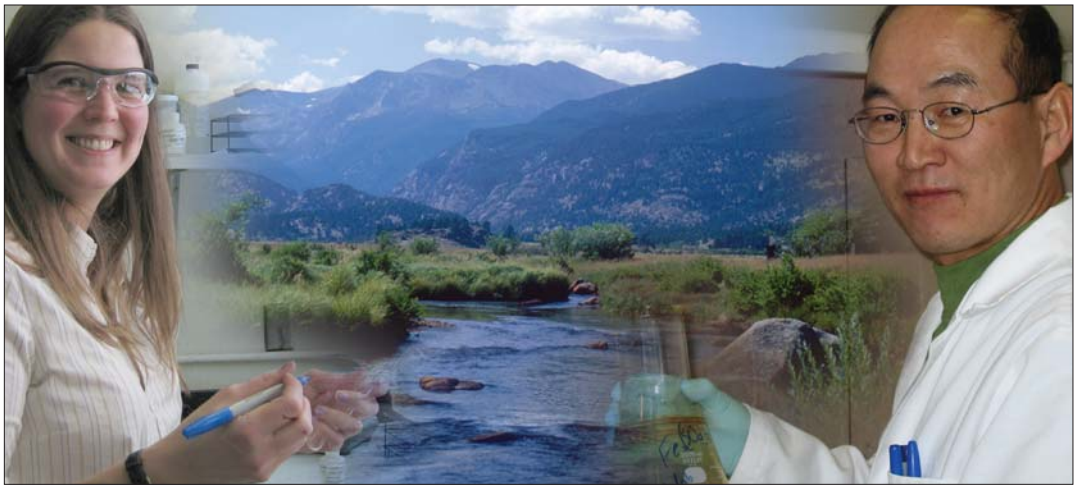
LIMS Saves Data Entry, Calculation and Administration Time for Agriculture Lab



The Montana Department of Agriculture laboratory in Bozeman, Montana, performs analytical services for both the Montana Department of Agriculture (MDA) and Montana State University's Agricultural Experiment Station. Under the MDA, the lab provides services in support of the Feed and Fertilizer Commodity Programs, Pesticide Enforcement Program and Groundwater Monitoring Program. The lab also participates in the United States Department of Agriculture's (USDA's) Pesticide Data Program, receiving bi-weekly samples from many sites throughout the United States to analyze for nearly 100 different pesticides and herbicides.

The Agricultural Experiment Station section of the laboratory analyzes samples in support of Montana's farmers, ranchers and researchers. The analyses performed under this program vary widely from nutritional information of forages to pesticide residues in environmental matrices. Many of the analysis methods used by the laboratory are complicated by the need to perform calculations and to take various actions based on conditional events.

Custom vs. configurable

Management of MDA felt that their previous laboratory information management system occupied too much of its systems

Key Benefits

- Improved productivity and accuracy
- Ease of configuration
- Automated, custom reports
- Instrument interfacing without customization or programming
- Advanced calculations

administrators' time and lacked flexibility, making it difficult to integrate with laboratory instruments and automate common data entry and calculation tasks. They evaluated several other software packages and selected one that could be configured rather than programmed to adapt to the laboratory's operating practices. The system also provides tools that make it easier to automate a wide range of tasks.

The original LIMS used by the laboratory was designed to adapt to a specific application using custom programming. The laboratory's information technology staff spent significant time writing custom programs to provide basic functionality needed by users. The programming staff was kept busy maintaining the program so little or no time was available to deliver functionality to automate common tasks such as calculations and instrument interfacing. A major problem with the old software was that most of the custom programming would have to be rewritten if the lab upgraded to a new version. As a result, the lab was not able to take advantage of new features offered in versions released after implementation.

The new LIMS requires far less administration time, so systems administrators spend much less time configuring the system to automate common laboratory tasks. For example, they created a macro that imports text files submitted by inspectors at remote sites and automatically logs them into the system. They have also configured the software to automatically accept results from a wide range of laboratory instruments and in some cases even provide data needed to set up instrumental runs. They have also automated most required calculations, either within the LIMS or in Excel files that are automatically uploaded to the LIMS.

Selection and implementation of new LIMS

Heidi Hickes, Laboratory Manager, said that the organization began looking for new software that would require less administrative support and provide the opportunity to automate manual tasks. "We were looking to modernize and hoping to find a simpler system that didn't require as much computer expertise to maintain," she said. "We looked at several of the leading mid-range LIMS and narrowed the field to two companies that were large enough to give us confidence that they would be around for the long haul. We selected LABWORKS® LIMS from PerkinElmer because it requires less customization and computer expertise. I also like the fact that a company of the stature of PerkinElmer is providing support for LABWORKS."

