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March 2012

Volume 7 • Number 2

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Is the Roller Coaster Ride Over?

Since the latter half of 2008, the laboratory industry has been on a roller coaster ride. And while this year's Fourth Annual Confidence Report reveals that laboratory decision makers expect their funding conditions to remain the same or to minimally improve, there is also reason to believe that 2012 has some good things in store for this industry. But don't undo those seat belts just yet.

Jonathan Witonsky

78

Perspective On: A Contract Lab

When developing new chemical entities, pharmaceutical and biotech companies often employ the help of contract research organizations (CRO). Bioanalytical CROs assist with method development, validation and sample analyses for preclinical and clinical drug development studies.

Sara Goudarzi



LAB MANAGEMENT

20 What Would Steve Jobs Do?

Although we don't often think about it this way, at its core the job of a manager is to make a difference. If you aren't making a difference in your laboratory's climate, its future prospects, and the development of your staff, what are you being paid for? Maintaining the status quo isn't valued and probably isn't possible for more than a short time.

Ron Pickett

LAB AUTOMATION

30 We Need Backup!

The New York City blackouts of July 1977 and August 2003 and the most recent San Diego Gas and Electric Co. blackout of September 2011 are reminders that our power delivery system in the U.S., Canada, and Mexico is fragile and strained. Making sure your laboratory automation systems are protected from such power failures is critical.

Raymond L. Hecker

TECHNOLOGY & OPERATIONS

36 Planned Downtime

Routine maintenance and proper training can extend the life of any piece of laboratory equipment. Unfortunately, even with proper maintenance, and sometimes resulting from lack of maintenance, large equipment can break down—sometimes at the worst possible time.

Sean Jordan

40 HPLC-Fluorescence Detection

Although scientists have relied solely on LC-MS methods in recent years, HPLC-fluorescence detection is now designated as the official analysis method for many components across various industries. In particular, it is used for analyses that demand high sensitivity and high selectivity.

Simon Robinson

LAB SAFETY

52 Jumping Back Gas!

This column focuses on ethylene oxide, a frequently used and potentially dangerous sterilizing agent. Also known as EtO or EO, it is highly compatible with today's polymer-based single-use medical devices, procedure kits, surgical trays, etc., and is commonly used for sterilization in many veterinary and animal surgical facilities.

Vince McLeod

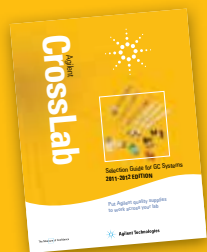
Pumped for Pittcon

Are you planning to be at this year's Pittcon conference and expo in Orlando, Florida? If so, be sure to check out *Lab Manager Magazine's* display at booth 1529 at the Orange County Convention Center. Here, you'll have a chance to get your picture taken and put on a custom "Lab Manager of the Year" cover of *Lab Manager* to show your friends and colleagues. Our three fellow LabX Media Group properties – LabX, LabWrench, and the recently acquired *The Scientist* magazine – will also be at booth 1529, so be sure to give them a look as well. And, of course, you'll certainly want to see all the great products that manufacturers will be showcasing. This month, we're featuring over 100 of those products in the special Pittcon Preview edition of our Technology News section, complete with company booth numbers so you can see them in person if you'll be at Pittcon 2012. Turn to page 86 for a sampling of what products Pittcon will have to offer this year.

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ASK THE EXPERT: TRENDS IN LABORATORY QA/QC 50

Michael Noble, Ph.D., professor in the Department of Pathology and Laboratory Medicine at the University of British Columbia and chair of the Program Office for Laboratory Quality Management says people still need to be reminded that the pursuit of quality is a commitment that needs constant time, effort and money. **Tanuja Koppal**

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Modest Optimism

"The year 2011 was tumultuous for the laboratory industry. In comparison, the outlook for 2012 looks only slightly positive. Laboratory decision makers generally expect their funding conditions either to remain the same or to minimally improve." So says Frost & Sullivan's Jonathan Witonsky in this month's cover story, which presents the results of our Fourth Annual Investment Confidence survey. Turn to page 12 for the complete picture and to find out how your view of current business conditions compares with those of your peers.

Whether your lab is flush with cash or watching its pennies, most likely you or someone from your organization will be attending this month's 52nd annual Pittsburgh Conference in Orlando, Florida (March 11 – 15). As has been our tradition for the past four years, *Lab Manager Magazine's* March issue showcases the instruments, software and consumables that will be on display at this year's event. Turn to page 86 for a sneak peek of what you'll be seeing in person in a few weeks.

If you're thinking about new instruments for your lab, you should also be considering the training and maintenance required for that equipment. For help in that effort, turn to page 36 for this month's Technology & Operations feature, "Planned Downtime." Here, author Sean Jordan explains the theory behind a key performance indicator known as overall equipment effectiveness (OEE), which "captures relative equipment effectiveness over a set time period by measuring unplanned downtime, resulting defects/errors, and equipment operating speed." According to Jordan, "If you can improve OEE, you can increase overall lab efficiency and reduce equipment repair costs."

Another concern regarding new laboratory equipment, especially that which is highly automated, is power outages. If that is something your lab is challenged by, turn to this month's Lab Automation article "We Need Backup!" on page 30. In this piece, author Raymond Hecker explains the advantages of instrumentation power protection systems (IPPS) which, when coupled with an emergency generator, can correct a generator's power "to provide pristine power delivery to your automated equipment."

Unrelated to equipment, but very important to all managers, is leadership style and effectiveness. In this month's Lab Management article (page 20), author Ron Pickett channels Steve Jobs as an illustration of one who inspired his team to go "beyond what anyone thought possible" and to do "some great work, really great work that will go down in history." Pickett provides practical analytical tools to help managers find things to do that will make a difference in their labs. "If you aren't making a difference in your laboratory's climate, its future prospects, and the development of your staff, what are you being paid for? Maintaining the status quo isn't valued and probably isn't possible for more than a short time," says Pickett. The message of improving your management style and technique is picked up again in Alan Edwards' "Science Matters" column (page 26), in which he says, "Personal management style can also dictate which employees—even the contract ones—are willing to stick around for the long haul as well as for future projects." Take a look to make sure you're doing everything you can to improve openness and creativity in your lab.

And if you're heading to Pittcon this month, please stop by *Lab Manager Magazine's* booth 1529 and say hello.

I hope to see you there.

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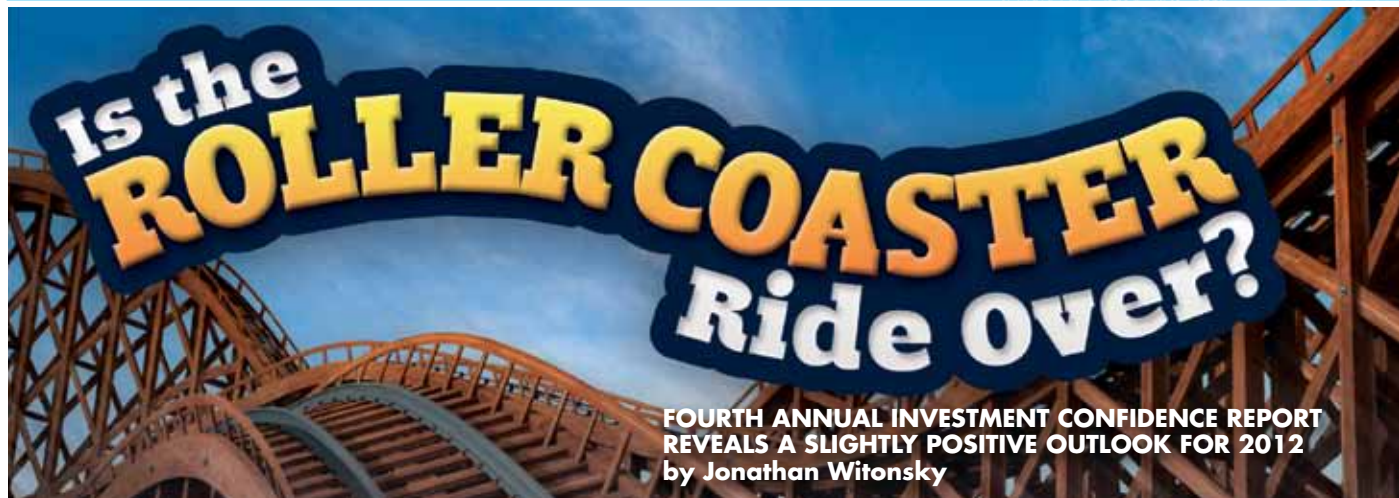
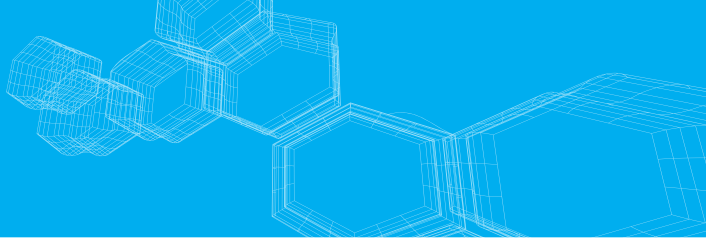
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The laboratory industry enjoyed several years of robust growth from the late 1990s until 2003. Record research and development (R&D) investments by the biopharmaceutical industry, in combination with the doubling of the U.S. National Institutes of Health (NIH) budget, allowed for continual double-digit growth rates. While laboratory investments were dampened from 2003 through 2008, growth rates remained relatively stable in the mid- to high-single-digit range. Then, during the latter half of 2008, the laboratory industry embarked on a roller coaster ride with multiple ups and downs. The economic downturn had a tremendous impact on the laboratory industry with across-the-board budget cuts. Facing impending doom after the downfall in the fourth quarter of 2008, the industry was revived with the U.S. American Recovery and Reinvestment Act of 2009 (ARRA), which dedicated \$10.4 billion to the NIH to be spent immediately in 2009 and 2010. However, because distribution of the funds to laboratories was slow, the industry saw little benefit until the fourth quarter of 2009, resulting in the first market contraction in more than a decade.

The year 2010 was marked by a huge bounce-back: Academic researchers were flush with ARRA funds, and the industrial sector rebounded from its 2009 purchasing freezes. The combination of stimulus dollars and pent-up demand resulted in an exceptionally strong year for the laboratory industry. While consolidation among biopharmaceutical companies remained a major obstacle to

growth, by the end of 2010 the general industry consensus was that the market had returned to a state of normalcy. Accordingly, 2011 started off strong with residual impact from stimulus dollars and the general economic recovery. Beginning in the fall, however, the market began to soften with laboratory hiring freezes and deterioration across most

purchasing budgets. Despite the drastic changes throughout, the overall market remained relatively flat compared to what it was in 2010. If there was any growth, it was low—around four percent globally. In more mature regional markets—such as the United States, Europe, and Japan—growth rates were certainly lower. Despite a recovery, industry growth did not return to pre-recessionary levels.

The year 2011 was tumultuous for the laboratory industry. In comparison, the outlook for 2012 looks only slightly positive. Laboratory decision makers generally expect their funding conditions either to remain the same or to minimally improve. Nonetheless, with this year still just kicking off, there are reasons to believe that 2012 has some good things in store for the laboratory industry. In order to assess potential market changes, in December 2011 and January 2012 the editors of *Lab Manager Magazine* and Frost & Sullivan surveyed 219 *Lab Manager Magazine* readers who were qualified as decision makers able to evaluate their laboratories' general business conditions. Survey respondents were asked about their investment confidence surrounding laboratory-related purchases and other budgetary plans based on past spending trends and future financial expectations.

