What is ISO 8655-7?

The following Q&A discusses the photometric method approved for liquid delivery device calibration

With new domestic and international regulations and standards published daily, it's difficult for laboratories to keep up with changes and maintain compliance. In the following interview, Dr. George Rodrigues, senior scientific manager at Artel, talks about the recently published standard ISO 8655-7 and its impact on chemical laboratory practices.

Q: What is ISO 8655-7 and why is it important for the chemical industry?

A: ISO 8655-7 is a new standard published by the International Organization for Standardization that formally approves the photometric method for calibration of piston-operated volumetric apparatuses. These include manual and automated liquid handling devices, both common in chemical laboratories and also in some processing applications. This standard is important because, as liquid handling instrumentation advances, so too must liquid delivery performance verification technology. This is highlighted by increasingly complex analytical tests and the intensifying industry-wide push for efficiency. Photometric calibration is the latest tool for laboratory quality assurance programs and meets the need for a superior calibration methodology. Until now, there was no official guideline or recommendation for photometric calibration of liquid handlers due to the fact that technologies often develop more quickly than regulatory agencies can respond. ISO Technical Committee 48 recognized that photometric calibration could allow laboratories to minimize uncertainty in liquid delivery verification, particularly at low volumes. For this reason, the organization evaluated and approved photometry for assessment of equipment performance.

Q: What are the consequences of working with liquid delivery instrumentation out of specification?

A: The consequences vary depending on the precise nature of the laboratory and the process in which liquid delivery occurs, but the consequences are usually serious. The potential for product recall, testing rework and general inefficiency are found broadly. Legal liability and regulatory non-compliance are also possible. Consider an environmental or food testing application where dispensing inaccurate volumes of samples can alter concentration and prevent the identification of a contaminant or produce quantitative results that place a compound below an action threshold. These "false negatives" can lead to liability or fines down the road.

Q: What ISO-approved methods to verify liquid handlers were available to

laboratories before photometric calibration was approved?

A: Previously, gravimetry was the only ISO-approved method for liquid delivery calibration. This method weighs liquid quantities on balances. However, this method has limitations. For example, gravimetry is ineffective at low volumes due to evaporation. Gravimetry also has limited applicability to multi-channel device performance verification because typically it only provides an aggregate assessment of all channels as opposed to each individual channel. It also requires a controlled environment to function properly, and this can impede normal laboratory operations.

Q: How can photometric calibration improve laboratory calibration processes?

A: Photometry relies on known light absorption properties at specific wavelengths to verify volume with a high degree of accuracy and precision. It is unaffected by the environment, even at low volumes, and can be very fast. Because it can be applied quickly and conveniently at the bench-top level, photometry is being used for frequent calibration, verification, and optimization of liquid handing operations. And this makes for better compliance and efficiency while strengthening data integrity.

Q: Do chemical laboratories need to strengthen data integrity?

A: Yes. Laboratories are facing several challenges that are emphasizing the need for superior data integrity requiring advanced liquid delivery calibration methodologies. For example, the mounting focus on quality is quite apparent in the chemical industry, and this goes hand in hand with the need for efficiency. Producing accurate results on the first run maximizes productivity, which is emphasized by a number of the latest management fads including six sigma, lean manufacturing, and continuous improvement. There is also growing alarm that large investments in lab automation have failed to result in productivity gains. Laboratories are looking for methods that can optimize automated equipment and enhance productivity. Laboratories are also plagued by a scarcity of resources. Technician workloads are growing due to a shortage of trained personnel. To avoid wasting time and resources, laboratories not only need assays and experiments to be correct on the first run but also need a convenient method to ensure this. Photometric calibration gives technicians an easily implemented and user-intuitive tool for almost instantaneous liquid delivery verification.

Q: How will ISO's approval of the photometric method impact its use in chemical laboratories?

A: We are already seeing an impact, particularly in Europe. Some companies that were previously intrigued by photometry, but were hesitant to adopt a new technology for something as critical as volumetric measurement, have decided to move ahead now that ISO 8655-7 has been approved. International standards development organizations devote time and resources to evaluating various methods. When technologies are approved by such agencies, laboratories can trust that these technologies are reliable and have the ability to improve industry practices. This is why internationally accepted technologies often become the

industry standard, which should be the case for photometric calibration. ISO 8655-7 says that this technology "may be the method of choice" for laboratories with suitable photometric equipment. While some laboratories, in fact, have relied on photometric calibration for some time now, many others will not implement methods that have not been formally approved. It is, therefore, difficult for laboratories to know which technologies are short-term, risky fads and which are solid, reputable solutions.