Marcus Svee, Program Manager for Montana Department of Agriculture at the time, took the lead during the implementation process in resolving a number of issues that arose. "As soon as we completed the implementation process, we began to experience the significant advantages of the new software," Svee said. "With our old software we were continually scrambling just to meet the basic needs of our users, so we never had time to go for productivity improvements. On the other hand, we were easily able to configure the new software to store the information we need, perform our calculations, and generate reports in the format that we were looking for without any programming. This made it possible to devote our efforts to improving productivity and accuracy."

	A	B	C	D	E	F	G	H	I	J
1	Claim Calculations for Department Feed Program									
2										
3	Analysis	Entered Claim Range	Min Value	Max Value	Calculated Min %	Calculated Max %	Calc Min Claim	Calc Max Claim	Claim Range Back to Labworks	
4	Calcium	0.1 to 0.5	0.1	0.5	0.12	0.06	0.088	0.560	0.088 - 0.56	
5	Protein	12.0 to 20.0	12.0	20.0	0.44	0.6	11.560	20.600	11.56 - 20.6	
6	Salt	0.1 to 5.0	0.1	5.0	0.16	0.6	-0.059	5.600	0 - 5.6	
7	Ash	0.5	0.5	0.5	0.47	0.465	0.035	0.965	0.035 - 0.965	
8	Fiber	15	15	15	1.20	1.2	13.800	16.200	13.8 - 16.2	
9	Phosphorus	15	15	15	1.23	1.23	13.770	16.230	13.77 - 16.23	
10	NPN	18	18	18	1.34	1.34	16.660	19.340	16.66 - 19.34	
11	Mojoinner Fat	1	1	1	0.10	0.1	0.900	1.100	0.9 - 1.1	
12	Potassium	0.1	0.1	0.1	0.02	0.015	0.085	0.115	0.085 - 0.115	
13	Moisture	2	2	2	0.24	0.24	1.760	2.240	1.76 - 2.24	
14	Vit A (IU/lb)	12000	12000	12000	3600.00	3600.00	8400.000	15600.000	8400-15600	
15	Vit A (IU/kg)	50000	50000	50000	15000.00	15000.00	35000.000	65000.000	35000-65000	
16	CTC	1.2	1.2	1.2	0.36	0.36	0.840	1.560	0.84 - 1.56	
17	OTC	1.9	1.9	1.9	0.57	0.57	1.330	2.470	1.33 - 2.47	
18	Monensin	6	6	6	1.80	1.80	4.200	7.800	4.2 - 7.8	
19	Lasalocid	2	2	2	0.50	0.50	1.500	2.500	1.5 - 2.5	
20	Copper (ppm)	50	50	50	15.00	15.00	35.000	65.000	35 - 65	
21	Copper (%)	0.05	0.05	0.05	0.01	0.01	0.038	0.063	0.038 - 0.063	
22	Manganese (ppm)	100	100	100	30.00	30.00	70.000	130.000	70 - 130	
23	Manganese (%)	0.05	0.05	0.05	0.02	0.02	0.035	0.065	0.035 - 0.065	
24	Sulfamethazine	1.5	1.5	1.5	0.45	0.45	1.050	1.950	1.05 - 1.95	
25	Amprolium	6	6	6	1.80	1.80	4.200	7.800	4.2 - 7.8	
26	Magnessium (ppn	1000	1000	1000	300.00	300.00	700.000	1300.000	700 - 1300	
27	Magnessium (%)	0.2	0.2	0.2	0.06	0.06	0.140	0.260	0.14 - 0.26	
28	Zinc (ppm)	500	500	500	100.00	100.00	400.000	600.000	400 - 600	
29	Zinc (%)	0.02	0.02	0.02	0.00	0.00	0.016	0.024	0.016 - 0.024	
30	Sodium (ppm)	1000	1000	1000	200.00	200.00	800.000	1200.000	800 - 1200	
31	Sodium (%)	0.24	0.24	0.24	0.05	0.05	0.192	0.288	0.192 - 0.288	
32	Lysine	1.6	1.6	1.6	0.32	0.32	1.280	1.920	1.28 - 1.92	
33	Methionine	5.8	5.8	5.8	1.16	1.16	4.640	6.960	4.64 - 6.96	
34	Iron (ppm)	500	500	500	125.00	125.00	375.000	625.000	375 - 625	
35	Iron (%)	0.3	0.3	0.3	0.08	0.08	0.225	0.375	0.225 - 0.375	
36	Selenium (ppm)	30	30	30	7.50	7.50	22.500	37.500	22.5 - 37.5	

Feed / Fert / ElementalFert / NNM /

Figure 1. Excel calculation used to calculate the appropriate range based on AAFCO Feed Rules.