“The economic downturn had a tremendous impact on the laboratory industry with across-the-board budget cuts.”

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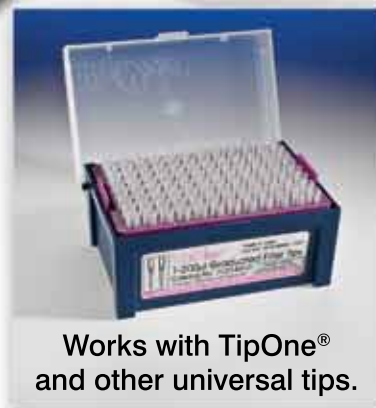
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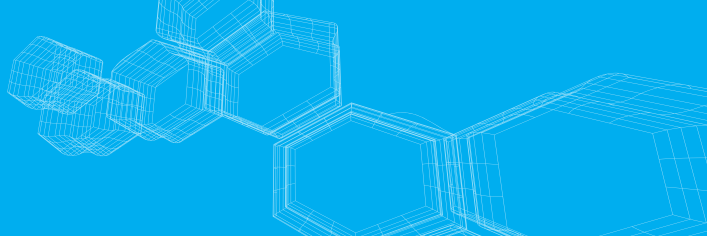
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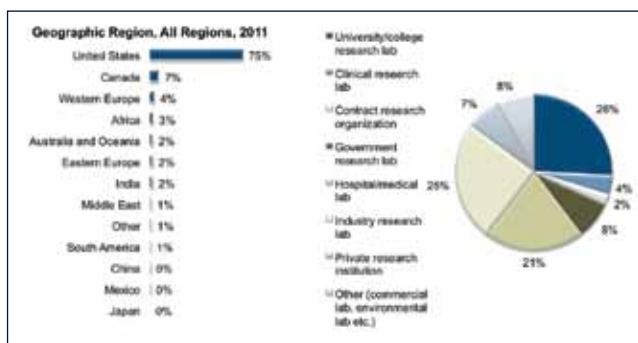
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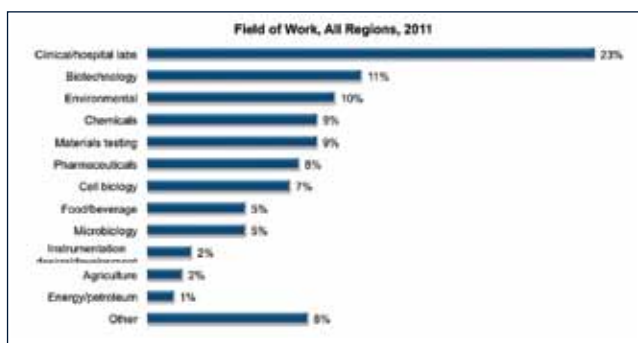
Survey results, presented below, aim to assess present and future business conditions, evaluate levels of confidence with regard to possible business scenarios, and gauge current and future budget changes. Survey respondents primarily included laboratory supervisors, managers, and directors; scientists and chemists; and QA/QC managers and directors. Most respondents' job functions are either in R&D; quality control, assurance, and validation; technical services; or operations. The top types of research organizations or markets/industries in which the respondents currently work include university and college research laboratories, industry research laboratories, and hospital laboratories.



▲ Geographic Region and Market/Industry



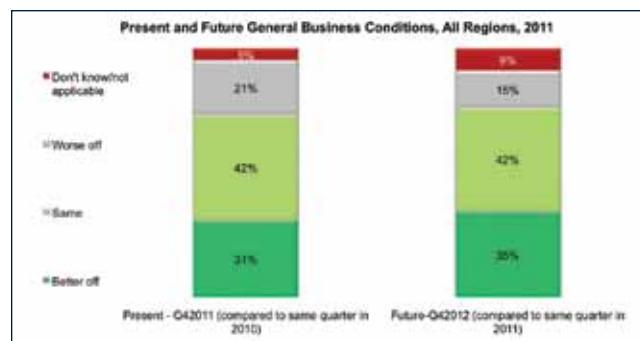
▲ Job Title and Function



▲ Field of Work

Modest Optimism for 2012

The modest optimism for 2012 is rooted largely in the belief of 35 percent of survey respondents that business conditions during the fourth quarter (Q4) of 2012 will be better than they were in Q4 2011. This number is slightly, yet significantly, larger than the 31 percent of respondents who believe that business conditions were better in Q4 2011 than they were during Q4 2010. While 42 percent of respondents believe that from Q4 2010 through Q4 2012 there will be absolutely no change in business conditions, the percentage of respondents who believe conditions will be worse dramatically decreased—from 21 percent of respondents who believed business conditions were worse in Q4 2011 compared to Q4 2010, to only 15 percent of respondents who believe business conditions will be worse in Q4 2012 compared to Q4 2011. Laboratory decision makers certainly don't expect 2012 to be a vast improvement over 2011, but they do have a somewhat positive outlook for the future.



▲ Present and Future General Business Conditions

Respondents were asked to rate on a scale of 1 to 7 their level of confidence with regard to multiple laboratory business condition scenarios, with 1 being not confident and 7 being very confident. Survey respondents are most confident that their laboratories will be sufficiently funded to maintain proper work environments. Roughly 20 percent selected either a 6 or 7 in response to the business scenario that "there will be sufficient funds to expand and maintain proper work space and a proper working environment in the lab." Respondents are also relatively confident that "there will be sufficient funds to acquire the technology necessary to achieve research objectives," with 19 percent selecting 6 or 7. Confidence is lowest in thinking that research objectives will be better off financially or properly staffed—in response to the business scenarios

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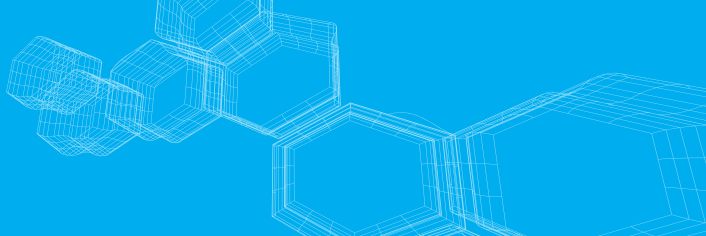
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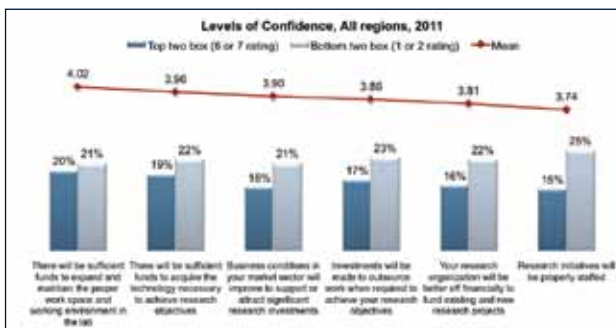
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Confidence Levels to Business Condition Scenarios



“your research organization will be better off financially to fund existing and new research projects” and “research initiatives will be properly staffed,” only 16 percent and 15 percent, respectively, of respondents selected 6 or 7.

When asked to comment on their level of confidence in their organization’s ability to invest properly in research projects in 2012, respondents gave a wide variety of answers. A principal investigator in a materials testing laboratory expects fairly significant cutbacks, writing, “We are trimming back 15 percent.” An operations manager in an agricultural research laboratory provided an equally bleak response: “We are currently at a standstill waiting for the economy to improve.” Many other respondents gave feedback that is far more positive. For example, a molecular biologist in the biotechnology industry anticipates a “very promising year in 2012.” Similarly, a technician in the pharmaceutical industry wrote: “I anticipate that 2012 will be a banner year for increasing new project research.” The overall consensus, though, best aligns with the sentiments of a core facility director in the environmental industry, who wrote: “We confidently expect a small increase overall.”

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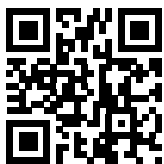
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“By the end of 2010 the general industry consensus was that the market had returned to a state of normalcy.”

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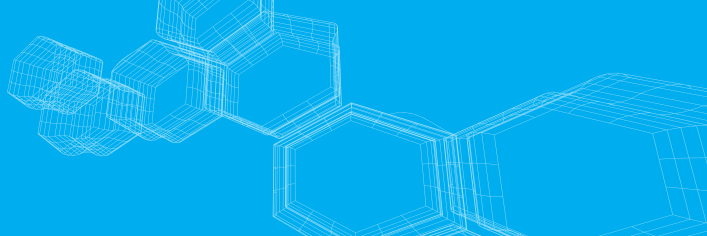
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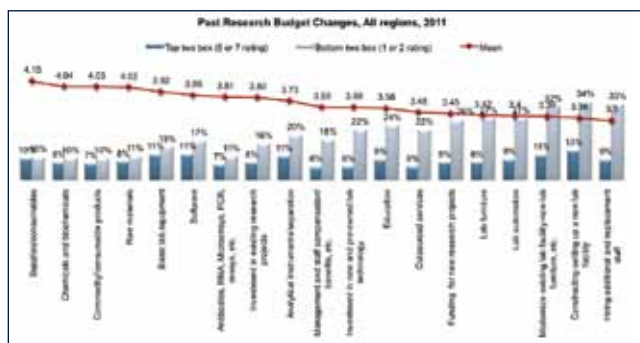


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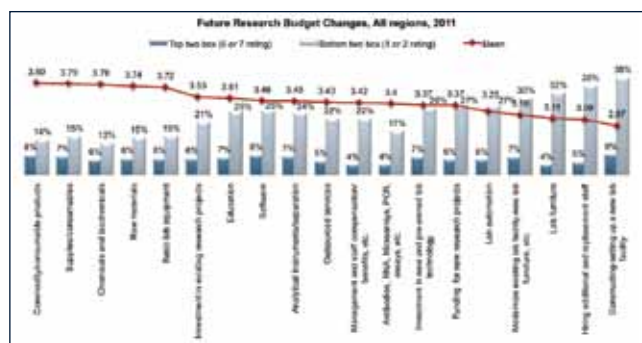


most others. Supplies/consumables are absolutely essential to the day-to-day processes and overall progression of laboratory work. While a laboratory might be able to continue functioning with fewer full-time employees or without the latest technologies, a laboratory cannot advance without basic supplies. Likewise, laboratories' spending on commodity/consumable products and raw materials increased from 2010 to 2011 and is expected to increase again in 2012. Despite these anticipated budget increases, the number of products purchased in these categories—the overall volume of supplies, consumables, commodities, and raw materials—is likely to remain flat. The reason for the increase in budget for these products is primarily due to rising manufacturing costs being passed on to consumers.



▲ Past Research Budget Changes

Spending on chemicals, biochemicals, and specialty biomedical research kits (e.g., antibodies, RNA, microarrays, PCR, assays) was also a leading reason for budget increases from 2010 to 2011. In 2012, chemicals and biochemicals spending is expected to remain strong. The specialty biomedical research kits, on the other hand, are likely to decrease in budgeting priority. These highly optimized kits come with a substantial, and often unnecessary, cost. For example, laboratories can employ home-brew methods to develop these expensive research tools in-house. Although home-brew methods are often more time consuming and less standardized than the off-the-shelf kits, they allow laboratories to avoid paying the premium costs associated with buying directly from manufacturers.



