



Online LIMS installation at Teck Cominco Metals Ltd., Analytical Services, Trail, BC

DRAFT -Version 2 (RSD)

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Introduction

Teck Cominco Metals Ltd. (TCML) underwent a very extensive and thorough LIMS selection process that included on-site demonstrations by various LIMS vendors as well as visits by Teck Cominco's LIMS selection committee to other North American labs that were already running and using some of the LIMS that had potential. At the end of this process, Online LIMS was selected as the Laboratory Information Management System to be installed at TCML's main lab in Trail, BC. A number of factors weighed into TCML's selection process. Here are a few.

- Performance, from system and human perspectives
- Ability to support current, laboratory work practices
- Ability to manage unit of measure variation
- Ability to transmit data from instruments
- Ability to forward data to other systems
- Requirement for customers to have a client view of their LIMS data
- Requirement for a view showing multiple samples and elements
- Implementation timetable
- Client References
- Cost

Teck Cominco and Lab Description

This laboratory supports most of the analytical requirements for Teck Cominco's metallurgical operations in Trail, British Columbia. Assays include raw materials, process streams, final products, and samples from a variety of other sources: research, environment, technical support and hygiene. The metallurgical operation in Trail is one of the world's largest non-ferrous smelting and refining complexes and its principal products include refined zinc, lead and silver. Through a number of fully integrated processes, a variety of other specialty metals are produced: indium, germanium, gold, bismuth, cadmium, copper sulphate, sodium antimonite, sulphuric acid, liquid sulphur dioxide, ammonium sulphate fertilizers, and ferrous granules. In the year 2000, Trail produced 272,900 tonnes of zinc, 91,300 tonnes of lead and over 12 million ounces of silver.



The Lab's sample throughput is 120,000 - 140,000 samples per year, publishing an average of 7 tests per sample. Operating on a three-shift schedule, it usually provides the Operations facility with the requested analytical results within a few hours of sampling and delivery to the lab. Prior to this LIMS installation, the laboratory used an in-house LIMS operating on an MVS mainframe.

Installation Strategy

One of the main challenges in any LIMS upgrade was the ability to successfully complete the installation and training with minimum disturbance to the daily work and data flow of the Lab. Tight turnaround times and schedules need to be maintained throughout the installation process.

The LIMS suite consists of a number of modules designed around the natural division of labour between the lab administration and laboratory technicians.

Modules	Abbreviations	Function
Management:		
OnSample	OnSPL	Sample manager
OnView	OnView	Client module
OnSetup	OnSetup	LIMS configuration
Production:		
OnWorksheet	OnWSH	Instrument interfacing and data collection
OnLineQualityControl	OnLQC	Quality Control and Quality Assurance (also a management tool)

Online LIMS implementation at TeckCominco was done in two phases:

1. Phase one: Lab Production
2. Phase two: Lab Administration

Phase one - Lab production

December 2001 to March 2002

Phase one involved two primary activities:

1. installation and training of the lab bench modules: Online Worksheet (OnWSH) and Online QA/QC (OnLQC) , and
2. development of a custom interface between the Online Worksheet and Teck Cominco's MVS mainframe LIMS

The first phase of the installation covered the automation of the laboratory at the analytical level and it included the installation and configuration of Online Worksheet and the QC modules. This phase also included training and setup of worksheet templates.

The Online Worksheet was designed to free the main LIMS from complicated algorithms and data intensive operations at the lab bench. Online Worksheet forwards only the final formatted analysis result to the main



LIMS. Another important characteristic of Online Worksheet was its ability to be easily customized to communicate with the existing LIMS through the use of 'plug-in' technology.

This stage of the installation only affected the lab technicians. The Online Worksheet was used to forward the final analysis results from the instruments to Teck Cominco's existing LIMS. The continuous flow of data was successfully maintained and there were no interruptions on the reporting of the results.

Online Worksheet was highly customizable through templates (similar to Excel). Most of the effort on this first phase was to setup the worksheet templates for each individual, analytic method.