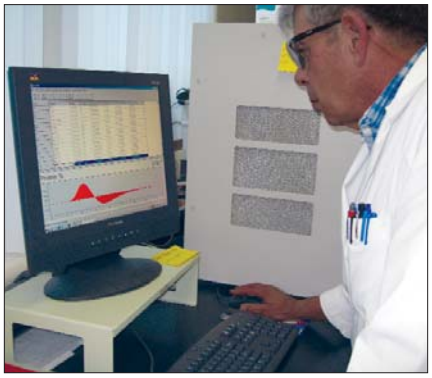


Figure 2. Bill Wheeler analyzes protein in feed samples on a Leco Nitrogen Determinator.

Laboratory workflow

Once the sample is logged in, it is automatically assigned to the appropriate department for analysis. The software organizes each department's work so they can easily see all of the projects assigned to them along with the due dates for each job. Interfaces are provided to most of the laboratory's instruments, automating the movement of data into the LIMS. The analysis results are automatically routed for approval to supervisors when required by the laboratory's business process. Each person in the approval process can call up a list of test results that are waiting for their approval along with the due dates for each one. A manager can also easily check the status of individual tests or obtain a summary of tests for a particular department or the entire laboratory.

The LIMS also automates the majority of the reporting process. LABWORKS LIMS generates reports automatically by drawing on information that has been entered into the database throughout the analysis cycle. Laboratory staff has also taken advantage of the user-friendliness of the Report Design module included with LABWORKS, which is based on Crystal Reports, to create custom reports that eliminate manual work and present information more clearly than in the past. With the Reports Design module, all fields are available for use and the user never has to be concerned with the relationships between them. The lab also reports data electronically to the Pesticide Enforcement operation of the MDA, the Feed and Fertilizer operation of the MDA and to the USDA's Pesticide Data Program.

Figure 3. Jacyln Darlow works on a PerkinElmer Optima 5300DV ICP-OES that is used in the analysis of metals in feed samples.

Productivity improvement projects

One of the first projects Svee took on was improving the process of entering data captured by remote inspectors. In the past, these inspectors would either enter the information into spreadsheets and email it to the laboratory or manually write down the information on a paper form and mail it to the laboratory with the samples. At that point, the only way to get the data into the old system was to print out the file and type it in. Svee took advantage of the ability of the new software to accept data in a wide range of formats to write a simple macro that automates the data entry process. The user simply imports the file on his or her machine and doubleclicks on an icon that runs a batch file. The batch file grabs the text file, logs in the sample and deletes the text file. This not only saves time but also eliminates the risk of data entry errors.

The ability of the new software to interface with nearly all of the laboratory's instruments without the need for customization or programming has driven additional time savings. For example, the laboratory uses a new method for analyzing feed and fertilizer with inductively coupled plasma optical emission spectrometry (ICP-OES). The method involves first weighing the sample, then burning off organics, diluting to a final volume, and analyzing with the instrument. The analyst needs to record the sample weight and any required dilution and these numbers are used to adjust the analysis results.