▲ Future Research Budget Changes

The final increased spending category, basic laboratory equipment, warranted larger budgets in 2011 compared to 2010, and the category is expected to grow again in 2012. Like general supplies, basic equipment is essential to day-to-day laboratory functions. Laboratories rely on equipment such as cold storage, mixers, shakers, and stirrers, and therefore anticipate periodic replacement of these tools. Conversely, budgets for high-end systems such as analytical instruments, separation technologies, laboratory automation, and other new or pre-owned lab technologies decreased in 2011 and are expected to decrease again in 2012. Unlike basic laboratory equipment, which generally costs hundreds or thousands of dollars, high-end systems often demand investments that are far more significant. By getting more mileage out of their older instruments and delaying new system purchases, laboratories can set aside precious funds for more dire needs such as consumables or staff.

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Respondents reported that their budgets for laboratory furniture, construction, and hiring underwent the greatest decreases from 2010 to 2011. Budgets for infrastructure and staff are expected to undergo a similar decrease in 2012. Recent ARRA funding resulted in the development of multiple new laboratories. With the exhaustion of those funds, further investment in infrastructure was suppressed in 2011 and will remain suppressed in 2012.

Jonathan Witonsky, Industry Manager, Life Science Research Tools & In Vitro Diagnostics, Frost & Sullivan, can be reached at jonathan.witonsky@frost.com, or by phone at 650-475-4520.

“Confidence is lowest in thinking that research objectives will be better off financially or properly staffed.”

Overall, research budgets for all surveyed areas did not change significantly from 2010 to 2011. Specifically, the mean budget changes for supplies and consumables increased most significantly, while the mean budget changes for additional and replacement staff experienced the most significant decrease. Future research budgets are not likely to change significantly. In particular, budgets for commodities and consumable products likely will see the most significant increases, while budgets for construction and the setup of new lab facilities are the most likely to decrease. While the roller coaster years of 2008 to 2011 were an incredibly unstable period for the laboratory industry, some may argue the survivors emerged leaner and more committed to progressing research and development. Moreover, the economic turmoil served as a learning experience on how to stay afloat when faced with limited funding. Given the current expectations for modest growth in 2012, laboratories will certainly need to put that education to good use.

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WHAT WOULD STEVE JOBS DO?

HOW INSPIRED MANAGEMENT CAN MAKE A LASTING AND SUBSTANTIAL DIFFERENCE by Ron Pickett

“Steve Jobs, technologist and tastemaker of modern digital culture, described himself as a captain of product design inspiring his teams of workers, as he once said, to go ‘beyond what anyone thought possible’ and to do ‘some great work, really great work that will go down in history.’”¹

Although we don’t often think about it this way, at its core your job as a manager is to make a difference. If you aren’t making a difference in your laboratory’s climate, its future prospects, and the development of your staff, what are you being paid for? Maintaining the status quo isn’t valued and probably isn’t possible for more than a short time. Organizations wax or wane; they don’t stay the same. So putting out fires and handling day-to-day problems, while necessary, aren’t really what your job is all about—think of these activities as buying you the time to make a substantial, lasting difference.

Middle management’s failure

A decade ago there was a scythe that went through the ranks of middle managers. Entire levels of management structure were eliminated. And you know what? Except for the pain for the individuals involved, there was very little impact. The reason, from my view, is that too many middle managers had defined their role as passing on directions

and orders; they had become a communications link, one that not only wasn’t needed but actually impeded achieving results for the organization.

“Sometimes life hits you in the head with a brick. Don’t lose faith.” —Steve Jobs

Individual contributors

It is easy to spot the contribution of “individual contributors.” I love that term! They are assigned tasks to perform and they are either successful or unsuccessful in achieving the goals that are set for them or, better, that they participate in setting. For managers, the easy goals are not a problem to assess—they are measured by the aggregate of the production of the staff—but the impact the manager has can be much more difficult to determine. The vagaries of the economy, changes in tastes of consumers, or a short-term run of poor results can have much greater impact on production than the results achieved from high-quality management.

What have you done that has made a difference in your department? That is posed as a rhetorical question, but I hope your mind is racing to find an objective response.

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“Be a yardstick of quality. Some people aren’t used to an environment where excellence is expected.” —Steve Jobs

Where to focus

How do you find things to do to make a difference? It takes time and knowledge of the intricacies and unique characteristics of the lab, the staff, and the total environment. Following are some analytical tools to help you.

Voodoo management

I believe that you can sense problem areas in your organization. There are “tells” in the vernacular of the poker stars; these are subtle clues that give hints about people and functions that need your attention. Often these are the places that can have the biggest, quickest impact on the total organization. Look for visual clues: wear and tear, traffic flows, posters and cartoons, books displayed prominently. Listen for subtle *sotto voce* comments; watch for facial expressions that don’t match the words; watch the interactions between people; and listen for hesitations in speech, a sense of seeking permission to continue. Mostly, listen with purpose. There is a feeling, a mood, a style that tense organizations exude; it’s the fear

that horses and dogs pick up, the attitude that precedes a downsizing. It’s something you can feel but can’t get your hands around. Use the data you have access to in order to support your sense—trends in or high turnover, complaints, mistakes, accidents, and other objective indicators.

If this description is leaving you cold, perhaps you need to tap into your sensitive, nonscientist self. You may find that some of your trusted allies are better at identifying subtleties and trends. Ask them what they are seeing and what they think needs to be changed. You do have trusted allies, don’t you?

“I think we’re having fun. I think our customers really like our products. And we’re always trying to do better.”
—Steve Jobs

Communication

Communication problems plague every work group. (Observe my communication with my wife if you need an example!) Have you been surprised by something lately? What happened? How were you isolated from the factors leading up to your surprise?

Think of three things that you can do to improve the clarity and effectiveness of the communication in your lab. (Hint 1: Start with reducing the fear of retribution—a shoot-the-messenger climate! Hint 2: Listen!)

Facilitating productivity

In a recent conversation I had with the manager of a restaurant, he described his role in making sure the wait staff had what they needed to do their jobs. For him that meant a corkscrew, order pads, and pencils—he had a stash of these items to help his staff be successful.

Spot some little things that get in the way of your staff and fix them! Sounds easier than it is.

Niggling, lingering issues

I recall one situation where there was an accounting problem. It was taking my staff an inordinate amount of time to get the final accounts finished and filed following major events. There were a number of issues involved, but the problem had persisted for several years. Part of the problem was that as soon as one event was completed, we were up to our neck in the next event. There was no time to fix the

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problem; it was easier to live with it than to get it resolved. The department manager and I got together with the accounting folks and, after spending a couple of hours in three or four meetings, we had a solution!

"The people who are doing the work are the moving force behind the Macintosh. My job is to create a space for them, to clear out the rest of the organization and keep it at bay." —Steve Jobs

Ask the question "What do you need from me to be more effective in your job?" And stash some corkscrews!

Improving the climate

What is it like to work in your lab? No, really! Bad economic times shield managers from the truth—people are afraid to leave, and a lot of people want a job. If the economy turned around tomorrow, how many of your staff would leave in a flash? A clue is how often you find resumes on the copying machine!

What one thing could you do today that would improve the openness for creativity in your lab—reduce restrictions, enhance rewards, improve resources?

"A lot of people in our industry haven't had very diverse experiences. So they don't have enough dots to connect, and they end up with very linear solutions without a broad perspective on the problem. The broader one's understanding of the human experience, the better design we will have." —Steve Jobs

Developing your staff

A few years ago, I ran across someone who had worked for me many years earlier. She said that she had just completed an essay as part of an application for graduate school. She used me as the example in her essay and said that I set goals that were thought to be beyond the skills of the staff—and they were surprised and energized when they were successful. Stretch your staff! Set high but achievable expectations and be a coach in helping them achieve the goals. People tend to get into a rut and do the same things over and over. When an opportunity to do something different arises, they tend to be resistant to taking on a challenge and doubt their ability to be successful. See "Leading Change," *Lab Manager Magazine*, Volume 5 Number 4, May 2010.

Stretching your staff is one of the most important ways to make a difference now and at the same time establish a climate of growth for the future.

"Mr. Jobs did not make the technology himself; he led the teams that did, prodding, cajoling, and inspiring."¹

Think of two or three things that are getting in the way of your staff's productivity. Fix them!

Input from your boss

"How will you know if I'm successful?" That's my favorite question for a new boss. It elicits some surprising answers and will give you an excellent insight into the priorities that your boss has for you and your lab. Over time you will be able to tell your boss the answer to this question—how he or she should tell if you are successful.

Telling your story. Think of three or four things that you have done that have had a positive (hopefully measurable) impact on your lab. (If you are new—how would you want to answer this question in three years?)

“Sometimes when you innovate, you make mistakes. It is best to admit them quickly, and get on with improving your other innovations.” —Steve Jobs

Trend spotting

I have the privilege of serving on the boards of two charitable organizations. Following their presentations on the state of their departments, I frequently ask staff members, “What should we be concerned about?” This question gets them thinking. They know that our role is to spot potential problems and help resolve them before they become serious. And they learn that they need to become focused more on the future than on day-to-day operations.

Ask yourself the question: What do I need to be concerned about?

Not invented here

Be wary of the “not-invented-here” syndrome! Making a difference is a great opportunity to find out how others have solved the problems you are dealing with.

“And no, we don’t know where it will lead. We just know there’s something much bigger than any of us here.” —Steve Jobs

Redefining your role

The best leaders I have worked for seemed to be constantly weighing the now and the future. They are always thinking about the impact of today’s situation on the future, always encouraging and stretching their staff, and always looking for ways to improve and open the lines of communication. So make a difference in your department—now!

“The system is that there is no system. That doesn’t mean we don’t have process. Apple is a very disciplined company, and we have great processes. But that’s not what it’s about. Process makes you more efficient.” —“The Seed of Apple’s Innovation,” Bloomberg Businessweek, October 12, 2004.

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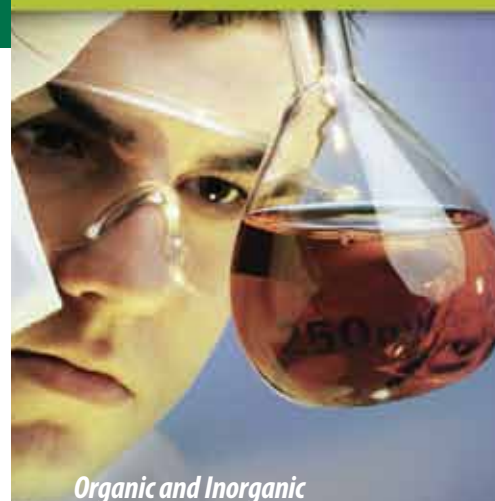
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ARE YOU HELPING OR HURTING EMPLOYEE MORALE?

By Alan Edwards



Last year I wrote a column about how “soft skills” are required to succeed in virtually every business today. Even in the sciences, a career path that has traditionally allowed insular personalities to thrive, soft skills are more important than ever.

The new workplace reality of the sciences, in fact, demands these soft skills, because of its cross-collaboration between organizations and business model that increasingly relies on relationships, networks, and knowledge-sharing to get things done. Scientists and anyone else working in the science industry today rarely work effectively without soft skills.

But while managers may tend to focus on an employee’s ability to adapt to company culture and successfully interact with others on a social level, it’s worth analyzing whether one’s own management style is helping or hurting the cause.

A good manager has the power to exponentially raise morale among workers—and that’s reason enough for leaders to brush up on the kinds of skills that allow them to relate to people on a more human level in the workplace. One of the most pragmatic reasons, however, is the bottom line, and it should convince any manager of the necessity for developing a better management style.

Exhibiting soft skills on the job, after all, isn’t just about an investment of good will toward employees, but a financial one as well. The most suc-

cessful labs and organizations, whether small or large, recognize this fact and are able to enjoy the rewards. Propped up by employees who feel that their managers value their time and worth, these companies tend to send products to market on time and on budget. They meet their customers’ needs quickly and efficiently. Customers continue to do business with them. More business flows in as a result.