Q: What are the benefits of integrating standard methods into laboratory operations?

A: Globalization strongly highlights the need for standard methods, and the chemical industry is no stranger to the globalization trend. Operations in laboratories across markets, from pharmaceutical R&D to food testing, are being contracted out. Laboratories across borders and oceans need to communicate in the same language using the same methodologies. An internationally approved method can be implemented around the globe to facilitate compatibility among laboratories. Standard methods also provide ease of method transfer. To seamlessly move projects from the research laboratory to processing facilities, operations in each facility must be harmonized. Risk reduction is another benefit. Implementing a proven and internationally accepted quality assurance technology will prove useful during regulatory audits in building client and consumer confidence and in striving to comply with cGMP and cGLP regulations and to ISO 17025, which is the international laboratory quality standard for calibration and testing. These standards support the preferential use of standard methods such as the photometric approach.

Q: What future do you see for photometric calibration?

A: The growing focus on liquid delivery quality assurance points to a bright future for photometric calibration. Even slight volumetric discrepancies can compromise laboratory data integrity and lead to higher costs associated with remedial actions, useless data, and inefficiency. In the ever-growing focus on enhanced productivity, laboratories want to maximize performance of their liquid handling instrumentation. ISO took the first step in approving this methodology and noted that it is particularly well suited for calibration of low volumes. It is probable that country-specific regulatory agencies will follow ISO's lead and adopt photometry as the calibration method of choice. Laboratories should act now to mold their laboratories to ISO standards and stay ahead of the competition.

George Rodrigues, Ph.D., is senior scientific manager at Artel, a leader in low-volume liquid delivery measurement and quality assurance. He is responsible for developing and delivering communications and consulting programs designed to maximize laboratory quality and productivity through science-based management of liquid delivery. Rodrigues has a bachelor's degree and a doctorate in chemical engineering. He can be contacted at 207-854-0860 or grodrigues@artel-usa.com. More information is available at www.artel-usa.com. neay intact without the filter media breaking off or migrating downstream into the process fluid. This is a very important quality control measure and needs to be monitored through periodic

testing.

In addition to filter integrity, the downstream process fluid needs to be closely monitored to ensure that no impurities are passing through the filter and contaminating the fluid used for the bioprocess. This is also critical to the operation and needs to be controlled through careful testing and monitoring.

Case in Point: Millipore

Tom Hirsch is a senior consulting engineer for the R&D Group in the Bioprocess Division of Massachusetts-based Millipore Corp. His group is responsible for building testing software used to monitor and check the integrity of filters used in the production of pharmaceuticals. Hirsch and his group use Alexsys Team 2 Pro software to track all events in the testing process. The management of such testing involves a team of scientists and engineers in remote locations. Because facilities are large and dispersed, filtration integrity is often monitored from central locations.

During any given project, this team consists not only of people in Hirsch's office but also people in different time zones around the world. These scientists and engineers are part of a team environment and have actions and tasks that need to be captured, tracked, and facilitated among team members. With the click of a mouse, members of the project team can easily record tasks in Team 2 Pro, allowing them to be prioritized, assigned, and completed with detailed documentation of pertinent discussions, notes, attachments, and a record of the time spent on each task.

Using Team 2 Pro, members of the R&D staff can instantly view and organize their assignments, create and update tasks, and collaborate with other team members. Reports and live views are easily generated for a variety of organizational needs.

Millipore's customers are concerned about internal records and mandate that their R&D team provide a "big trail of evidence" to allow an easy audit of the testing software, any problems discovered in the testing, what problems where fixed, how they were fixed, and by whom they were fixed.

