieve a stronger competitive position are standardizing on Laboratory Information Management Systems (LIMS) across their laboratory networks. Pemex initiated a LIMS standardization project and implemented Thermo Fisher SampleManager LIMS software in all laboratories across its nine gas processing facilities in Mexico, and today is increasing its investment in integrated laboratory software to further advance the company's business goals.

After decades of vertically-integrated state monopolies and limited private participation in the hydrocarbons sector, the Mexican government created a new model by ending the monopoly and allowing direct participation by private parties. The new hydrocarbons law and several other laws regulating the energy sector took effect in August of 2014. Since that industry transformation, Pemex has been involved in a process to modernize their technologies to improve their competitiveness nationally and internationally, moving from out-of-date technologies to advanced industry solutions, like SampleManager LIMS software, which provides the framework to comply with domestic and international regulations while allowing Pemex to realize significant efficiency improvements across their operations.

The key objectives for this significant change to Pemex business operations are:

1. Technology and operational harmonization across Pemex laboratories and integration with existing enterprise systems
2. Compliance with domestic and international regulations
3. Data integrity/quality controls which are more strict since July 2016 when the CRE Mexican Energy Regulatory Commission approved additional rules for oil and gas companies in Mexico to comply with quality of specifications for oil production
4. Compliance with CRE Mexican Energy Commission regulations that require Mexican oil and gas companies to record and provide traceability to quality data through a Laboratory Information Management System (LIMS) that supports compliance with ISO 17025:2005
5. Electronic methodology (Laboratory Information Management System) to provide certificate of origin for products and chain of custody for all samples

Industry challenges

The oil and gas industry faces the consistent, yet ever increasing challenge of improving personnel efficiency, productivity, business intelligence and decision-making, while delivering quality products to their customers, meeting or exceeding financial goals and delivering continuous returns for company shareholders. However, because Pemex has invested heavily in integrated informatics and a proven laboratory software solution across its laboratory network, Pemex has advanced beyond the traditional method of collecting data from different processing facilities and entering and manipulating that data manually. By standardizing on SampleManager LIMS software, an Integrated Informatics solution, Pemex is an example for other oil and gas companies that data management need not be a time-consuming process resulting in a drain on human resources, with transcription errors and omissions leading to questionable data integrity. Laboratory data management is now no longer a weak link in the Pemex daily workflow; it is a routinely automated and relied upon business technology that enhances Pemex operations not only in the laboratory, but across the organization.

Any manual data management process generates a significant amount of paper records, the administration of which is costly due to the reliance on highly-skilled lab personnel performing this important function. But manual data management is also a potential hazard which can lead to loss of confidence in untraceable data or data that cannot be defended to regulators. When data is stored in multiple places and across multiple unconnected systems, it can become nearly impossible to access real-time laboratory information from across the process chain and auxiliary services. With information dispersed across paper and disparate electronic sources, most companies will find it extremely difficult to make timely decisions and to improve or correct operational processes. Also, as international management standards such as ISO 14000, 18000, 9000 and 17025 are updated and become more demanding and companies try to expand their distribution globally, manual laboratory data capture and management become barriers that prohibit easy compliance with these requirements and GMP practices in a timely and cost-effective way.

Additionally, in many large oil and gas companies, there are still no organization-wide standards (i.e. Standard Operating Procedures and adherence to ISO 17025)

for testing and analysis, so routine analysis becomes reliant upon an individual's experience and skill. This presents significant constraints for personnel rotation and harmonized processes across the operations. Moreover, analytical methods, job routines, reports and units often are not unified and consolidated. Loss of any key personnel with this institutional knowledge can be costly and disruptive for any company faced with filling a position requiring years of experience, industry knowledge and company expertise.

Pemex needs

In order to address these challenges, to continue to improve its competitive position and to build on its already significant contribution to the economy of Mexico, Pemex has standardized on a single LIMS solution across all of its gas processing facilities and refineries. The company needed an enterprise-wide system that would automate the data capture and validation process, thus accelerating the analytical cycle. Standardization would contribute to ensuring data integrity, enabling secure access to laboratory information in real time, and reducing duplication of tasks. And an Integrated Informatics solution, standardized across all Pemex laboratories, would help Pemex speed its business decision-making process and continuously improve its practices.

Furthermore, Pemex needed a LIMS solution that would easily integrate with other technologies employed by the company (See Figures 1 and 2), including their ERP System (SAP) and Process Information Management System (OSIsoft PI). As soon as test results were

entered and authorized in the LIMS by the laboratory staff, the information could be immediately available for the technicians and other personnel in the processing facilities, as well as Pemex's headquarters and even directly to Pemex's customers.