“Scientists and anyone else working in the science industry today rarely work effectively without soft skills.”

Unfortunately, businesses that don’t understand this connection between good management and performance will suffer, and the opportunities that highly skilled workers have at their fingertips today is a big reason why.

Both employees and employers in the sciences are embracing a more free-agent work style in which highly skilled workers are hired on a contingent basis. The result is an environment in which scientists have more opportunities—and more choices—in terms of employment. They also are able to acquire many specialized skills as well as versatility™—the ability to adapt quickly and hit the ground running on any type of project with very little training.

A company’s ability to attract this type of highly skilled talent will be a critical sticking point when it comes to successfully completing complex projects. But if a company can’t make certain projects attractive through a combination of meaningful work and a meaningful work culture, these potential employees could very well choose to work somewhere else.

But what if, once you recruit the talent you need for a specific project, you are unable to retain that talent? Personal management style can also dictate which employees—even the contract ones—are willing to stick around for the long haul as well as for future projects. And in an age when knowledge retention is so critical for scientific companies, a failure to retain the best workers could mean a hit to a company’s bottom line in the future.

There is no doubt that scientific companies expect their workers to have a range of skills, both technical and soft, to get the job done. But managers will have to hold themselves to the same standards as the workplace transforms, realizing that the way they relate to their workers is an invaluable investment in every aspect of an organization’s goals.

Alan Edwards is vice president and science product leader, Americas Products Group, Kelly Services®. Kelly Services, Inc., a leader in providing workforce solutions, is headquartered in Troy, Michigan. For more information, visit kellyservices.com. Alan can also be followed on LinkedIn® and Twitter®

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BIG MOTIVATION

By Al Walker



"I don't know how to motivate anybody. I just know that when a person has a genuine burning passion to do something, they'll give it all they have." —Al Walker

Are you motivated? Is everyone motivated? Yes or no? Take a look around your lab. The truth is, you and everyone around you are motivated in one way or another. Even someone frozen in place, not doing one single solitary thing, is motivated to do just that—absolutely nothing.

Exactly what is motivation? Where does it come from? What causes one person to be what we all call "motivated" and another person to seemingly just plod through life, doing only what needs to be done to keep their job, stay in school, maintain a marriage, etc.? What does it mean to be self-motivated (beyond the obvious) and how do we do that? Why is it that no matter what we say or do to motivate people, some folks just never seem to have the "get up and go" we would like for them to have?

I don't know of many other words that have been as misunderstood or misused as the word "motivation." When most people say they motivated someone, they mean they said or did something that caused that person to move forward at a little faster pace than they had been. People aren't really motivated by what we do or say. They are motivated by what they think about what we said or did. They (we) always have a choice.

They decide, usually in a matter of seconds, that it would be in their best interest to do or not do whatever it is you want them to do.

In other words, what you said or did was simply the stimulus for them to make a decision. AND...I promise you, everyone usually makes the decision they feel is in their own best interest. So, we can say people do whatever it is they do for their reasons, not ours.

For example, we have a person in our community I've known since we were children. His father died when he was in his early 20s and he was an only child. He received a small annuity from a policy his dad had bought for him which was just enough to exist on...not really live, just exist. He lived with his mother until she died about five years ago and he continued to live in the house he was raised in. This person has only had two jobs in his several decades on the planet. They both lasted just a few months. He married young and his wife left him after about a year. That was when he had his first job, which he quit going to after a couple of months, yet he would get up every morning, tell his wife he was going to work, then go to a restaurant and sit there until he knew she had left for work and then he'd go back home. Once she found out, that was just one more straw that broke the camel's back of their marriage.

His mother was a hard worker and head buyer of cosmetics in a large department store. She got him the only other job he ever had selling men's cologne. It came with a salary, a company car and other benefits. Three months into the job, his manager walked up behind him at a college baseball game on a weekday afternoon and told him he had been following him around the past few days and was very unhappy about the lack of effort, energy and results our friend had been getting. He then told him, either go get in your car and go make some sales calls or give me the keys. Our friend, very nonchalantly pulled the keys out of his pocket, gave them to the manager and said, "I quit."

The manager thought he'd motivate our friend to do what he wanted to do, but our friend surprised him and did instead, what he wanted to do—just get by—and he has done just that—barely gotten by—for a long, long time. Are your people just getting by?

Al Walker is a motivational humorist who offers funny, inspiring and entertaining speeches, workshops, seminars and concurrent sessions. His reputation as a trainer, facilitator and workshop/seminar leader has brought him international recognition. Visit his website at www.alwalker.com or contact him via email at info@alwalker.com or by phone at 800-255-1982.

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WE NEED BACKUP!

THE IMPORTANCE OF POWER PROTECTION IN LABORATORY AUTOMATION

by Raymond L. Hecker

For many of us, our introduction to laboratory automation revolves around the formerly popular Technicon SMA (Sequential Multiple Analyzer, circa 1969) and the SMAC (SMA + C), when a computer interface was added to the platform in 1974. In the heady days of clinical chemistry laboratory management, when the lab was a profit center and the goal was publishing more reportable test results, these laboratory workhorses were not bounded by restrictive government reimbursement policy such as DRGs (diagnosis-related group) and the Health Insurance Prospective Payment System (HIPPS) codes—originally developed for Medicare. In these early days, automation in the laboratory was a collection of electromechanics and peristaltic pumps to move the samples, with spinning colorimetric light sources assisting in analysis; it was not too dissimilar to “pinball machine” logic and the game’s flashing lights with some computer and limited microprocessor control. As the Archie and Edith Bunker characters from *All in the Family* sang in 1971, “Those were the days!” and yes, they were. There was a plentiful supply of laboratory technologists, as the market’s growth appeared nearly unlimited. After all, the baby boomers would arrive on the scene to drive healthcare services to greater heights. The lab equipment of the day was relatively simple to operate, and the faster you could pipette and aliquot, the better.

Between 1967 and 1983, hospital reimbursement costs rose more than tenfold, from approximately \$3 billion to \$37 billion annually. With the government footing the bill for the majority of these costs, it was obvious that a change was in the wind to control reimbursements. HIPPS codes and related DRGs were voted into law in 1982. While Congress debated the benefits and requirements of controlling cost, forward-thinking chemistry system manufacturers began taking advantage of improved microprocessor technology and minicomputers such as the Digital Equipment PDP-11 to develop faster instrumentation systems with hospital interfaces. The dawn of laboratory automation

had its roots in government regulation of the early 1980s as labs became cost centers and the way business had to be conducted was forever changed. The IBM personal computer was burgeoning, and the demand for faster, lower-cost reportable results was in full swing.

“The U.S. power industry is a commodity product utility with a generally good track record of delivering on its promise of 99.99% reliability.”

Laboratory automation had its development roots in the very late 1970s and progressed rapidly through the mid-1990s as industry interest groups were developed and became more popular. The most notable product of these groups was information interface and equipment standards, including the Laboratory Equipment Control Interface Specification published in 2000. While the rush to cost reduction was in play on an enterprise-wide level and computer demand grew in the digital age, we also unknowingly suffered from a historic industry deregulation. The deregulation of the power industry put many in the laboratory business sector on a collision course with the digital age, technology improvements, cost center management, and an insufficient and degraded power delivery system. Our laboratories, literally wired for the 1970s and 1980s, could not possibly cope with the demands of the computer age and the strain they put on the laboratory’s electric power delivery. Enterprises suffered from high power demand and inadequate wiring. The business losses due to power quality issues soared.

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▲ *Figure 1: Photo of NYC 2003 blackout*

switching transients, and harmonic distortion are even more devastating.

But we were slow on the uptake of lessons we should have learned; fast-forward to today. We are on the verge of DNA sequencing becoming a common clinical chemistry technology, complete with a reimbursement mechanism. Molecular diagnostics have made great strides in translational oncology and the DNA-sequencing industry supported by the U.S. Department of Health and Human Services' NIH- and NCI-funded research projects. Next-generation sequencing is in its third wave, with single molecule real-time sequencing technology looking like a very prominent and game-changing technology. The promised \$1,000 personal genome can occur only with very high-throughput testing (HTT) as a result of sophisticated laboratory automation—the most advanced high-speed robotics of the laboratory industry. With laboratory automation standards set, we now turn to keeping this technology up and running.

The U.S. power industry is a commodity product utility with a generally good track record of delivering on its promise of 99.99 percent reliability. Is this reliability good enough, and does it protect the laboratory? The “four 9s” reliability figure translates into an average 53 minutes of annual power loss. The problem with power reliability at this level is the switching transients that make up the majority of the accumulated loss. An annual average of 53 minutes translates to over 750,000 lightning strike events and incidents per year in an area the size of Germany. The most prevalent time for electrical disturbances is during the months from June through September. A computer can tolerate a loss of up to 20 ms without skipping a beat; however, the typical glitch that we can sense is approximately 300 ms in duration. That is a devastatingly long period of time and enough to send a computer to never-never land. Coupled with switching transients is harmonic distortion, the real killer of sensitive electrical equipment like that used for HTT laboratory automation.

Laboratory automation is primarily high speed and utilizes very-high-acceleration robotic technology. Laboratory automation is much more than a computer; it is sophisticated multiaxial

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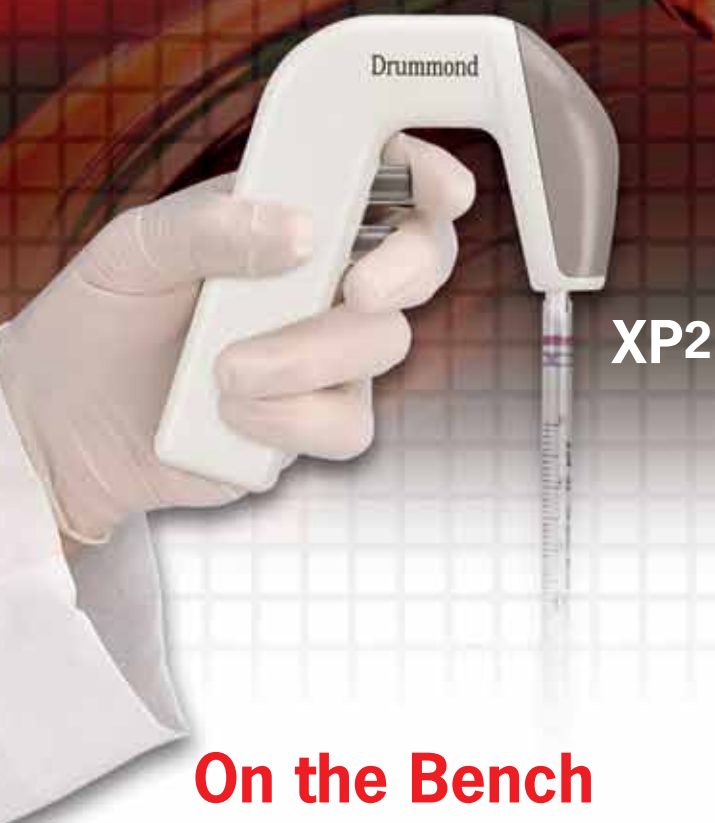


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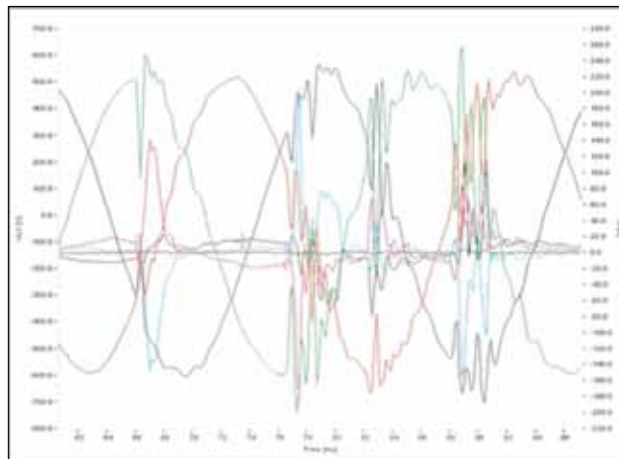


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motor control, precision mechanisms, and AC and DC three-phase motors with laser sensors. A computer has only two moving parts: a disk drive and a fan, which use DC voltage. An automation system has AC and DC circuits, high-frequency switching motor control, and high in-rush currents, and it is not tolerant of an adulterated AC wave form (Figure 2).



