

# Success in Mexico: LIMS Standardization Project

## Better productivity and product quality generate increase in revenues

By Ing. José Manuel Cardel Gonzalez and Oliver Faidi Cortes

Automation of laboratory data capture and analysis is seen as the major challenge facing the petrochemical industry. Indeed, elimination of manual processes leads to considerable product quality improvements while aiding compliance with strict environmental regulations. As a result, companies that wish to remain ahead of the competition are standardizing on laboratory information management systems (LIMS). For example, Pemex Gas and Basic Petrochemicals initiated a LIMS standardization project and implemented Thermo Electron's SampleManager LIMS solution across its nine gas processing facilities in Mexico. This report chronicles their experience.

## Background Details

In 1998, Pemex Gas and Basic Petrochemicals selected SampleManager LIMS for its gas processing complex in Tabasco State in Mexico. The implementation generated significant productivity gains, which led the company to commence an enterprise-wide LIMS standardization project. Pemex Gas and Basic Petrochemicals is a subsidiary entity of Pemex (Petróleos Mexicanos), considered the largest company in Mexico. The subsidiary holds a strategic position in the country's gas industry, processing, storing, transporting, distributing and marketing natural gas, natural gas liquids, gas derivatives and basic petrochemicals.

## Industry Challenges

In general, the petrochemical industry faces fairly standard and consistent challenges that impact personnel, productivity, business intelligence and decision making. Traditionally, data from different processing facilities is captured, entered and manipulated manually, often using multiple systems with proprietary file formats. This cumbersome and extremely time-consuming process results in a tremendous drain on human resources as well as errors and omissions that lead to questionable data integrity.

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Furthermore, the manual process generates tons of paper records, the administration of which is particularly costly and troublesome. The required data is stored in multiple places, making it impossible to access real-time laboratory information from process chain and auxiliary services. With information dispersed across paper and electronic sources, companies find it extremely difficult to make timely decisions and to improve or correct testing processes. Also, as environmental regulations become stricter, manual laboratory data capture and analysis does not help companies to comply easily with requirements in a cost-effective way. Oftentimes there are no organization-wide standards for testing and analysis. As a result, routine analysis is dependent upon individual experience and skill. This presents significant constraints for personnel rotation. Moreover, analytical methods, job routines, reports and units often are not unified and consolidated.

## The Solution

In order to address all these challenges, Pemex decided to standardize its LIMS solution across its gas processing facilities. 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 overlapping of tasks. This would help Pemex speed its business decision making and continuously improve its practices.

Furthermore, Pemex needed a LIMS solution that would easily integrate with other technologies employed by the company, including SAP/R3 and OSI PI. As soon as test results were introduced and authorized in the LIMS by laboratory personnel, the information could be immediately available for the technicians and other personnel in the processing facilities, as well as Pemex's headquarters and laboratory administrators.

In addition, it was necessary for the specific LIMS solution to operate under Good Laboratory and Manufacturing Practices, speeding up operations for increased product quality. Pemex sought to establish a system that would maintain 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 greater profitability, as well as contributing to better inventory and shipping management. The LIMS of choice would need to monitor and alert personnel about any safety or quality issues along the supply chain &#151 from the delivery of goods to the petrochemical company to the delivery of final products to customers. Finally, Pemex needed a LIMS solution featuring an auditing ability for routine reporting to regulatory agencies.

## Suitability Decision

It is not easy to decide whether a LIMS solution is suitable for a standardization project or not. There are a number of criteria that need to be taken under careful

consideration in order to make an informed decision. Initially, the system must be able to harmonize and consolidate laboratory practices such as methods, analysis and reports while also eradicating inconsistent information originated by manual capture and calculation. It must deliver results within the least amount of time possible and operate under a single centralized database to simplify administration. The system should also be easy to use by all laboratory employees and offer Web access to information, PI interface and other capabilities to share information with network systems. Easy configuration and an easy-to-use tool for reporting are also essential for internal and external reporting requirements. With all the above in mind and after completing in-depth research, Pemex decided to deploy SampleManager LIMS.

## Implementation Process

SampleManager is among the leading LIMS serving the specific needs of the petrochemical industry, with major global companies standardizing on this enterprise solution. The system operates via a single centralized server, 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 with a single server that is easy to access and administer will protect and save the integrity of the information, avoiding the storage of data in personal computers as Excel or Word files. Enabling electronic publishing and fast access to information contained on standard reports, SampleManager improves business decision making.

SampleManager is capable of supporting both local and global laboratory deployments, is scalable for a large user base and available in multiple languages. The system integrates the laboratory with the process plant and the enterprise, as well as with desktop applications and laboratory instrumentation, providing a foundation for a complete laboratory automation solution. A three-tier client/server solution operating on Windows environments with an Explorer-driven interface makes the system easy to use. The solution is also fully auditable, satisfying laboratories operating in a regulated environment while being designed, developed and supported within an ISO 9001/TickIT environment.

The standardization of SampleManager across all of Pemex's gas processing facilities has resulted in a substantial reduction of the company's production costs. Indeed, standardization could achieve an estimated production cost savings of more than \$500,000 per year. Already, there has been a notable increase in revenues generated by improved productivity and product quality. The use of an enterprise-wide LIMS solution has helped Pemex 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 have also been achieved because LIMS generates electronic reports, eliminating hard copies and printers. The standardized LIMS solution has also reduced employee training costs and allowed the rotation of personnel across gas processing facilities. Risk of accidents and insurance costs have been reduced since employees are no longer required to transfer documents throughout the different areas of the operation.

LIMS standardization has also allowed for more effective planning of the tasks

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taking place in Pemex's laboratories, organizing them by different levels of priority on a daily basis. Moreover, all tasks for all processor facilities have been consolidated and programmed in the most efficient way. Being an open system, the LIMS has further allowed the integration of equipment and enterprise systems while ensuring remote access capabilities for efficient and effective support.

## Future Developments

Pemex is in the process of standardizing on an enterprise-wide chromatography data system and has selected Thermo Electron's Atlas CDS. The CDS will be implemented in all nine gas processing facilities to extend LIMS capabilities to their chromatography &#151 in effect, initiating a unique automation system combining LIMS and CDS functionalities.

## Conclusion

LIMS standardization is the solution needed in high-throughput petrochemical laboratories, requiring automation of laboratory data capture and analysis and regulatory compliance with the lowest cost possible. The standardization generates a number of important and immediate benefits including considerable reduction in the time needed to conclude the different tasks and elimination of the logical risks generated by manual processes. The availability of consistent and real-time information enables the continuous improvement of the production processes, the quality control of the end products according to certain specifications and the implementation of adjustments and corrections during the production process for improving the final product. The end result is a substantial overall production cost reduction.

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