It was necessary for the LIMS solution to operate under Good Laboratory Practices (GLP), speeding up operations and improving product quality. Pemex wanted to implement a system that would help enforce the parameters and specifications that certify its products under a strict quality control process and ensure regulatory compliance. Specification checking was also required to achieve tighter control and greater profitability, as well as to contribute to better inventory and shipping management. The LIMS of choice would need to monitor and alert to any safety or quality issues along the supply chain, from the receipt of raw materials such as oil field chemicals, catalysts etc., to the delivery of the final products to their customers. Finally, Pemex needed a LIMS solution that could provide full audit capabilities for routine reporting to regulatory agencies.

How to select an enterprise-level LIMS – the Pemex criteria

Standardizing on a LIMS solution across a company's operations is a strategic decision which demands careful consideration of a number of criteria. Initially, the system must be able to harmonize laboratory practices such as methods, analyses and reports while also eradicating inconsistent information created by manual capture and calculations. It must deliver results within the least time possible and operate as a single integrated solution to simplify administration.

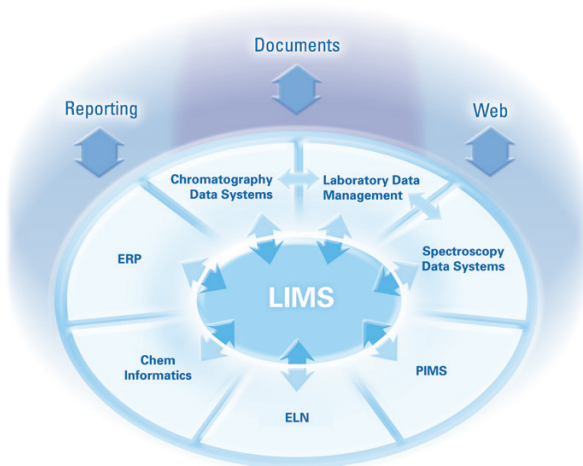


Figure 1: LIMS can be leveraged across the organization by integrating with lab instruments and applications as well as enterprise platforms and systems.

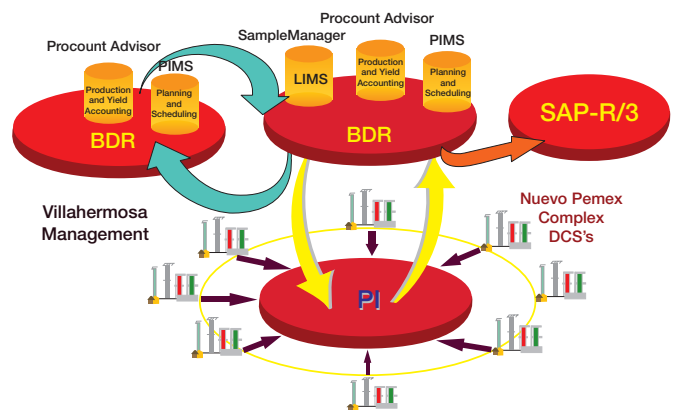


Figure 2: How SampleManager LIMS software integrates with Pemex's enterprise systems.

The system should be able to demonstrate the following proven capabilities:

- Easy to use by all users, both inside the laboratory and externally
- Web access to information (See Figure 3)
- Bidirectional interface to real-time data management systems such as OSI PI
- Bidirectional connection to share information with enterprise systems such as SAP
- Simple configuration tools for extending the LIMS functionality
- Easy to use reporting tool for internal and external reporting/communication requirements

With all the above criteria in mind and after completing in-depth research, Pemex decided to deploy Thermo Fisher SampleManager LIMS software in its gas processing complex in Tabasco State in Mexico in 1998 to initiate the process of standardizing on the LIMS across all of its laboratories. The implementation generated significant productivity gains, which led the company to commence an enterprise-wide LIMS standardization project. At Pemex, Thermo Fisher SampleManager LIMS software was selected as the corporate LIMS solution for all laboratories across the Pemex network. The LIMS has been operating successfully in Pemex laboratories since 1998 and has been updated to its latest version in 2014. The company recently extended implementation of the 2016 release of SampleManager 12 LIMS into their refineries.

Why Thermo Fisher SampleManager LIMS Software

SampleManager LIMS software is the leading enterprise-level LIMS serving the specific needs of the oil and gas industry, with major global companies standardizing on this Integrated Informatics solution. The system provides a single infrastructure, thus providing easy access to queries and administration of information, as well as the capability to unify and consolidate analytical methods, job routines, reports and units. Furthermore, working as a single solution that is easy to access and administer ensures the integrity of the information, eliminating the storage of data locally in personal computers. And because SampleManager LIMS software is fully integrated with laboratory instrumentation as well as enterprise systems across Pemex, the LIMS can be leveraged across the entire scope of Pemex operations, with electronic publishing and fast access to information via standard reports and dashboards. The scope of the LIMS' contribution to Pemex operations is that it improves daily workflow in the lab and ensures data integrity and compliance with regulatory requirements, it enables real-time access to important data from anywhere in the Pemex laboratory network, and ultimately improves decision making across the organization.