The Online Worksheet and Online QA/QC (OnLQC) modules have many features to help optimize and simplify the data workflow on the lab. Of greatest value are the MS Excel-like formulas that permit entry of primary data used in the calculation of final, analytical results. The worksheet interacts with OnLQC to evaluate results, and then forwards those results to the LIMS database, making them published. At this point, clients may view their analytical results anywhere in the Operation.

Lab administration - Second phase installation

April 2002

Phase two involved three primary activities:

1. installation and implementation of the lab administration modules: OnSample and OnView modules to replaced the previous LIMS.
2. data migration, of one year's activity, from Teck Cominco's LIMS to OnSample LIMS, and
3. thoroughly comparing and carefully analyzing both systems for consistent results by running the systems in parallel.

During the first two weeks, the new database was installed and loaded with approximately one year's data (165,000 samples) from the previous LIMS system. All data was imported into the new system through an interface designed for this purpose. Imported data was analyzed and referential tables were generated through queries. During this phase, data was simultaneously transmitted to the old and new LIMS.

The OnSample module provides a powerful "Selection Filter" menu to select analytical results (figure 1). This filter lets administration personnel quickly identify the status of work (pending, published, or ready to be published), filtered by time, sample type, client, category, charge code, analysis and service group. Numerical and graphical, statistical reports, summarizing activity and backlog, can be generated with ease. When an inquiry is made from a customer on a published result, the OnSample display provides a quick, drill-in feature to launch the worksheet from which the results were originally published to the LIMS. Depending upon the extent to which the service group is fully using OnWorksheet, this drill-in can provide detail to the level that might be otherwise found in the analyst's laboratory notebook. This worksheet then allows management to speak immediately to some of the underlying analytical issues of the result: quality-control samples run with sample in question, duplicate results if any and which analyst did the work. A costing system was an additional component of the OnSample module that was installed during this phase.

A screenshot of a software dialog box titled "Selection Filter". The dialog is divided into several sections. On the left, under "Sample selection", there are fields for "Start Date" (01-Dec-2003) and "End Date" (07-Dec-2003), both with navigation arrows. Below these is a "Lock Date" checkbox (unchecked), a "SampleId" text field, and a "Max Rows" spinner set to 0 with a "Sort ascending" checkbox (unchecked). Under "Sample Lock", there is an "Include locked samples" checkbox (unchecked), an "Autolock Id" text field, and a "Locking Method" dropdown menu. On the right side, there are fields for "Client / Id", "Notes", "Category" (dropdown), "Charge Code", "Analysis", "Srv Group" (dropdown), and "Status" (dropdown, currently set to "All"). At the bottom right, there is a checked checkbox for "Include Inactive templates". At the bottom center, there are three buttons: "Reset", "OK", and "Cancel".

Figure 1. On Sample filter menu

Phase two also involved upgrades to OnWorksheet:

- Upgraded OnWSH to support full data publishing and reviewing.
- Upgraded Graphic data analyzer on OnWSH to validate both QC and production data.
- Implementation of advanced number formatting

The OnView module (customer's view of LIMS data) was the final module to be installed. OnView is an internet-browser based application designed to provide a client view, similar to TCML's previous LIMS. This view shows multiple sample and element results, selected by sample type and over a period of time. Filtering features are provided so clients can quickly and easily find their results. Training (approximately 1 hour) was required only for representatives of clients, who in turn provided training in their area of operation. Exporting features were implemented so clients could quickly and easily export small or large volumes of data directly into MS Excel or into a comma-separated variable file. Clients are only able to view the lab results that are "published" by the lab. Once results are locked by the LIMS administrator (i.e. a Quality Control function), this "locked" status is also visible to the client.

Conclusion

Not all LIMS installations are successful. The success of this LIMS installation can be attributed to the team of laboratory staff and Information Systems personnel who were committed to conducting a quality review of LIMS systems, identifying one that would meet the existing business needs of the organization, and ensuring all laboratory personnel were full participants in the installation process.

Ongoing LIMS service is arranged through a support and maintenance contract with OnLine LIMS.