



LIMS Standardization – The Real Benefits for the Process Industry

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Abstract

Automation of laboratory data capture and analysis is claimed to be the major challenge facing the petrochemical industry. Indeed, elimination of manual processes leads to considerable product quality improvements while also 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). 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.

Background

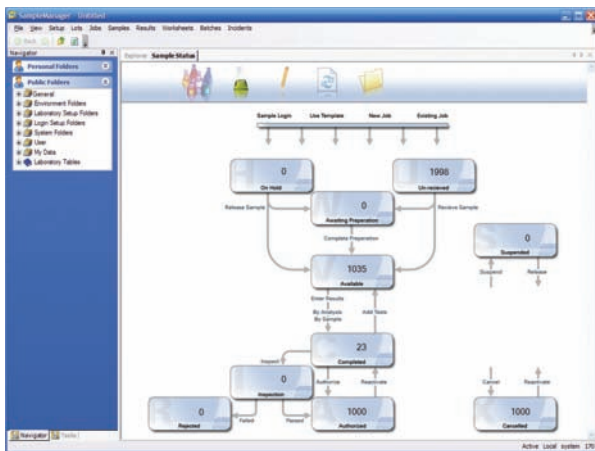


Fig 1 – New SampleManager version 9 from Thermo Electron

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), 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. PEMEX Gas and Basic Petrochemicals employs 12,000 people.

PEMEX's revenues totaled \$86 billion in 2005. The company is the world's third largest producer of crude oil and ninth largest integrated oil company, achieving remarkable proved reserves equivalent to 10 years of production. Its activities include the exploration of hydrocarbons and the production, storage, transportation, distribution and sales of crude oil, natural gas and refined products.

PEMEX operates through four principal subsidiary entities: PEMEX Exploration and Production (crude oil and natural gas), PEMEX Refining (petroleum products), PEMEX Gas and Basic Petrochemicals (natural gas, liquefied natural gas and basic petrochemicals) and PEMEX Petrochemicals (secondary 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 and errors and omissions lead to questionable data integrity.

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 have become stricter, manual laboratory data capture and analysis does not help companies to easily comply with these requirements in a cost-effective way.

Oftentimes there are no organization-wide standards for testing and analysis, so 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.



Fig 2 – SampleManager is used in process environments such as PEMEX

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 circle. 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 the 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 to contribute to better inventory and shipping management. The LIMS of choice



Fig 3 – PEMEX is the largest company in Mexico

would need to monitor and alert to any safety or quality issues along the supply chain, from the delivery of goods to the petrochemical company to the delivery of the final products to the customers. Finally, PEMEX needed a LIMS solution featuring an auditing ability for routine reporting to regulatory agencies.

Deciding on the Suitability of a LIMS Solution

In general, 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 standardize and consolidate laboratory practices such as methods, analysis and reports while also eradicating inconsistent information originated by manual capture and calculus. It must deliver results within the least 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 to attend to internal and external reporting requirements.

With all the above in mind and after completing in-depth research, PEMEX decided to deploy Thermo Electron's SampleManager LIMS™.

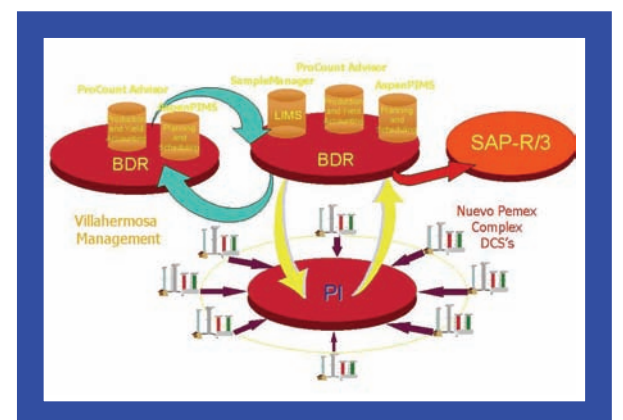


Image 4 – PEMEX needed a LIMS that will integrate with SAP

Analytical Instrumentation

Why SampleManager LIMS?

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 protects and saves 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 a Explorer driven interface makes the system particularly easy to use with the least training possible. 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 Benefits

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 over \$500,000 per year. Already 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 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



Image 5 – Thermo's SampleManager version 9 is scalable for a large user base

fact-based business decisions. Cost savings were also achieved since LIMS generates electronic reports eliminating hard copies and printers.

With a smooth and particularly rapid installation for PEMEX, as well as easy-to-use interface for all laboratory employees, the standardized LIMS solution has also reduced employees' training costs considerably and allowed PEMEX to rotate personnel across its gas processing facilities. Risk of accidents and insurance costs have been reduced since employees no longer manually transfer documents throughout the different areas of the operation.

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

Following the extensive benefits generated by LIMS standardization, PEMEX is now 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. By July 2006, it is anticipated that PEMEX Gas and Basic Petrochemicals will initiate one unique automation system combining LIMS and CDS functionalities.

Conclusion

LIMS standardization is the solution needed in today's high throughput petrochemical laboratories, requiring automation of laboratory data capture and analysis and regulatory compliance in 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.