Case Study

Online Worksheet at SGS Lakefield Research

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Abstract:

This document is intended to provide a detailed overview of the implementation process of the Online LIMS OnWSH module at SGS Lakefield Research and the issues and benefits encountered throughout that process. Information will be presented that shows the Online LIMS worksheet and instrument interface program 'OnWSH' has had a definite positive influence on the capabilities of our facility.

Company Profile: SGS Lakefield Research Ltd.

Lakefield Research was originally established in 1941 as Nepheline Products Ltd. to support the processing of nepheline syenite from local deposits. As demands increased and processes needed to be further refined, an old cement factory in Lakefield, Ontario became the R&D hub for the company. In 1945, "Lakefield Research" was born and soon expanded in scope to become one of the leading Metallurgical and Mineral Processing facilities in the world. The head office of the company is located in the beautiful village of Lakefield, Ontario situated on the banks of the Otonabee River; approximately 1½ hours northeast of Toronto. Over the years, Lakefield Research has gone through a number of major changes, from its beginning as a subsidiary of Falconbridge Limited through a management buyout in 1995 to its recent acquisition (April 2002) by SGS; a worldwide leader in testing and verification services with 32 000 employees and 800+ locations around the globe. Throughout this time the company has continued to expand its services to include complete Analytical and Environmental laboratory capabilities, Mineralogy & Environmental Services. This expansion in services also saw a geographical expansion into Chile, Brazil, South Africa and Australia. The analytical lab portion of the business has grown to over 100 people in the Canadian operation alone, offering a wide range of analytical services and has earned a reputation of being able to handle large jobs and still provide high quality results.

Online LIMS at SGS Lakefield Research Ltd.

In the early 90's the lab had expanded in scope and size such that the need for a LIMS system was becoming paramount. The company had tried an implementation of another

product, but after a couple of years found it to be lacking in several key areas. After an exhaustive search and a much more rigorous selection process the decision was made to go with Online LIMS in March of 1993. By June of the same year the LIMS was fully up and running with most of the major instruments online. As with any software migration of this magnitude there were some minor issues encountered along the way but overall the implementation went quicker and much smoother than anticipated. In 1993 the lab had 42 employees, 25 PCs and was processing ~60,000 samples and ~300,000 analyses per year. By the end of 1995 these numbers had grown to 73 employees, 48 PCs and ~120,000 samples with ~960,000 analyses for the year. The stable structure and efficient coding of the Online LIMS product took this and future growth in stride with little effect on overall performance. Online LIMS continued to evolve through a number of releases along with the expanding workload of the lab. However, even with it's proven scalability the continued rapid growth of the lab and the desire for even more information would eventually exceed the capabilities of the DOS based LIMS. In 1997, development began on a full 32-bit windows version based on the modular design of the DOS system that would run against a SQL database backend. Online LIMS is composed of a variety of modules, each with its own specific functionality. The WSH (Worksheet) module however, is the key component that truly links the lab with the rest of the LIMS, this module is the electronic equivalent of a technician's notebook that allows for easy integration with almost any instrument capable of electronic data transfer.

As this product is truly a technician/bench level orientated system this module was also the initial focus of the upgrade. The initial version of OnWSH ('On' prefix added to windows release) worked with an Access database through its development cycle. This version was first introduced in late 1998 and was an immediate success, the user-friendly Excel-like interface made this already powerful tool even easier to use. This Windows based version was used in conjunction with the DOS based LIMS. The seamless connection between both platforms allowed for continual development to be done while having a minimal impact on the rest of the laboratory. The first area to really benefit from this updated version of the WSH was the newly implemented ICPMS lab, this area would prove to be an excellent development and testing ground. The system was designed to be able to handle large instrument data files with multiple parameters quickly and efficiently. The system was also being designed right from the start with the goal of being a stand alone instrument interface platform with the capability to interface to other LIMS products or in some implementations act as its own mini-LIMS system. The tightly integrated QC module (OnLQC) allows technicians to accurately monitor the quality of their work in real time. Over the next year, development on the OnWSH module continued along with the rest of the LIMS. In mid 2000 the system was switched from the development platform of MS Access over to MS SQL Server, a full-featured Relational Database Management System. The LIMS continued to be run in hybrid mode (Windows OnWSH with DOS LIMS) with the majority of lab areas using the new OnWSH with the old DOS reports until mid 2001 when the full migration to the Windows based version of Online LIMS was conducted.

The full transition to the new platform went relatively smooth considering the magnitude of the task and was for the most part completed within the first week with only minor

configuration changes required after that. The system has undergone further upgrades and improvements over the past two years primarily due to requests for additional features. Aside from these scheduled updates and maintenance periods the LIMS has been up and running non-stop since that time, which is a testament to the efficiency and stability of the coding and database design of this product.

Currently the analytical lab at SGS Lakefield Research has grown to 100 people and ~ 100 PC's performing an average of 1.8 million determinations on over 230000 samples each year. The instrumentation of the lab has also expanded to include 7 AAS, 3 ICP, 2 ICPMS, 5 HPLC, 6 GC/GCMSs, over a dozen balances and a host of other analytical instrumentation.