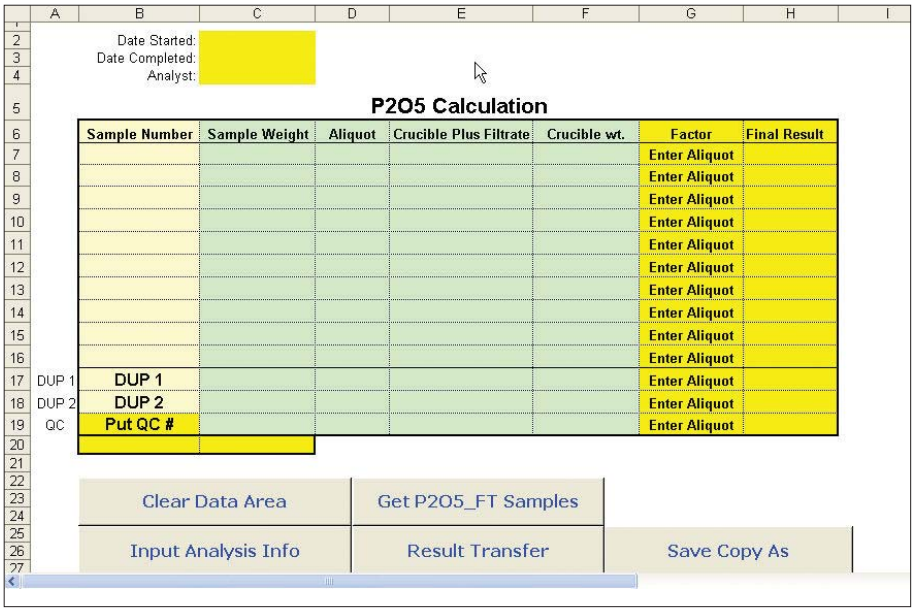


Figure 4. Excel calculation sheet that is used in the analysis of P2O5. The document is interfaced to an analytical balance for the entry of sample weights and the LABWORKS database for data retrieval and data entry.

Svee created an Excel workbook that captures the sample weights from the balance. The workbook then prompts the analyst to enter the volume and final dilution. The analyst pushes a button in the worksheet which transfers the required data to the ICP-OES instrument. The analyst performs the run on the instrument and the results automatically move into the Excel workbooks. Data reduction is then done in Excel per the laboratories standard procedures and the final results are transferred to the LIMS. This process saves a considerable amount of time that was previously spent entering and checking data and also avoids the risk of data entry errors.

Hickes concluded that the laboratory is now fully functional with the new LIMS. "Operators are very happy with the new system and the user complaints that we had seen in the past have disappeared," she said. "Our systems administrators are also happy since they spend less time supporting the basic functionality of the system. They are now able to devote a higher proportion of their time to adding new functionality such as automating calculations and interfacing to new instruments. In the mean time, Marcus Svee, who led the implementation while he was at our company, has gone to work for PerkinElmer in a support position. We are sorry that he left but pleased that he is able to continue to provide us with the same high level of support in his new position."

For more information, please visit www.labworks.com, www.perkinelmer.com, or call 1.800.762.4060.

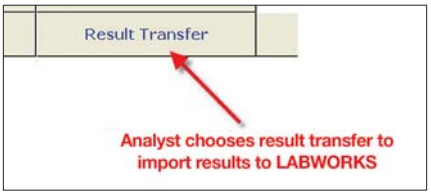


Figure 5. Step 1 of transferring data from P2O5 analysis into LABWORKS.

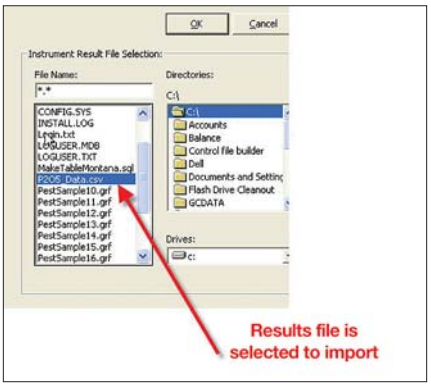


Figure 6. Step 2 of transferring data, selecting the results file.

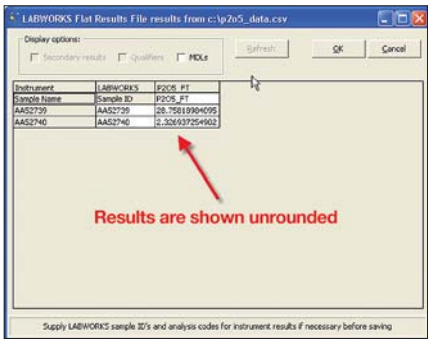


Figure 7. Step 3 of transferring data, reviewing Raw Results.

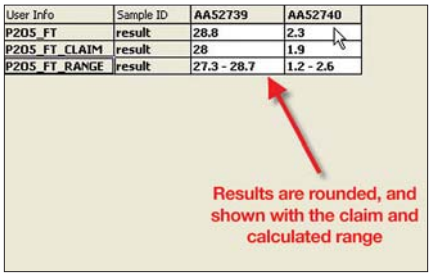


Figure 8. Final Step of transferring data, reviewing Rounded Results.

PerkinElmer Life and Analytical Sciences
710 Bridgeport Avenue
Shelton, CT 06484-4794 USA
Phone: (800) 762-4000 or
(+1) 203-925-4602
www.perkinelmer.com

PerkinElmer® precisely.

For a complete listing of our global offices, visit www.perkinelmer.com/lasoffices

007578_01