Their effort to monitor filtration integrity and their use of collaborative software to document their actions are right in line with the software best practices. According to research conducted by the Connecticut-based Gartner Group in 2002, titled "Software Best Practices Start at the Top," software applications need to use good common sense. The research advises: "Think before doing. Understand your objectives and your realities. Keep things simple. Plan for intermediate manageable results. Establish a feedback loop. Reuse the reusable. Track and evaluate the modern technology trends, then apply only those that fit. In most projects, however, most of these common sense guidelines are compromised &#151 or worse, avoided."

In Millipore's case, its filter integrity testing utilizes state of the art technology, common sense guidelines, and a steady stream of feedback information. This approach has helped the company's Bioprocess Division become one of the largest

and most successful components of its overall business.

Competitive Edge

In order to gain a competitive edge in the market, organizations must capture, track, and facilitate the human processes of their groups. No matter how big or small a company might be, the right project management process tools bring better productivity and more effective leveraging of limited resources. They give management and employees the ability to automate people-centric processes to stay ahead of the competition.

With the right collaborative software, teams are more productive by working with their existing processes &#151 instead of forcing new or additional processes on them. Good collaborative project management software offers groups a more effective means of sharing data and enhancing individual effectiveness.

Team 2 Pro software, engineered to be easy to install and use, is easier to implement and use than traditional project management software packages. It works in Microsoft Windows and uses standard web browsers. Administrators can use the product out-of-the-box or customize it with a proprietary Adaptive Rules Engine to create specific fields, forms, tables, escalations, and notifications, which become immediately available to members without the need for rebuilding, rebooting, or restarting. Users can instantly view and organize their assignments, create and update tasks, and collaborate with other team members.

Reports and live views are easily generated for a variety of organizational needs. Managers can quickly get a snapshot view of both individual user and project workloads to identify bottlenecks, balance workloads, streamline group communications, and better leverage human resources.

Traditional Approaches

Project management software and traditional tools lack certain key elements for today's environment. Traditional project software often omits the role of the knowledge worker. While they do offer thorough scheduling features, they lack a focus on information, tools, and work allocation for the many individuals dispersed throughout a corporation. Also missing are enabling tools that allow the team to prioritize and focus their efforts. The right things at the right time by the right people can run amuck with traditional project management software.

Truth in Details

With the right technology, potential problems can be avoided. How? Ask the question: "What do I need to do today to have the greatest impact on the bigger picture while keeping the project on track and on schedule?" This focus needs to be melded into project management technology. In other words, collaboration

technology should be designed to be the "on ramp" to dispersed task management. The truth is in the details. By allowing knowledge workers common access to key documentation, communication can be greatly improved. Information is available to all, and an audit trail is automatically in place for regulatory authority.

How can that be done? The following six concepts are key when creating dispersed project team management technology.

&#149 Classify: Define and categorize task items.

&#149 Targets: Parlay action items into specific tasks on a milestone schedule.

&#149 Prioritize: Rank and order task action items for the common good of all team members.

&#149 Collaborate: Select and direct the right tasks for and to the right people. The "it's not my job" syndrome is out. The division of labor responsibility is clear.

&#149 Monitor: Track and monitor tasks with regard to schedule and milestone adherence and completed task actions. This is an excellent way to keep all task members informed of what has been completed and what has not.

&#149 Track: If history repeats itself, there is valuable information in project history files. Such information may help predict the future and provide lessons learned for concurrent and future projects. Historical data gives way to continuous improvement. It also documents your actions and automatically provides a trail for auditors. Government regulators have increased their pressure on required documentation in many industries, and such technology available in task management history files allows for an organized and complete compliance with their requirements.

Automated and Expedited

Projects can be intimidating. Today's project managers need drill-down tools and tactics that can transform an obese project scope into very specific bite-sized tasks. This requires smart technology. Such technology must respect workloads, milestones, and task priority. Simply stated: Knowledge workers need to know who is doing what, when, where, and how. Once a task is completed, a record of the completed task should become available and accessible by all.

Managing a process operation with a dispersed team of players is greatly facilitated when all the legwork is automated and expedited. For Millipore's Bioprocess Division, the task of monitoring filter integrity exemplifies the right technology in a team environment.

Rich Bianchi is the president of Alexsys Corp. based in Stoneham, MA. Alexsys provides software solutions designed to automate the management of tasks and

business processes. Its software has been deployed by hundreds of organizations of all sizes around the world including Fortune 50 companies. Information: www.alexcorp.com.