▲ *Figure 2: Line Power Harmonic Distortion. Source: General Electric*

While your laboratory may be protected by an emergency generator and a central UPS, the primary issue with a central system is that it cannot react to short-duration transients that do not result in a loss of power of sufficient duration and magnitude to set an automatic transfer switch in motion to start a generator. A central system is also a single point of failure. Likewise, short-term transients bypass most central systems, which are optimized to meet green energy mandates and provide power for long-term outages, usually exceeding one minute or longer. While the central system is coming up to speed to protect all the load it is designed to carry, your automation system is now off to never-never land again.

So how can you protect your laboratory automation?

The answer is simple and straightforward:

- If your automation looks like a computer and uses power like a computer, then protect it with a high-grade computer UPS.

“Reliable power delivery to your instrumentation and automation allows your laboratory to fulfill its customer promise[s].”

- If your automation looks and acts like an advanced automated instrumentation system, protect it with a specific and purpose-built instrumentation power protection system (IPPS) that is designed to protect the dynamic loads of instrumentation and high-throughput automation.

The decision to add advanced automation to your laboratory was for long-term consistent production and cost reduction. This choice indicated a decision to reduce bench staff, improve performance, provide timely reportable results with higher accuracy and high specificity, and drive cost down.

The addition of smart monitoring and reporting coupled with a laboratory automation system is another wise choice.

A point-of-use IPPS with smart monitoring and reporting technology provides the ultimate power protection for the high-throughput automated laboratory. Coupled with an emergency generator for a nearly unlimited power resource, the IPPS corrects the generator's power to provide pristine power delivery to your automated equipment. Reliable power delivery to your instrumentation and automation allows your laboratory to fulfill its customer promise of delivering low-cost reportable results in a timely manner. Your lab's reputation is saved, your customers and stakeholders are happy, and you have more time to plan and operate your laboratory business as you intended.

Raymond L. Hecker, consultant, Power Protection Solutions for the Laboratory and Life Sciences Industry, can be reached at rlbecker2@gmail.com or by phone at 949-636-7922.

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PLANNED DOWNTIME

EXTENDING EQUIPMENT LIFE THROUGH OVERALL EQUIPMENT EFFECTIVENESS *by Sean Jordan*

Routine maintenance and proper training can extend the life of any piece of laboratory equipment. Unfortunately, even with proper maintenance, and sometimes resulting from lack of maintenance, large equipment can break down—sometimes at the worst possible time. The subsequent bottleneck and chain of events, including scheduling a service vendor, coordinating purchase orders, and redirecting or halting work planned on that equipment may lead to increased employee frustration, lost research time and materials, and increased equipment cost of ownership. Fortunately, there is a way to reduce equipment breakdowns and related service costs so your team can focus, uninterrupted, on your science.

In addition to preventive maintenance and training, a key performance indicator known as overall equipment effectiveness (OEE) can highlight improvement areas that may prevent unwanted equipment breakdowns in your lab. OEE is a well-known measurement in production environments for capturing equipment performance, and is gaining momentum in life sciences. As part of an overall improvement strategy, OEE is not difficult to calculate, and it will create lasting benefits for your lab.

OEE captures relative equipment effectiveness over a set time period by measuring unplanned downtime, resulting defects/errors, and equipment operating speed. Once calculated, you and your team can investigate issues impacting the OEE value and implement appropriate corrective actions. If you can improve OEE, you can increase overall lab efficiency, reduce equipment repair costs, and focus more on your science.

OEE may be useful in your lab if equipment:

- Is used more than other equipment
- Is critically important to processes, thus creating work stoppages when unavailable
- Has frequent unplanned downtime
- Has poor quality performance
- Has a specific purpose that cannot be duplicated in the lab

Calculating overall equipment effectiveness

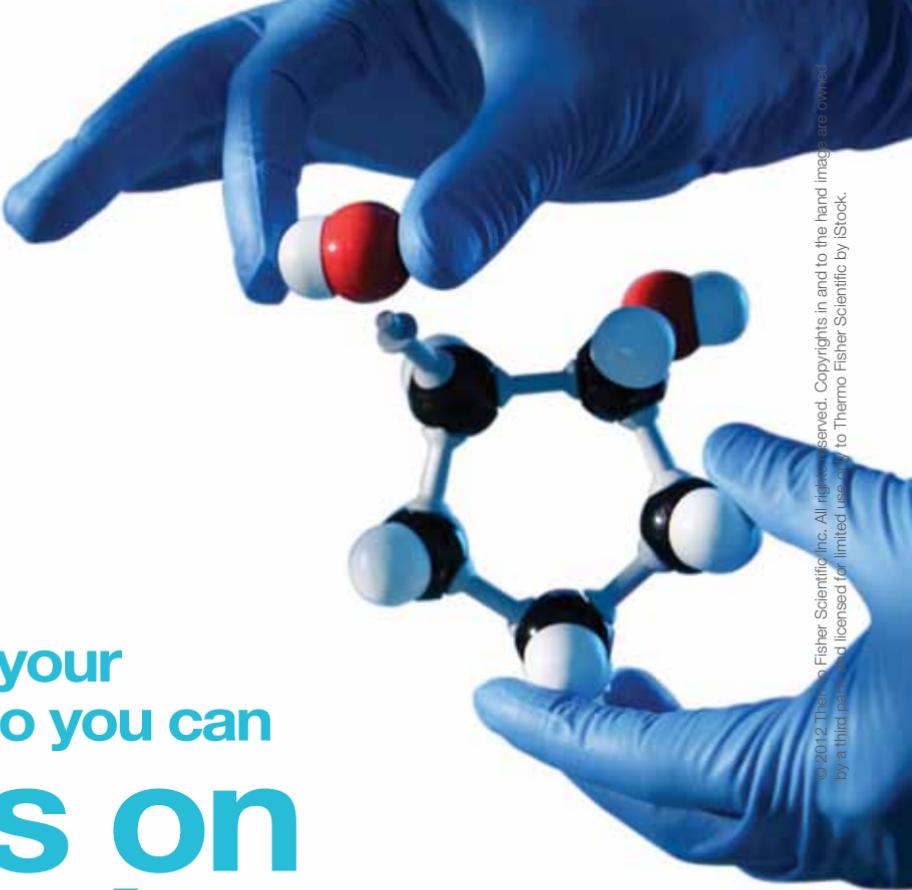
Take the time to collect data. Calculate the OEE by measuring unplanned downtime, processing speed, and quality of results, and keep a log of all equipment-related issues (Figure 1).



◀ *Figure 1.*
A variety of factors may influence overall equipment issues and costs.

OEE captures unplanned downtime. It is not meant to minimize planned downtime such as routine and preventive maintenance, new user training, and operations that should be regularly scheduled to extend equipment life. Unplanned downtime is time when the instrument should be functioning but cannot complete its assigned tasks. This includes broken machinery, occasional stoppages during a process, and setup and adjustment time prior to and during the process. Users in a lab often tweak scientific equipment to find the optimal setting without realizing that this is unplanned downtime. For example, if an instrument is scheduled to run 35 hours every week and is actually unavailable for five hours during that week due to setting tweaks or other unplanned downtime, it is only available for 30 hours per week, or 85.7 percent of its scheduled time.

Actual processing speed compared to the manufacturer's specifications is also considered. Measurements may vary based on the nature of the samples used or individual labs and could include microplates per minute, units per second, time to incubate, assay read time, or any other processing speed measurement. Continuing with our example, let's assume the instrument's manufacturer specifies a processing speed of 40 units per second and the actual output



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is 38 units per second. The instrument therefore performs at 95 percent of the manufacturer's specification.

The third and final OEE parameter is quality of the equipment's output. Does another sample have to be processed as a result of a previous incorrect outcome? What percentage of this equipment's processed outcome is correct the first time? Concluding with our example, let's assume that one out of every four samples has to be reprocessed. This means that the instrument's correct output is 75 percent.

Using unplanned downtime, processing speed, and equipment output, OEE may be calculated. Using our example parameters of 85.7 percent availability, 95 percent processing speed, and 75 percent quality results, we can calculate that $OEE = 0.857 \times 0.95 \times 0.75 = 0.61$, or 61 percent. Fundamentally, the instrument is losing effectiveness, because it has less availability for valuable processing, runs at a slower speed, and produces inferior results.

"Once OEE is calculated, a small team or an individual should consider the most significant problem to address."

Once OEE is calculated, a small team or an individual should consider the most significant problem to address. Per the example we used, users may be spending too much time tweaking the instrument (unplanned downtime). When investigating the need for setting tweaks, consider the following possible causes:

- Worn parts
- Partial contamination (spills, clogs, dirty optics, etc.)
- Decreased instrument accuracy
- Inconsistent methodology from user to user
- Varying material types

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“Manipulating OEE metrics to achieve a high OEE value will only result in a high, meaningless number.”

Now research further to determine their root cause. Why are parts worn? Why and where has contamination occurred? Why is there an accuracy issue? Why are employees doing the same test differently? Are the sample materials appropriate for this instrument? This applies to all potential causes, and there could be several levels of subsequent questioning before the final root cause is identified. Once the root cause is identified, brainstorm possible solutions, test them, and measure their impact on OEE and overall lab performance.

In line with any corrective action or improvements, financial benefits should also be considered. Quality improvements could translate to less wasted expensive materials, consumables, or precious samples. Increased available time and processing speed may provide increased overall throughput.

It is important to remember that the more improvements you make to the equipment's operation, the more results you should get back. With that said, OEE is not a quick-fix method toward instant benefits. The time to recognize impact is dependent on the change implementation time, and benefits are based on sustained, long-term activity.

Other factors to consider

Although a world-class benchmark is 85 percent OEE or higher, this number is not absolute, and attaining it should not be the focus. Manipulating OEE metrics to achieve a high OEE value will only result in a high, meaningless number; it will not contribute to improvements in your equipment's life or efficiency. Instead, determine and correct root causes where feasible and set a realistic and lab-specific OEE target number.

Regularly scheduled preventive maintenance and user training also significantly contribute to extended equipment life and reduced unexpected breakdowns and related repair costs. Maintenance and training can be performed by internal maintenance and training designees, manufacturer service representatives, or authorized third-party service providers. For lab managers looking for external assistance with a maintenance improvement program, many states offer assistance through the Department of Labor or

economic development programs. Many state governments also have funds for Lean and Six Sigma projects, which utilize OEE and Total Productive Maintenance.

In a laboratory accustomed to running equipment despite quality issues and frequent work stoppages, it may seem paradoxical to improve lab efficiency through increased equipment downtime. However, this planned downtime improves quality, minimizes unplanned downtime, saves money, and improves timely results and performance.