Key Benefits of OnWSH in the Laboratory

The most obvious advantage that we have seen from having a module like OnWSH in the lab that is capable of direct instrument interface, is the reduction in the amount of manually entered data transcribed from printouts and hand written pieces of paper. Not only does it save time (which means money) it drastically reduces the number of transcription errors and the possibility of losing those paper records. Calculation errors are also reduced by using the OnWSH with validated calculations in templates that are used to create new worksheets. This functionality benefits both the lab and the client; the lab in that they can produce better results more efficiently and consistently and the client gets better results quicker. Aside from importing the desired data, OnWSH also captures all of the raw data directly from the source and stores that information in a separate log for auditing and recovery purposes. All of the information pertaining to that batch of samples is conveniently located in one spot. The benefits of direct readings or file import cannot be overstated, considering the following scenario(s):

A technician weighs a batch of 1000 samples on a balance and he/she is recording the results on a piece of paper to be entered into a computer at a later time. Assuming it takes approx. 3 seconds to record each weight and another 3 seconds to type it in, it would take 100 minutes or 1.66 hours just to record the results. (Time between samples and stabilization is not considered here…as it would be the same for all methods) If the technician makes $12.00/hr it costs $19.92 for those results to be recorded providing there were no errors.

The same technician has another batch of 1000 samples to do, but they have since installed Online OnWSH with the balance connected directly online. Assuming it takes 1 second per sample to press the print button and capture the weight, it would take 1000 seconds or 16.7 minutes to record the results (with minimal chance of transcription errors). The cost to get these results would be $3.33…a savings of $16.59 (83%)…not to mention the extra time that is available to the technician for other tasks.

If the results were from an instrument that sends them to a data file the story gets even better, it would take that same technician approximately 2 minutes to import 1000 results. The actual import time is roughly 5 seconds but it takes a minute or two to navigate into the worksheet and select the data file. It now costs a mere 40¢ to record those results, which translates into a 98% savings from the handwritten/typed in method.

The previous scenarios are merely analogies to illustrate the potential cost savings of using a system such as the OnWSH. Granted there are other factors not considered here, but the end result would still show a marked improvement in production. This is evident from the following real world numbers. As mentioned previously the lab has gone from analyzing ~60,000 samples for ~300,000 analyses in 1993 (1429 samples/employee/yr or 7143 analyses/employee/yr) to ~ 230,000 samples for 1.8 million determinations in 2002 (2300 samples/employee/year or 18000 analyses/employee/yr), that's over a 60% production gain in # of samples processed per employee and a whopping 150% increase in the number of determinations per employee. This increase is largely due to efficiency improvements from instrument automation and integration with the LIMS and OnWSH.

So far we have only looked at the production and efficiency benefit; the other main improvement is realized in the area of data quality and quality assurance. The tight integration of the OnLQC module (which is bundled with OnWSH) with the OnWSH module allows technicians to monitor QC samples in real time and be warned if the quality is starting to drift, thus reducing potential headaches from upset clients and additional costs from re-assays.

At Lakefield Research we currently track and monitor approx. 900 different QC samples and are able to view/plot historical data back several years and pinpoint where the data came from. This powerful module allows you to plot various graph types Replicate Ro, Replicate %, Range Control, Range Ratio, Cumulative Sum as well as distribution curves. Our lab was one of the first labs in Canada to get accredited by CAEAL (Canadian Association for Environmental Analytical Laboratories) and SCC (Standards Council of Canada) in 1994, and that occurred while using the DOS LIMS product with its version of WSH and LQC. We are currently accredited by CAEAL/SCC to the ISO/IEC 17025 standard. This sophisticated QA/QC module was a key factor in us achieving and maintaining that accreditation.

OnWSH utilizes another module called OnLINK to make direct connections to instruments. These modules have continued to develop as well and now allows direct KB capture into any application (such as Excel). It also has a user configurable table parser that allows the end user create custom instrument drivers if they do not already exist. This added functionality serves only to enhance this already powerful tool.

Many labs already have good LIMS systems that they have spent a lot of time and money on to customize for their specific needs, however a good number of these products really fall short when it comes to instrument integration. Online LIMS recognized this shortcoming early on and developed the OnWSH to fill that void. OnWSH can be interfaced to almost any LIMS so you can get all of the benefits of the OnWSH and

OnLQC module without having to endure the disruptions and costs to replace your entire LIMS.

Conclusions

Lakefield Research is one of the leading analytical laboratories for mining and analytical/environmental work in Canada and probably the world. This level of performance and recognition is primarily attributed to the talent and expertise of the people that work here, but having the right tools at their disposal makes these people even more effective. This software product with its full featured user friendly interface and powerful data capturing functions has literally saved the company thousands of dollars and given us the production capacity to go after large projects that otherwise we could not have pursued. Online LIMS with the OnWSH/OnLQC modules have proven to be the 'right' tools for our operation.