

Sakhalin Energy utilizes LIMS for largest Russian LNG project ever

Sakhalin Energy is bringing onstream one of the largest integrated oil and gas projects in the world in Russia's Far East. The Sakhalin II Project combines partnership incorporating the recovery, production and transportation of oil and liquefied natural gas (LNG). Sakhalin Energy standardized on Thermo Scientific™ SampleManager™ LIMS software for use in its main laboratory located at its LNG plant/oil export terminal (OET), as well as in upstream satellite laboratories throughout Sakhalin Energy.

Profile

Headquartered in Yuzhno-Sakhalinsk in Russia, Sakhalin Energy was founded to develop the Piltun Astokhskoye (PA-A) oil field and the Lunskeye gas field east of Russia. The fields are located off the north-east coast of Sakhalin in waters frozen for six months of the year.

The Sakhalin II project refers to the world's biggest integrated oil and gas project. It is being built from scratch in the harsh subarctic environment of Sakhalin Island located in the Sea of Oshotsk. Sakhalin II is the largest single foreign investment project in Russia at \$10 billion, and is the first offshore development project in Russia, as well as Russia's first liquefied natural gas (LNG) project.

The two fields contain reserves of approximately 140 million tons (1 billion barrels) of oil and 550 billion cubic meters (20 trillion cubic feet) of natural gas. The oil reserves equate to more than one year of crude oil exports from Russia and the gas reserves represent nearly five



years of Russian gas exports to Europe or enough to supply current global LNG demand for four years. To export the gas, the company is building Russia's first-ever LNG plant, which converts the gas to a liquid by cooling it to a temperature of minus 161 degrees Celsius (minus 258 Fahrenheit) so that it can be transported by ship.

The Sakhalin LNG plant will be the world's second in a cold climate. The gas will be transported from the gas field platform by pipelines to an onshore production facility (OPF) and then via an 800 km onshore pipeline to Prigorodnoye in the south of Sakhalin Island, the site of the LNG plant and oil and LNG export terminals. The OPF's main purpose is to process gas and condensate produced at the Lunskoye gas field before pumping them into the pipeline system for transportation to the oil export terminal and LNG plant.

Prigorodnoye's ice-free sea makes it a perfect location to enable full year round export of oil and LNG. Divided over two liquefaction trains, the LNG plant has a capacity to produce a total of 9.6 million tons of liquefied natural gas. Shell's Double Mixed Refrigerant (DMR) process was selected for the Sakhalin plant. This DMR technology was specifically developed for cold climates like Sakhalin has, and for locations with large seasonal temperature variations. Under these circumstances, DMR achieves much higher power utilization than the conventional C3/MR process would of the 88 MW GE Frame-7 gas turbines that drive the refrigeration process.

Sakhalin is located close to emerging economies in Asia and will guarantee uninterrupted supply of LNG to Asian markets year-round. Customers in Japan, South Korea and the U.S. have already bought all the gas to be produced at Sakhalin for the next 20 years.



Sakhalin lab technician Yuri Efitsenko

Requirements

The Sakhalin II Project is the largest integrated oil and gas development project in the world and as such, has a major undertaking for sampling and testing. Environmental and Health and Safety compliance have been important drivers in the development of Sakhalin II both to monitor the field operations and plant processes and to measure product specification and quality test the products. The function of the laboratories on Sakhalin Island include quality testing of oil and gas, process monitoring at LNG plants, testing at upstream facilities and environmental monitoring across the island.

In order to provide a real-time round-the-clock analytical regime, an ultra-modern laboratory was commissioned to be located at the LNG plant/OET. This new central laboratory is also supported by upstream satellite laboratories. The state-of-the-art LNG/OET laboratory successfully passed certification tests to the requirements of Gosstandart and the international ISO17025 standard.

Laboratory specialists are now analyzing samples of oil, gas, chemicals and wastewater from the LNG/OET site. In addition, the laboratory will be used to analyze, as required, samples brought from the onshore processing facility (OPF) as well as managing non-routine samples.