Sean Jordan, service director at BioTek Instruments, has spent more than a decade coaching, designing, and implementing various equipment performance solutions in a variety of industries. He can be reached at jordans@bitok.com or by phone at 802-655-4740.

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HPLC-FLUORESCENCE DETECTION

SUPPORTS FUNCTIONS RANGING FROM CONVENTIONAL TO ULTRA-FAST LC ANALYSIS by Simon Robinson

Although scientists have relied solely on LC-MS methods in recent years, HPLC-fluorescence detection is now designated as the official analysis method for many components across various industries. In particular, it is used for analyses that demand high sensitivity and high selectivity, especially when the analyte has little or no UV absorbance.

Specifically, fluorescence is widely used in the food, environmental, and pharmaceutical fields, especially with samples containing high levels of impurities. One example is the pharmaceutical industry, where fluorescence detection combined with either HPLC or high-performance thin-layer chromatography (HPTLC) has been used for pharmaceutical quality control in hospital chemotherapy production units.¹

HPLC-fluorescence detection has a number of important benefits, including high sensitivity, high selectivity, and repeatability. The most advanced fluorescence detectors feature a temperature-controlled cell to ensure stable analysis even if the ambient temperature fluctuates. These detectors also provide high levels of sensitivity and validation to support functions in a wide range of applications from conventional to ultra-fast LC analysis.

Fluorescence detection: State of the art

Scientists seeking the most reliable and efficient HPLC-fluorescence should consider the following factors when selecting instrumentation.

High sensitivity

With a water Raman S/N ratio of at least 2,000, the most advanced fluorescence detectors are powerful tools for tests demanding analysis of trace-level components while retaining the acquisition speeds necessary for ultra-fast analysis. Because fast response is necessary to follow

the sharp peaks in ultra-fast analysis, some of these instruments can provide 10 ms response. The quick response time permits ultra-fast LC without loss of separation.

Additionally, simultaneous testing of multiple components requires detection at optimal wavelengths. These detectors allow ultra-fast, highly sensitive, multi-component analysis using wavelength switching via a time program.

“Top-of-the-line detectors have a power supply that provides consistent energy flash-to-flash.”

Temperature control

As a general rule, fluorescence intensity drops as the temperature rises, because the molecular collisions increase in frequency with increases in the temperature. Therefore, molecules lose their potential energy. In other words, a fluctuation of the ambient (de-

tection) temperature changes the fluorescence intensity of some compounds and this negatively influences the accuracy of analysis. However, more advanced instruments have a temperature-controlled cell as a standard feature, ensuring the high reliability of analysis that is not affected by temperature.

Figure 1 shows a comparison of the peak intensities at cell temperatures of 25°C and 30°C. The comparison of two chromatograms at cell temperatures of 25°C and 30°C reveals a decrease in peak intensity of more than 10 percent for every compound at the higher cell temperature. By maintaining a constant cell temperature, peak intensity, and detection, sensitivity will not be compromised if the room temperature changes during the sequence run.

Modern detectors should include a temperature-controlled cell with a cooling function. This maintains a constant detector cell temperature, even if the testing environment's room temperature fluctuates, so it ensures reproducibility without any drop in sensitivity.

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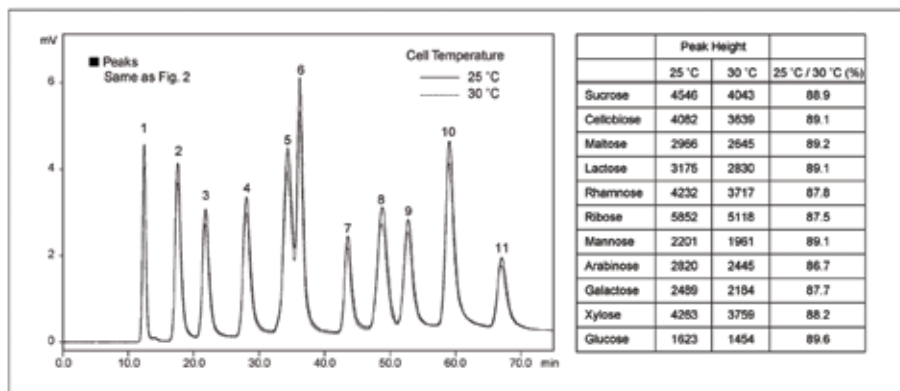
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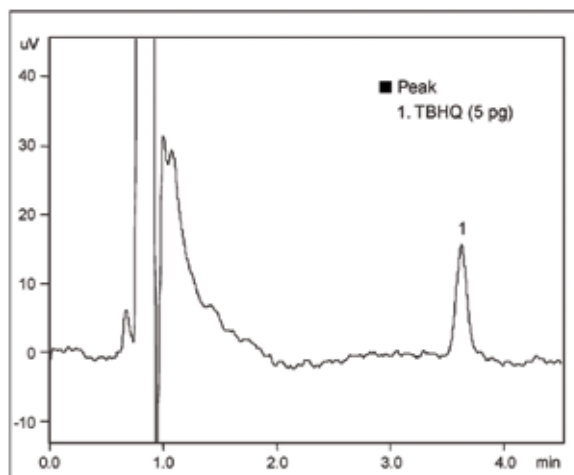
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▲ Figure 1. Effect of cell temperature on peak intensity.



◀ Figure 1. Effect of cell temperature on peak intensity.

Arc lamps vs. flash lamps

There are a number of differences between xenon arc lamps and flash lamps in fluorescence detectors. For example, the life of xenon arc lamps can last up to 2,000 hours, which can be up to four times longer than flash lamps. This significantly reduces running costs and downtime due to maintenance.

However, it should be noted that the life of either type of lamp is impacted by the way the lamp is run, so more flashes at a lower energy (joules) or less flashes at a higher energy may result in the same lifespan. The typical lifetime also depends on the starting voltage, peak current, length of discharge, and fill pressure. While many lamps are designed to last one million to 10 million flashes under “normal” conditions, changing the energy per flash can shorten those numbers significantly.

Another consideration is that arc lamps change output wavelengths, depending on how much energy is used. At lower flash energy, users will get more ultraviolet light in the 300 to 400 nm range. At higher flash energy, the energy shifts to visible and infrared light in the 700 to 1,000 nm range. Top-of-the-line detectors have a power supply that provides consistent energy flash-to-flash so that the energy expended per flash does not need to be monitored as closely.

This allows flash lamps to be tuned to the sensitivity requirements of the analysis. However, when used at their most sensitive and highest flash frequency, the lifetime is normally below that of a xenon arc lamp, making the cost of ownership higher.



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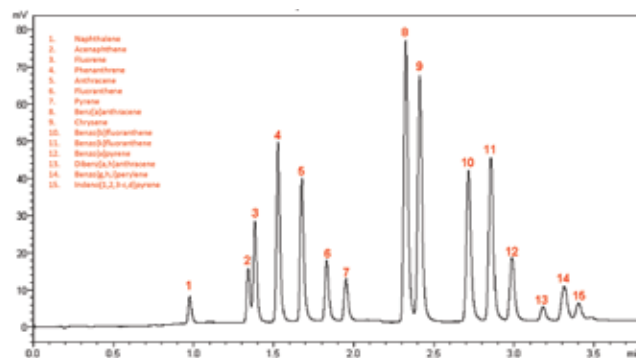
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Analyzing food additives

Tert-Butylhydroquinone (TBHQ) is one of the phenolic antioxidants, and its use as a food additive is permitted in some countries. Typically, HPLC with UV detection is employed for analyzing phenolic antioxidants; however, some of these substances, including TBHQ, can be detected with a fluorescence detector.



▲ Figure 2. Chromatogram of TBHQ (0.001 mg/L, 5 µL injected).

Figure 2 shows an example of TBHQ high-sensitivity analysis using an advanced fluorescence detector. Here, 5 µL of a TBHQ standard solution (0.001 mg/L) was injected, clearly demonstrating that 5 mg of TBHQ can be detected.

Environmental testing

The recent oil spill in the Gulf of Mexico created concerns over the safety of seafood that could be contaminated with polycyclic aromatic hydrocarbons (PAH) from

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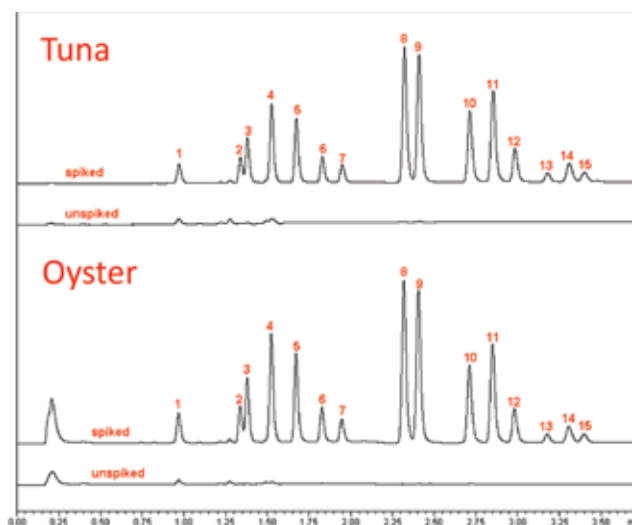


TECHNOLOGY & OPERATIONS

crude oil. PAH is one group of wide-ranging environmental pollutants, some of which the U.S. Environmental Protection Agency has identified as carcinogenic, toxic, and mutagenic. The EPA has designated 16 PAH compounds as "priority pollutants" that are subject to restriction.

Some Gulf jurisdictions started screening seafood for at least 12 PAH compounds. The traditional method for analyzing PAH is GC-MS, which can take upwards of 60 minutes per analysis. However, because many PAH compounds are fluorescent, they can be detected with high selectivity and high sensitivity using a fluorescence detector.

In one analysis, researchers performed rapid analysis of PAH in tuna and oysters using UHPLC equipped with a sub 2-micron PAH column and fluorescence detector. The 100 Hz sampling rate permitted ultra-fast LC with no loss of separation. Furthermore, this method provided accurate determination of 15 PAH compounds with optimum wavelengths in less than four minutes. (See Figure 3.)

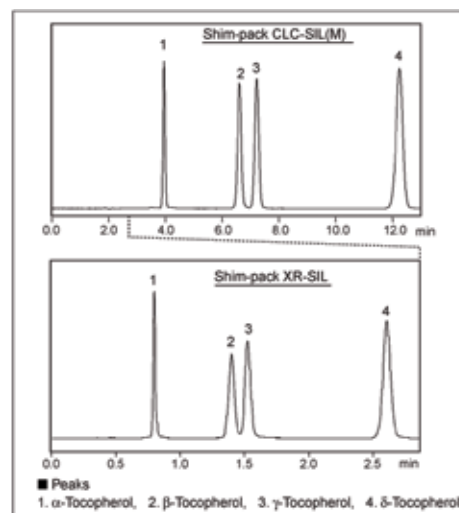


◀Figure 3. Separation of polycyclic aromatic hydrocarbons at 20 ppb level (top); Samples of tuna and oyster vs. the same samples spiked with PAHs at ppb level.

Pharmaceutical analysis

Tocopherols (Vitamin E) consist of a class of nutrients that are not only used as food additives such as antioxidants and nutritional supplements, but are also included in natural ingredients. Tocopherols are known to exist in various forms, including the β -, γ -, and δ -isomers, as well as α -tocopherol.

HPLC analysis of tocopherol isomers is typically conducted using normal phase chromatography combined with fluorescence detection. In this example, ultra-fast analysis was conducted using a high-speed, high-resolution analytical



▲Figure 4. Chromatograms of standard mixture of tocopherols (2 mg/L each).

