

Five ways a LIMS improves upstream oil and gas operations



The oil and gas industry is under immense pressure to produce more energy at lower costs with less emissions. And nowhere is this pressure felt more than in the upstream organisations, who must find ways to increase workflow efficiencies to cut costs and remain competitive. However, many upstream oil and gas companies have archaic digital infrastructure, which poses several challenges. In particular:

- Data is often siloed, making it harder to access, analyse, and draw insights from
- Labs may still use manual processes, which are inefficient and can cause errors
- Some organisations may be left with weaker data security, increasing the chances of data loss and breaches
- Data integrity can be poor, making it less reliable
- Data is not managed properly, making it difficult to demonstrate regulatory compliance

Having to deal with these difficulties can hinder upstream oil and gas companies, making their processes lengthy and expensive. Consequently, such companies are less competitive, and lose growth opportunities and potential earnings. So, how can organizations overcome these challenges and optimise their workflows?

Implementing a lab information management system (LIMS) could be the answer. With a LIMS, companies can better manage data, processes, and workflows, for highly optimised operations. In this article, we look at five benefits a LIMS brings to upstream oil and gas companies.

1. Better-informed decision making

Data generated at every step of the workflow is extremely valuable in the upstream oil and gas industry, as it holds the information that companies need to make insightful decisions. But the true value of data can only be unlocked if it is centralised and accessible in real time — something which isn't possible with archaic digital infrastructure.

However, a LIMS is able to overcome these challenges. By connecting all the people, equipment, consumables, systems, and data involved in workflows (such as data from manufacturing execution systems (MES), plant information management systems (PIMS) and enterprise resource planning (ERP)), a LIMS ensures data is centralised, captured, and accessible in real time. The LIMS can then use this gathered data to generate informative reports and display dashboards, enabling personnel to easily identify any key trends and insights, and ultimately, make more informed decisions.

Additionally, since an advanced LIMS collects all the data automatically, it makes data collection easier and quicker, and removes the risk of human error.

2. More efficient workflows

Workflow efficiency is a major challenge for oil and gas companies that still rely on archaic digital infrastructure. However, by implementing a LIMS, companies can drive workflow efficiency in multiple ways:

Easier sample management

Samples in the oil and gas industry can have a long journey from collection to analysis. To keep the workflow running smoothly, samples must be carefully tracked at each stage, and any testing and results clearly recorded. When using archaic systems, though, data recording is often manual, making it slow and resource-intensive, and consequently expensive. As well as making the workflow inefficient, manually recording data can be extremely laborious for the personnel involved, too.

To make sample management more efficient, an advanced LIMS offers bidirectional data transfer. This means data is automatically pulled off all the different instruments used in the workflow, eliminating the need for manual data input and transfer. Personnel can also record necessary tracking data for samples by scanning barcodes, allowing them to register where a sample is at a given time with ease. Reducing manual data input saves time, therefore increasing workflow efficiency.

Streamlined reagent and consumables management

Labs use significant quantities of reagents and consumables, but archaic digital infrastructure cannot easily and accurately track reagent and consumable use in real-time, making consumables management tricky. Consequently, personnel may run out of these unexpectedly, which can interrupt workflows.

However, with a LIMS, personnel can easily see where reagents and consumables have been stored, how long for, and their stock levels. Using this information, a LIMS can issue re-order alerts for any reagents and consumables, making sure personnel always have what they need to perform their duties. That way, there are no unexpected disruptions, and analytical workflows remain efficient.

Planned instrument downtime

Instruments require maintenance over time — but any unplanned repairs, checks, or calibrations can cause delays. With archaic digital infrastructure, labs do not have the instrument oversight and management needed to predict or schedule any instrument downtime.

To avoid workflow disruption, companies can use a LIMS to schedule maintenance in advance. Doing so means personnel can plan their workflow around instrument downtime, which is vital to keep processes running smoothly.