The decision to invest in a new LIMS to manage the sampling process from upstream to sample report was imperative for Sakhalin Energy's new laboratory. Sunil Pandya, the Head of Laboratory for Sakhalin Energy, explains, "Our laboratory has well-defined procedures for essential quality control work, for scheduling samples, to managing resources and reporting on samples. To manage the workload and integrate with the instrumentation, we selected Thermo Scientific SampleManager LIMS software for the laboratory. The LIMS is widely used for the oil and gas industry and it is implemented in our main laboratory, in the upstream satellite laboratories as well as for data management of environmental monitoring throughout Sakhalin Energy operations."



Solution

The laboratory provides analytical services to the LNG/ OET facilities. It generates analytical reference data for product quality and custody transfer invoicing, calibration of on-line process analysers, plant performance, equipment condition and environmental monitoring. It also provides expert advice on LNG and crude oil Sales Purchase Agreements (SPAs) and plant troubleshooting. It also provides ad-hoc laboratory services to other Sakhalin Energy assets (OPF, pipelines, offshore platforms).

The majority of samples are taken by operations staff and delivered to the laboratory. Laboratory staff train the senior operators and maintenance technicians to collect samples. Laboratory staff collect special samples that require complex sampling techniques, such as 2-phase samples, flue gas, etc. The sampling and testing requirements are agreed and scheduled with operations, engineering, environmental and technology departments.

Various internal customers use the analytical reference data;

- Operations for plant performance monitoring and product export
- Engineering for equipment condition monitoring
- Technology for efficiency checks and troubleshooting
- Environmental services for environmental monitoring and compliance
- Marketing for customer liaison support
- Finance for invoicing

Objectives

- To provide unbiased laboratory services and advice to LNG/OET and third parties in a timely, accurate and reliable manner
- To achieve and maintain a high standard in health, safety and environmental performance

The new LNG/OET laboratory handles the samples coming from upstream operations, through the LNG plant and the final products. The analyses of final products are performed when the LNG storage tanks are prepared and isolated or during the ship's loading. When sufficient reproducible results are obtained, the mean and weight average composition are both calculated. The mean composition of each cargo is used to calculate density and gross heating value and all values are included on the Certificate of Quality.

Any data required by the business is automatically available from the LIMS with sophisticated automatic data transfer. The LIMS is used to interface seamlessly with critical IT systems including Sakhalin Energy's corporate Energy Components (ER) package and Process Information (PI) system for efficient reporting and documentation support.

Thermo Scientific SampleManager LIMS software was selected by Sakhalin Energy because of its pedigree in this industry. A proven system that works in the rugged demanding environs of the oil and gas industries, the LIMS is used in many organizations needing to demonstrate regulatory compliance while ensuring optimum product quality. The company required a LIMS that could provide documentation of compliance with ISO 17025, which is the international standard for analytical laboratories developing their data management systems for quality, administrative and technical operations.



Benefits

The Sakhalin Energy facility handles the entire process from extraction to issuing SOPs and Certificates of Quality with all samples tracking managed from within the LIMS system. The laboratory has to operate according to GLP/OECD guidelines and uses SampleManager LIMS software to demonstrate its procedural conformity.

Sakhalin Energy staff use the LIMS 24/7 to help manage the data from the thousands of samples that are required throughout the sampling stages on Sakhalin Island. Some instruments of the laboratory are planned to be connected into the LIMS so that reports can be accessed centrally and instruments can be scheduled for calibration, etc. from within the LIMS. The data from the facility's state-of-the-art equipment, including GCs, is all directly transferred into the LIMS, which is tasked with storing and tracking data processed in the laboratory. The LIMS is also used for data trending and analysis, or to identify when product is moving out of specification.

Since the implementation of SampleManager LIMS software at the LNG/OET laboratory, major benefits realized include improved sample turnaround times, centralized access to data and improved operational efficiencies. The system also meets the laboratory's need for GLP and ISO17025 compliance. The solution has been capable of handling standard and non-routine sampling requirements, providing audit trails to track deviations and amendments to each study.