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ANALYTICAL CONDITIONS	
Instrument	Nexera UHPLC with RF-20AXs Fluorescence Detector
Column	PAH C18 (2.1 x 50 mm, 1.8 μ m)
Mobile Phase	Acetonitrile in Water
Gradient	Acetonitrile 50% (0.20 min) 100% (2.80 min) Acetonitrile 100% (3.50 min) 50% (3.51 min)
Flow	0.6 mL/min
Column Temperature	30°C
Detection	0.00–1.59 min, Ex: 260 nm, Em: 350 nm 1.59–2.10 min, Ex: 260 nm, Em: 440 nm 2.10–2.54 min, Ex: 260 nm, Em: 400 nm 2.54–3.50 min, Ex: 280 nm, Em: 470 nm

ANALYTICAL CONDITIONS	
Column	Shim-pack XR-SIL (75 mm L. \times 3.0 mm I.D., 2.2 μ m) Shim-pack CLC-SIL(M) (150 mm L. \times 4.6 mm I.D., 5 μ m)
Mobile Phase	Hexane / 2-Propanol = 100 / 0.5 (v/v)
Flow Rate	1.2 mL/min (XR-SIL), 1.0 mL/min (CLC-SIL(M))
Column Temp	30 °C
Injection Volume	4 μ L (XR-SIL), 10 μ L (CLC-SIL(M))
Detection	RF-20AXS Ex. at 298 nm, Em. at 325 nm
Cell Temp	25 °C
Flow Cell	Semi-micro Cell (XR-SIL); Conventional Cell (CLS-SIL(M))

column (particle diameter 2.2 μ m) together with a fluorescence detector.

Figure 4 shows an example of analysis of a standard solution of four tocopherols (2 mg/L each) using a conventional column (particle diameter 5 μ m) and the high-speed column. The high-speed column shortened the analysis time to less than one-fourth of the original time.

Conclusion

Fluorescence detectors are used in a wide range of fields and are indispensable for their high sensitivity and selectivity. With the capacity to identify and quantify low concentrations of target compounds, they are the right complements to LC in applications requiring efficient and reliable analysis.

Simon Robinson, HPLC product manager, Shimadzu Scientific Instruments, can be reached at scrobinson@shimadzu.com or by phone at 410-381-1227.

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Michael Noble, Ph.D.

ASK THE EXPERT

TRENDS IN LABORATORY QA/QC

by Tanuja Koppal, Ph.D.

Michael Noble, Ph.D., professor in the Department of Pathology and Laboratory Medicine at the University of British Columbia and chair of the Program Office for Laboratory Quality Management, emphasizes that while increased awareness, education and standardization of information and protocols have helped improve laboratory quality, people still need to be reminded that the pursuit of quality is a commitment that needs constant time, effort and money. Hence, he advises lab managers to start small, stay committed and keep an eye on the “cost” of having poor quality as opposed to focusing on just the costs incurred for quality improvements.

Q: Having been in this field for more than a couple of decades, do you think we have gotten better, gotten worse or stayed the same in terms of lab quality?

A: I think we are doing better. In the 1940s, when we started looking at the notion of proficiency and competency for laboratories, studies done in Philadelphia labs found that there was absolutely no correlation between the lab results. Since 2000, we have started to recognize that we would do better if we emphasized the importance of standardization and there has been a huge amount of work in that direction. Accreditation, proficiency and monitoring have all gotten better, and it's largely because the public is increasingly demanding it. If we stay along the track where we recognize improvements through standardization and monitoring, then we will continue to get better. If we choose to go back to the notion of using invalidated and unverified testing methods, then we would be right back in the mess we were in 25 years ago. One

of the biggest problems we have right now is in the area of molecular diagnostics where very little of the work is truly validated for its use.

Q: Besides standardization, what else do you think has impacted lab quality?

A: Associated with standardization has been increased awareness and education. People who are coming into laboratories today are more aware than we were back in the mid-1970s. Back then, if Dr. Smith said it was so, then it was so, and that's the way it was. But that's not the way it works anymore. Now we have requirements and expectations for operating procedures. We have quality indicators that are requirements. We have a whole series of steps along the way and we take caution to ensure that the information we're providing is what we expected.

Q: Improvements in quality involve costs. How can lab managers justify those costs and the return on investment?

A: The cost of quality is the part everybody sees. Managers see the cost of accreditation, of proficiency, and everybody sees the cost of quality control. What they don't see, because it's buried deep in their numbers, is the cost of poor quality.

Let me give you an example. One of the studies we did looked at how much time people spend correcting errors. In a small laboratory, with 10 technologists or less, even if they have only one error a day (and that would be extremely unusual), they can be consuming up to 35 percent of their employee time correcting those errors. So a third of their workforce is spent doing work that has no revenue associated with it. In very large laboratories, with greater than 250 full-time employees, nearly 12 percent of their personnel are involved in the correction of errors. Well, if you were to reduce those errors by 10-15 percent, the amount of money that you would save in productivity starts to get into the range of a couple hundred thousand dollars a year. I know that it's really easy to look at the cost of quality, but I think that laboratory managers who understand and are committed to the notion of quality need to express to their top management how much they can benefit through the quality process by reducing their costs of poor quality.

Q: What are some of the biggest challenges preventing quality measures from taking place?

Dr. Michael Noble, Ph.D., has held a broad variety of quality-oriented positions that focus on medical laboratory quality within the private, public, academic, research and planning environments, both national and international. He is a medical microbiologist and internal medicine specialist by training and has been an infectious diseases physician, an infection control physician, a laboratory specialist and a researcher at various times throughout his career. He is currently a professor in the Department of Pathology and Laboratory Medicine at the University of British Columbia and is also a medical microbiologist with LifeLabs Medical Laboratory Services. Dr. Noble has been actively involved in medical laboratory quality management issues for almost 25 years. In 2001, he developed the Program Office for Laboratory Quality Management (POLQM), to function as a companion program to the University of British Columbia Clinical Microbiology Proficiency Testing (CMPT) program, to broaden the scope in terms of both research and education opportunities. The Program Office has been successfully engaged in national and international research in laboratory quality management.

A: When it comes to quality, we hop around a lot depending on the flavor of the month. For a time, Lean was seen to be the godsend, and now you see a lot of literature talking about all the problems with Lean. You see the same thing with Six Sigma and with ISO 9000. The reality is that all of these programs are sound; if they are implemented, they will actually reduce team costs and improve the quality of the laboratory. The problem is that we tend not to implement them with commitment. We kind of expect the “magic bullet” and when that doesn’t occur, we drop it and go to the next one. We get more engaged in the tool than we do in the concept of quality.

The reality is that, with quality, the notion is one of continual improvement. It’s not a matter of doing it right the first time. It’s picking up the error, learning from it and always going forward a step at a time. And that’s where we tend not to be particularly good in our quality implementation. We always make this assumption that we have to get it right the first time. We don’t. Quality takes a long-term commitment. But it’s worth it in the end because costs are guaranteed to go down, the amount of energy people have will go up, the amount of enthusiasm will remain, we will stop losing personnel and we will make laboratories better.

Q: Besides Lean and Six Sigma, what other standards have impacted lab quality?

A: It seems to me that across Europe, increasingly in Canada, and to some degree in the United States, for the medical laboratory, ISO—and particularly ISO 15189—is becoming a very useful medical quality standard. I think there’s a good chance that this document, which keeps being revised and will be out with a new version in 2012 or 2013, has the sustainability of being a long-term standard. The ISO 15189 document is called “Medical Laboratories - Particular Requirements for Quality and Competence,” and it is very specific in identifying elements that are critical for quality management, in terms of the documents, the processes and the positions that are required. For example, ISO 15189 is very clear and specific and says that every laboratory “shall have” a laboratory quality manager. The point is that quality is a full-time job and if you think that your supervisor can do it on the side, you’re wrong. When ISO 15189 was first drafted, it was not written as an accreditation document. It was written as a document that laboratories would be able to read and implement, as a way of improving their own awareness and their own quality improvement program. I think that’s still the case, and it’s a good document for laboratory personnel to read.

Q: Do you have any advice as to how lab managers can make little, incremental changes that will eventually build up the right culture and expectations in their lab?

A: Yes, here’s the number one thing that they can do. They can make a commitment that every week or every two weeks they are going to do some form of a mini-audit within their laboratory. Today, we’re going to look inside the refrigerator to see if there are any outdated reagents. Next week, we’re going to review the standard operating procedures that are on the culture bench. None of these audits should take longer than 45 minutes to perform and maybe a day to analyze the results. Then you plan to study the results and act to fix the problem. By doing one mini-audit every week, at the end of a year you’ve done 52 mini-audits. Currently, what many laboratories tend to do, if they do them at all, is one big audit at the end of the year. And they never have the chance to actually look at any of the information and the time to analyze the results. So at the end of five years, they’re no further ahead than they were before. If they did one mini-audit every two weeks, at the end of four years, they’d have over a hundred. And the consequence of that is there are a hundred things that they’ve been able to put some sort of continual improvement on. So the message is: commit to get started, get started small, stay small but stay continuous, and over time accumulate a massive amount of information and help your laboratory.



JUMPING BACK GAS!

SAFE ETHYLENE OXIDE STERILIZATION
by Vince McLeod

This column will focus on ethylene oxide, a frequently used and potentially dangerous sterilizing agent. Also known as EtO or EO, it is highly compatible with today's polymer-based single-use medical devices, procedure kits, surgical trays, etc., and is commonly used for sterilization in many veterinary and animal surgical facilities. Although it typically is used in small-batch countertop cabinets, contract companies have units as large as semi tractor trailers. In the small-batch sterilizers, EtO is usually delivered as a gas or in a small capsule of liquid that is opened and allowed to vaporize for each batch run. Sounds simple. But ethylene oxide at normal room temperatures is a colorless, highly flammable, toxic gas, and improper or careless use can cause serious problems. We will now take a closer look at the hazards of EtO and how to safely use this common sterilizing agent.

Recognizing the hazard

EtO has been in use for many years. In 1977, the National Institute for Occupational Safety and Health (NIOSH) estimated that there were more than 10,000 sterilizers in use and 75,000 workers nationwide were potentially exposed.¹ It's probably safe to assume that these numbers have increased in the interim. In addition, during the period from 1994 to 1998, EtO was associated with 10 explosions, causing major property damage, scores of injuries and at least one fatality.² In August 2004, Sterigenics, a major contract sterilization company, had an explosion in its Ontario, Calif., facility that injured three employees and shut down the plant.³ With these facts in mind, let's begin with understanding the physical and chemical properties of EtO.

As mentioned above, EtO is a gas at room temperature, with a boiling point of 10.7°C (51°F). It is colorless, with a characteristic sweet odor; however, if you smell it, you are breathing a concentration hundreds of times greater than the exposure limit. The OSHA permissible exposure limit is only 1 ppm, while the reported odor threshold is between 500 and 700 ppm. Therefore, odor is a very poor warning property for EtO.

EtO is also a highly flammable gas. The flammable limits in air are three percent to 100 percent, a very wide range. The vapor density is 1.5 (air=1.0), and if uncontrolled, the vapors will tend to sink to the floor (or lowest available levels) and accumulate, spreading to the nearest ignition source.

In addition to its dangerous physical properties, EtO is a serious health hazard. Exposures usually occur by inhalation or skin absorption. Exposures to either the liquid or vapors can have severe results. Liquid EtO can produce irritation or blistering of the skin or frostbite

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from rapid evaporation and consequent cooling. In some people, ethylene oxide exposure may result in allergic sensitization and future exposure may cause hives or a life-threatening allergic reaction.