Reduced manual work

As mentioned, many processes within the upstream oil and gas industry are still manual, which can be highly time-consuming. A LIMS can overcome this by automating certain digital processes, such as data collection from instruments, issue flagging, and report creation. It can also work with other systems that automate physical parts of the workflow. For instance, the LIMS connects to workflow scheduling software that can control instruments and robotics, enabling bidirectional data transfer. Reducing the number of manual tasks performed in this manner is pivotal to making workflows more efficient.

3. Enhanced personnel safety

In the upstream oil and gas industry, personnel regularly work with hazardous substances. To improve safety, personnel must comply with SOPs — but if they aren't followed correctly, or untrained personnel perform tasks, there is a serious risk of injury. What's more, companies that fail to comply with SOPs can have their operations shut down. With archaic infrastructure, there is no way to guide personnel through procedures and help them follow SOPs correctly.

An advanced LIMS, though, can improve lab safety in multiple ways. It ensures personnel have gone through the necessary training before being allowed to perform certain tasks, for example, thereby stopping untrained personnel performing high-risk activities. A LIMS can also guide analysts through each step of a method, ensuring SOP compliance.

And that's not all. A LIMS also has additional features to further support industry safety:

- Constant collection of safety parameter data such as temperature and pressure, allowing personnel to have a real-time overview of conditions
- Environmental monitoring capabilities that ensure air quality, waste disposal, and other parameters are within safe and compliant limits
- Alerts for any out-of-specification results or unsafe conditions, immediately making users aware so they can take action

Overall, through these features, a LIMS can help make sure that personnel are working in the safest environment possible and are able to take immediate action when any anomalies arise.

4. More secure data

Upstream oil and gas industries manage a lot of sensitive and confidential data. When using legacy systems, data can be less secure, leading to a higher risk of breaches, which can be extremely costly to an organisation, both financially and reputationally.

To increase data security, a LIMS uses identity and access management systems, including OAuth2.0, which ensure that only authorised personnel can access it. What's more, a LIMS can be set up for multi-factor authentication, leading to more secure data and thereby minimising the risk of data breaches. As an added layer of protection, a LIMS can offer data backup, disaster recovery, and information security monitoring.

5. Simpler compliance

During upstream oil and gas industrial processes, personnel must determine the quality of their products by testing composition and purity and checking for contaminants. To demonstrate their ability to deliver reliable results, labs need to comply with the global standard ISO 17025. But doing so can be challenging using archaic infrastructure, since it doesn't allow labs to fully manage the testing process, and lacks the traceability needed to prove compliance.

To support oil and gas testing laboratories, a LIMS can be configured to comply with ISO 17025. It maps complete lab processes, breaking each one down into reusable workflow sections that can be applied across the company's testing and process workflows (see: slideshow above). By making workflow sections reusable, it ensures labs can build reliable testing workflows that comply with ISO 17025. And to help labs prove compliance, a LIMS can make and keep technical records, with any changes to data fully recorded and traceable in a detailed audit history, significantly simplifying the process.

Optimise data, process, and workflow management with a LIMS

From inefficient, error-prone manual processes to difficulty proving compliance, archaic digital infrastructure causes numerous challenges for the upstream gas and oil industry. Companies are subsequently less competitive, and can end up hindering their growth and earnings potential. To remain viable and profitable, companies need to ensure they are using up-to-date solutions.

A LIMS is one such solution, helping upstream oil and gas organisations overcome these critical challenges by better managing data, processes, and workflows. Companies that adopt them can make more informed decisions, and have more efficient workflows, enhanced personnel safety, more secure data, and simplified compliance — leading to optimised operations that make them highly competitive.

Tareq Alnajjar is a Global Strategic Account Executive of Energy, Digital Science Solutions at Thermo Fisher Scientific. He has extensive experience identifying, establishing, and expanding market/product presence in the oil, gas, and energy arenas. With his most recent experience as the VP of International Business Development/Investor Relations at Vacom Systems LLC from 2015 – 2022, Tareq joined Thermo Fisher Scientific in February 2022 to bring his expertise into the team supporting Thermo Fisher's LIMS software portfolio. Tareq has a Bachelor of Science Degree in Electrical and Computer Engineering from the University of Utah and a Master of Business Administration (MBA) from the University of Utah David Eccles School of Business