



Improving Productivity in the Petrochemical Industry

The Benefits of an Integrated Enterprise Level LIMS Solution

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Companies in the petrochemical industry face many challenges that impact productivity and decision-making. Today's high throughput petrochemical laboratories need tools that not only automate laboratory data capture and analysis but also facilitate connectivity to help them improve enterprise-wide communications, reach critical decisions faster and produce timely, accurate reports on end products. This article will provide an insight into the challenges faced by the petrochemical industry and will use an application example to demonstrate the benefits achieved when utilising an integrated enterprise level laboratory information management system (LIMS) to connect the organisation.

Integration Challenges within the Petrochemical Industry

Within the petrochemical industry, most IT and automation systems employed at production plants are an amalgamation of disparate systems, operating independently from each other. These systems are often sourced from different suppliers and vendors, selected according to the needs or market trends in force at the time. A data system created in this manner can prove to be a time-consuming maintenance job for IT personnel, particularly if the systems are managed in isolation rather than as a single integrated solution.

The petrochemical industry faces the consistent, yet ever more difficult challenge of improving personnel efficiency, productivity, business intelligence and decision-making. Traditionally, data from different systems is captured, entered, compared and manipulated manually, often using multiple systems with different user interfaces, data dictionaries and proprietary data structures. This can be a cumbersome and extremely time-consuming process, resulting in a tremendous drain on human resources, as well as the potential for errors to occur, leading to questionable data integrity.

A solution that enables connectivity between LIMS and laboratory instruments, equipment and other resources is crucial to remove this bottleneck. It is important to be able to integrate laboratory-generated data with ERP systems, PIMS, MES and other collaboration tools throughout the organisation. The integration of informatics solutions with a variety of enterprise systems is particularly relevant in today's business climate, where speed, accuracy and efficiency are critical. Companies working in the petrochemical industry need to be able to make decisions in response to raw materials inconsistencies and condition changes in the manufacturing process, to ensure the consistent quality of the end product and the safety of the environment.

The lack of a coherent strategy for systems, instrument or software integration can result in data redundancy stemming from the same data existing in different systems. Master data being defined several times within different automation and IT systems affects data integrity, consistency and increases the maintenance overhead and adds additional costs for integration/interfaces between the different systems.

Adding to these difficulties is the lack of interoperability between the different products from market leading vendors. The result is that the technologies implemented can often result in a data silo, mentality leading to information gaps as well as functional overlaps and data redundancy.

Further problems include:

- Fragmented support from individual vendors or IT personnel not fully trained in all the various systems
- Complex software upgrades required for disparate systems originating from different vendors

- Error-prone manual work due to a limited data exchange and availability at all levels for all systems/users.
- Difficulty in performing implementing new requirements
- Mis-match of terminology between similar systems
- ERP systems failing to utilise the referential and dynamic data of sub systems.
- Inability to fully benefit from the capabilities and data of real-time systems
- Changes in one system that has a knock on effect across other systems

An integrated solution is needed that assimilates data from all systems, instruments and software. In petrochemical plants most processes require information such as plant hierarchy, plant configuration areas, equipment definition, streams definition etc. At least 20% of the tables that store this information are shared between two or more applications. In addition, multiple systems offer source data for common reporting, data warehousing, data mining and analysis. They use standard networks and are implemented using open software systems and technologies. This open architecture and commonality amongst the systems provides a solid foundation and justification for better and more seamless integration. By leveraging and sharing the data, faster and more informed decisions can be made about operational conditions.

Application Example

Thermo Fisher Scientific has worked with many of the leading global oil and gas companies to complete enterprise-wide deployments of its Sample Manager LIMS with the aim of reducing costs and increasing productivity, while ensuring optimum product quality and regulatory compliance. One of the world's largest petrochemical companies with major manufacturing facilities around the world needed a LIMS to ensure its products are of a certain quality, optimise the efficiency and throughput of its continuous processes, keep within governmental safety standards, and control its processes with rigorous testing and real-time monitoring.

The company decided to invest in a LIMS capable of ensuring optimum quality control in its manufacturing plant in Singapore. Like many of today's petrochemical manufacturing businesses, this particular company is under continual pressure to control costs and increase efficiency whilst ensuring the quality of its petrochemical and chemical products.