Figure 3: Reviewing SampleManager LIMS software data through the Web interface.

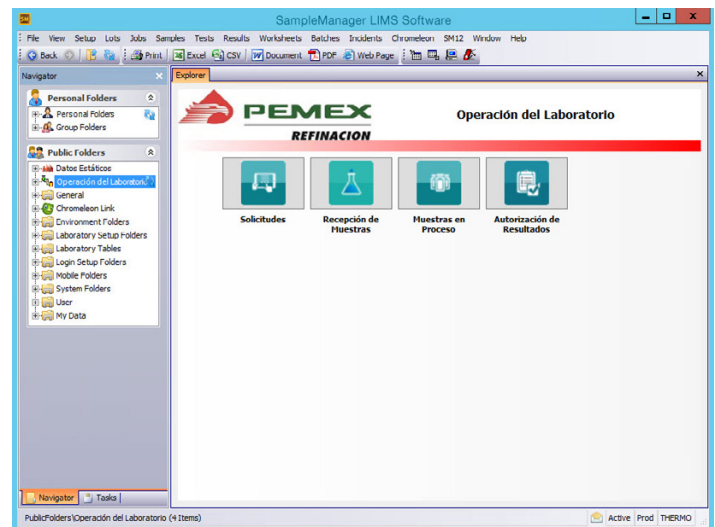


Figure 4: SampleManager LIMS software has an interactive graphical interface that allows users to easily view their sample workflow and sample status.

Laboratory Data Management Solutions

SampleManager LIMS software is capable of supporting both local and global laboratory deployments, is scalable for a large user base and is available in multiple languages. The system integrates all of the laboratories with the process plants and with existing enterprise systems, as well as with desktop applications and laboratory instrumentation, providing a foundation for a complete lab and data management solution.

The benefits

The standardization of SampleManager LIMS software across all of Pemex gas processing facilities has resulted in a significant reduction of the company's production costs. There has been a notable increase in revenues generated by the improved productivity and quality of the products. The use of an enterprise-wide LIMS solution has since helped Pemex to improve product quality and accelerate time to market at a lower cost by converting raw data into real-time knowledge for fast, timely and fact-based business decisions. Cost savings are also achieved since the LIMS generates electronic reports, eliminating paper copies, and saving personnel time typically spent creating and distributing reports.

With a smooth and rapid implementation of SampleManager LIMS software at Pemex, as well as easy-to-use interface for all users, the standardized LIMS solution has also reduced employee training costs considerably and allowed Pemex to rotate personnel across its gas processing facilities, thereby ensuring that institutional knowledge is shared and spread out over the organization. The standardization of the LIMS has also allowed for more effective workflow planning across Pemex laboratories, organizing projects by different levels of priority on a daily basis.

"Since first implementing SampleManager LIMS software, Pemex has continued to turn to Thermo Fisher Scientific for solutions that increasingly automate their processes and raise productivity while driving down the total cost of ownership for a significant software and infrastructure investment," said Oliver Faidi, Commercial Director of Thermo Fisher's Digital Science business. "We are delighted to work with Pemex on standardizing on

SampleManager LIMS software throughout its laboratory operations, and integrating our LIMS throughout the Pemex laboratory network, which will further improve productivity at Pemex. The strength of this long-standing relationship is illustrated by the trust Pemex has placed in Thermo Fisher, in our products and in our commitment to continuous product development to keep pace with the increasing challenges our customers face."

David Herrera, IT Manager for Pemex, says, "It's been the long partnership with Thermo Fisher Scientific that has enabled Pemex to deliver a fully integrated and standardized LIMS solution across our entire operational network. We not only rely on the technology that Thermo Fisher is providing, but it is important to highlight the financial strength, size and resources of Thermo Fisher as a supplier. Such a partnership with a global company like Thermo Fisher has allowed us to minimize the risks of this large-scale software implementation project and to ensure the ongoing success of the LIMS standardization project."

Conclusion

Integrated Informatics solutions are becoming necessary as part of major software and infrastructure projects at many global companies and LIMS standardization is the solution needed in today's high throughput laboratories, requiring automation of laboratory data capture and analysis and regulatory compliance. The standardization of SampleManager LIMS software across Pemex labs generates a number of important and immediate benefits, including considerable reduction in the time needed to successfully deliver results to the lab's customers, and elimination of the risks inherent in the manual handling of data. The availability of consistent and real-time information enables Pemex to continuously improve the production process, the quality control of the end products according to certain specifications, and the implementation of adjustments and corrections during the production process. The end result is a substantial overall reduction in production costs and a rapid return on investment for the Pemex LIMS standardization project.

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