Sunil Pandya explains "SampleManager LIMS software was selected due to its proven performance within the Shell group of companies and in this industry. Our laboratories have been designed from the ground up to support this site – this project represents the new frontier in oil and gas development and our laboratory needed a LIMS that was proven to be reliable in this environment and dependable for the future of the project."

Conclusion

Sakhalin Energy is Russia's largest project in the oil and gas industry and its ultra-modern laboratory has been designed to provide the scientific background to ensure LNG production is maintained year-round. With both a commercial and a scientific driving rationale, Sakhalin Energy has equipped its laboratories with the technologies and infrastructure that allow it to deliver consistent support to the production and shipping cycle of finished product. To deliver this reliability of service while demonstrating regulatory compliance, Sakhalin Energy has standardized on SampleManager LIMS software in its new state-of-the-art LNG/OET Laboratory. Since its implementation, the system has allowed Sakhalin to develop and manage a sophisticated sampling program with the objective that all the LNG supplies for the emerging Asia markets will be delivered from Sakhalin Island for the coming decades.

SampleManager LIMS Software helps Sakhalin Energy meet ISO 17025 requirements

The ISO 17025 standard, General Requirements for the Competence of Testing and Calibration Laboratories, covers laboratories using standard, non-standard and laboratory-developed methods. This international standard is the accepted standard for analytical laboratories developing their data management system for quality, administrative and technical operations.

There are several critical areas of compliance for any oil and gas operation, including security, instrumentation calibration, maintenance of electronic records, traceability of procedures and personnel and environmental and equipment monitoring. The ability of laboratory managers at Sakhalin Energy to have control of this vital information is an important aspect of the oil and gas operation and ensures that production can continue uninterrupted by changes related to environment, personnel, instrumentation or equipment that falls out of calibration or becomes damaged in the production process.

SampleManager LIMS software offers a centralized system to access data and extract information, enabling effective management of laboratory operations. The LIMS provides evidence and documentation to support laboratory compliance with ISO 17025.

SampleManager LIMS software addresses the security required for laboratories conducting testing in their “permanent facilities, at sites away from permanent facilities, or in associated temporary or mobile facilities,” by providing full security controls, including “group security,” which can be used to segregate work from different clients or in different laboratory areas. The LIMS has enhanced functionality that covers a broad range of requirements, including validation of methods, instrument calibration, sampling, control of non-conformance testing and reporting of results.

To meet ISO 17025 requirements regarding the “control of non-conforming testing and/or calibration work”,

SampleManager LIMS software has built-in functionality for incident management and statistical analysis of both calibration standards and sample results. The LIMS also automatically maintains all electronic records and makes them available for either reviewing or reporting, and has built-in archiving, which allows for the removal of older records once their retention period has expired. Full audit trail facilities are standard, allowing full traceability of the personnel and the procedures that were entered. These built-in capabilities allow laboratories to more easily review their quality system by having ready access to all incidents, corrective actions, non-conforming results and other events.

To address the Technical Requirements of the standard, SampleManager LIMS software has built-in functionality to handle environmental monitoring, a critical component of laboratory compliance with ISO 17025. Within the LIMS, environmental monitoring of key areas of the laboratory can be scheduled on a routine basis. Certain instrumentation can be connected via the Instrument Manager function, and data can be collected and logged at periodic intervals. Validation of methods is a critical ISO 17025 requirement, and the LIMS has built-in functionality to allow lab managers to be in continuous compliance. Batch Management functionality provides analytical QA/QC support, including automatic and interactive sample assignment according to pre-defined templates.

Equipment and instrument calibration, also an important part of ISO 17025, is managed by the LIMS through Instrument Calibration Scheduling, allowing the LIMS to prevent the use of any instrument that is past its calibration due date. SampleManager LIMS software provides reporting that indicates which instruments are out of compliance or need calibration. Finally, to comply with ISO 17025 reporting requirements, existing functionality includes powerful and flexible report writing, making it possible to create any report format required by the laboratory, and including any data stored within the SampleManager LIMS software database.

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