To achieve this, a LIMS was required to ensure that the correct tests were performed on its products at the correct time and ensure that a record of conformance with internal and external standards and regulations was produced. The company looked for a solution to sort test information and organise it into specific report formats in order to meet customer requirements. They also required a solution that would manage the

complete testing routine from sample login to preparation, testing, re-testing, and final reporting. In order to meet these requirements, the company began to look for a LIMS that would provide efficient and accurate data and information on the production process and product quality. A key demand for the LIMS was to support the streamlining of laboratory information work flows while monitoring both the quality of the product and ensuring a clean and safe environment.

Furthermore, a LIMS solution was required that would easily integrate with other technologies employed by the company, including their ERP system (SAP) and Process Information Management System (OSI PI). The LIMS solution needed to provide full audit capabilities for routine reporting to regulatory agencies. Like all major oil and gas companies, the business also faces pressures from environmental regulations, therefore a LIMS was required to ensure environmental samples were taken regularly and reported back accordingly.

Following the successful implementation of Thermo Scientific Sample Manager LIMS at its manufacturing plant, and in line with an IT model, the company decided to commence an enterprise-wide LIMS standardisation project, implementing Sample Manager LIMS across 27 of its production sites across the US, Europe and Asia Pacific. This global IT solution would speed the company's business decision-making process and continuously improve its practices as well as delivering a consistent IT framework throughout the organisation. It is a continuous program rolling new LIMS implementations as plants are acquired.

Sample Manager LIMS impacts the wider organisation, integrating the laboratory with the rest of the enterprise by interfacing LIMS with SAP, OSI PI, Honeywell PHD and Yokogawa Exaquantum to name just a few. Since each plant may have its own unique combination of IT applications, it was a requirement that the Sample Manager LIMS should be able to fit within the local framework, whilst delivering the same business information capability. By linking Sample Manager with these applications, the company can bridge the gap between laboratory generated data and the enterprise level information that is required for mission-critical management decision making.

The data are accessible not only to laboratory staff and engineers monitoring the production process, but also to business managers, suppliers and even customers, enabling the business to maintain profitable margins as well as improve customer satisfaction. Sample Manager can also provide internet based access to visualise online data, product status, end product characteristics and quality reports, extending the reach of the system beyond the laboratory.

Benefits

The benefits of better and more consistent quality products, faster and more informed decision making,

higher customer satisfaction, and maintained or increased profit margins can all be obtained by adopting an enterprise integration approach. By implementing a coherent strategy that can integrate data from LIMS, CDS (chromatography data systems), ERP, MES, ELN (electronic laboratory notebooks) and other sources across the enterprise, both the business and customers benefit.

For companies working in the petrochemical industry the need for integration between production and quality has never been greater. In the chemical and petrochemical industries particularly, increasing demands on production coupled with stringent quality requirements means that it is no longer acceptable to maintain islands of information in areas that impact so heavily on each other. Between the production plant and the laboratory that is analysing data, there is a need for regular exchange of information about product quality and analysis values.

In order to leverage the full benefits of ERP, all

aspects of the business, including the laboratory, need to be able to supply and receive data that drives decision making within different business functions, from logistics, through to manufacturing, to sales and marketing activities.

Petrochemical companies are working in an increasingly stringent environment. They are under increasing financial pressure to conduct projects with minimum cost, to deliver professionally, on-time and within budget. Partnering with companies who already have many years of integration project expertise, such as Thermo Scientific, ensures that the goals and benefits are achieved.

Conclusion

Efficient integration and appropriate interfacing, creating seamless IT communication, is essential for achieving streamlined data management and successful business management. LIMS standardisation

is the solution required in today's high throughput petrochemical laboratories. It is imperative for petrochemical companies to extract greater leverage and utilisation from their existing enterprise data systems and LIMS investments to enable them to respond with more certainty and more accuracy to the many challenges facing them today. The availability of consistent and up to date information enables the continuous improvement of production processes and quality control of the end products according to customer specifications.

Petrochemical organisations should consider their overall systems, how each system is or can be integrated with the overall systems structure, and its benefit to the organisation. Careful consideration should be placed in the investment in IT and management systems that sustain potential future demands of the company and have the capacity to accommodate IT additions and alternative systems, creating as little disruption to the information management as possible.