Symptoms of inhalation exposure can include headache, nausea, vomiting, diarrhea, shortness of breath and cyanosis (blue or purple coloring of the skin). Acute effects may lead to central nervous system depression, pulmonary edema, respiratory distress and coma.

Finally, if the facts above are not reason enough for caution, ethylene oxide is designated as a suspected human carcinogen with links to reproductive effects, mutagenic changes and neurotoxicity.

Evaluating the hazard

Ethylene oxide has its own specific OSHA standard, 29CFR1910.1047. This standard covers all occupational exposures to EtO and outlines the requirements for monitoring, medical examinations, training and record keeping. Under the standard, OSHA has established

an action level of 0.5 ppm and a permissible exposure limit (PEL) of 1.0 ppm, both based on eight-hour time-weighted averages. There is also a short-term exposure

“In addition to its dangerous physical properties, EtO is a serious health hazard.”

limit of 5.0 ppm, and a 15-minute average that employees should never exceed. Periodic monitoring is conducted every six months for employees exposed at or above the action level and every three months for those exposed at or above the PEL. The appendices to the standard contain useful information on health and safety data, sampling and analytical methods, and workplace design and practices.

If ethylene oxide is used in your facility, potential exposures should be evaluated. First, take a close look



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at your equipment and how it is set up. Is the room or area appropriate, with proper ventilation and exhaust and without conflicting uses? For general ventilation, is the room on dedicated single-pass air without recirculation? Is the air pressure in the area slightly negative relative to adjacent spaces? Are there sufficient room air changes (normally expressed as air changes per hour (ACH)? ACH is calculated based on room volume and the cubic feet per minute of supplied conditioned air.

Examine the sterilizer equipment thoroughly. Are the door gaskets in place and in good condition? Is the sterilizer exhausted properly according to the manufacturer's recommendations? Is the exhaust working? How are gas cylinders handled? Are associated piping, hoses, valves, regulators and filters inspected and checked for leaks regularly?

Next, scrutinize the technician's operation of a complete sterilization cycle. Pay special attention to unloading of the sterilizer. Is a purge cycle used? How are the sterilized materials vented and handled?

Controlling the hazard

After you have completed the comprehensive hazard evaluation above, move on to implementing and verifying the needed controls. Measure supply and exhaust flows and calculate the balance, then check physically with simple smoke tubes. Ensure that equipment is exhausted and that there are no leaks. Check for leaks from the sterilizer, gas cylinder and supply lines (if so equipped) while you are at it.

We have observed significant potential for exposures from the venting and off-gassing of sterilized materials. Considerable EtO levels can remain for up to 30 minutes after removal from the sterilizer. Think about incorporating an additional purge cycle or transferring materials to a hood or other exhausted enclosure prior to further handling.

The final step is to conduct exposure monitoring to validate that all the above

systems and procedures are in fact preventing any exposures. Have your industrial hygienist conduct personal exposure monitoring with appropriate media and air-sampling pumps, followed by analysis by an accredited laboratory. Portable infrared analyzers and direct-read instruments can provide real-time data and are useful for leak detection.

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Summing up

Additional assistance is available from the EtO Sterilization Association (<http://www.eosa.org/>) as well as the NIOSH and OSHA websites. The key to working with ethylene oxide (and any hazardous material) is first to recognize the hazards, then evaluate the potential exposures, and then design and implement proper controls. In areas where EtO is used, ensure ample exhaust, sufficient room air changes, safe cylinder/material handling and routine leak-check procedures. Finally, conduct periodic monitoring of the engineering systems and air concentrations.

We welcome your comments and questions. You can email us your thoughts at thesafetyguys@labx.com.

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Vince McLeod is an industrial hygienist certified by the American Board of Industrial Hygiene and the senior industrial hygienist in the University of Florida's Environmental Health and Safety Division. He has 22 years of occupational health and safety experience at the University of Florida, and he specializes in conducting exposure assessments and health-hazard evaluations for the university's 2,200-plus research laboratories.

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SAFETY TIP

REQUIRE ALL STAFF MEMBERS TO READ APPROPRIATE SAFETY MANUALS, SIGN A RULES AGREEMENT, AND KEEP STATEMENTS ON FILE

By James A. Kaufman

Following this procedure does several things. It forces you to decide what the rules and policies are going to be, shows everyone that you are concerned about health and safety, and keeps a permanent record of your safety standards.

This policy is important for staff as it makes the expectations very clear, essentially saying 'safety is part of good science and here's what we expect at our institution or company' and 'safety is part of doing any job right.' It is particularly important for new employees as it sets the standard right from the beginning.

A good rules agreement consists of six parts: (1) the rules, (2) the signed statement that your employees read, (3) understand, (4) agree to follow and realize the failure to follow the rules can result in termination, and (5) a cover letter signed by the organization's president or superintendent confirming that not following the rules can result in termination.

To get started, it is not necessary to write your own set of rules, policies, and procedures. Take some from the LSI Publications, State Guides, NSTA or ACS publications.

Source: Kaufman, James A., *Laboratory Safety Guidelines - Expanded Edition*, The Laboratory Safety Institute, www.labsafetyinstitute.org.



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MICROSCOPY IN REAL TIME

by **Angelo DePalma, Ph.D.**

Live cell imaging is made possible by a confluence of advances in imaging, computing, microscopy, and reagent technologies, connected by a deeper understanding and appreciation for cellular processes.

Cell imaging has become one of the most exciting subcategories of biological microscopy. During the past decade, cell imaging has evolved from the study primarily of fixed cells to time-lapse photos of events in living cells to real-time videos of cellular processes.

“Working with living systems is much more indicative of what’s going on in the cellular physiology,” says Ian Clements, product manager at Applied Precision (Issaquah, WA), a GE Healthcare company. “We have reached the point where we can follow the same event in the same cell over a period of time rather than simply taking snapshots.”

Expanding visualization horizons

New imaging techniques typically develop in the fixed-sample world, where sequential still photomicrographs still dominate. Researchers apply these methods to living cells as the techniques improve and become faster and more robust. That was the case with optical super-resolution (OSR) techniques, which enable imaging within a narrow

window below the diffraction limit of visible light (about 300 nm) and the upper limit of electron microscopy (20 nm).

One approach to OSR, termed STED (stimulated emission depletion), was discovered at the Max Planck Institute in 1994, and commercialized by Leica (the original licensee), Nikon, and Zeiss. Other OSR methods include photoactivated localization microscopy (PALM); ground state depletion individual molecule return (GSDIM); and stochastic optical reconstruction microscopy (STORM), which was developed at Harvard University during the late 2000s.

The oldest and arguably most widely adopted OSR technique is three-dimensional structured illumination microscopy (3D-SIM) — invented at the University of California, San Francisco — and was licensed to Applied Precision, which continues to improve the technique and implement it in its product line. An ultra-fast version of 3D-SIM can capture videos of very rapid cellular events. Twenty-four top research institutions worldwide have adopted 3D-SIM in their OSR core facilities.

Although routine laboratory instrumentation tends toward simplicity and ease of use (think MS, LC), high-end experimentation (e.g., flow cytometry, cell imaging) increasingly requires a type of “renaissance” researcher, according to

Mr. Clements. Because cell imaging is so novel, investigators must confirm what they see on-screen with “molecular” assays. “Ten years ago journal papers often had 20 or more authors, each of whom played a small role. Today, scientists must wear many hats and be prepared to use several high-end instrumental methods as well as more traditional tests to confirm their results.”

Imaging in physiologic context

Researchers are looking for greater control and physiological context from their live-cell imaging assays. Cell-based assays provide enhanced content and pharmacological relevance over biochemical assays, but many applications benefit from physiological modeling beyond simply placing cells in a well plate or slide. The demand for physiologically relevant assays is driven by the costs associated with promoting new drugs from development into the clinic. “Learning about a drug’s activity in an enhanced in-vitro environment reduces those risks and costs,” says Michael Schwartz, program director at Fluxion Biosciences (South San Francisco, CA).

Fluxion’s claim to fame is a cell-imaging system, BioFlux, which conducts experiments under “controlled shear flow.” Many physiological processes

are mediated by physical shear stresses found in blood vessels. According to Mr. Schwartz, studying these phenomena requires re-creating those shear stresses in a controlled manner. This can be accomplished by creating laminar flow in a channel of known and reproducible dimensions. "Many physiological processes, such as platelet aggregation and leukocyte adhesion, are profoundly different if you don't incorporate the shear stress normally present in the physiological context. Controlled shear flow provides a more realistic outcome when viewing biological phenomenon, gene knockouts, or pharmacological modulation."

Imaging in a box

Maintaining cell viability during complex imaging experiments requires special culture chambers that sit atop an inverted microscope and control for temperature and atmosphere. Instruments capable of multiplexed analyses tend to be quite pricey and difficult to use, according to Mike Mortillaro, president of cell-imaging specialist Bulldog-Bio (Portsmouth, NH).

The concept of designing cell imagers that worked inside the warm, humid atmospheres of glove boxes or incubators originated in Asia, where many laboratories do not use air-conditioning during the summer. "A lot of their instrumentation is designed to handle high temperatures and humidity," Mr. Mortillaro explains. "If you're designing a microscope to fit into a space-challenged lab and it already operates well at high heat and humidity, why not put it into an incubator?"

Bulldog sells two such imaging products, the JuLi™ Smart Fluorescent Cell Analyzer and the Lu-

maScope™ Fluorescent Live Cell Microscope, which are compact and robust enough to withstand conditions in which cells thrive. Bulldog also produces cell counters and consumables. The JuLi design operates wirelessly inside glove boxes and can transmit cell images to mobile devices through a dedicated app (including one for the iPhone/iPad).

There are several advantages to having an imager inside the incubator. Operators can analyze cells in their experimental growth environment without worrying about viability. "And researchers do not have to park themselves next to the enclosure for hours or days at a time, removing and returning samples to the incubator. Not only is that time-consuming, but it adds manipulations and variables to the experiment," Mortillaro says.

JuLi and LumaScope—both of which are fully functional, single-channel inverted microscopes—were designed for simplicity. With all unnecessary features stripped out and highly robust components built in, the instruments cost "less than one-fifth as much as a conventional inverted microscope and one-tenth as much as a multi-well plate cell-imaging system," according to Mr. Mortillaro. The catch is they are not suitable for high-throughput or multichannel experiments.

Angelo DePalma is a freelance writer living in Newton, NJ. You may reach him at angelo@adepalma.com.

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APPLICATION-DRIVEN, TOP-DOWN MARKET

by **Angelo DePalma, Ph.D.**

As a mature market, filtration moves forward incrementally through improvements in filter media and housings. “Developments are more on the application side than on the product side,” notes Karen Storm, director of sales and marketing at Sartorius Stedim Biotech (Göttingen, Germany).

Improvements in lab instrumentation and techniques demand a new level of sample preparation that was unnecessary a decade ago. High-performance liquid chromatography (HPLC) in particular has undergone a renaissance due to the advent of sub-two-micron columns. In an effort to reduce dead volumes while increasing sensitivity, system designers have eliminated all unnecessary volumes, thus placing a very high burden on sample purity. Particles that would simply flow through a 10-micrometer particle stationary phase get trapped within UHPLC columns or cause distortions inside detector cells.

“Since columns are so much more expensive, filtration and/or prefiltration of samples is mandatory in order to maintain column life in HPLC,” says Ms. Storm of Sartorius, “and for all analytical technologies as well.”

Throw it away

The last great technologic wave in filtration was the introduction of single-use or disposable products. Single-use filtration membranes and cartridges have become standard fare

in large-scale processing in pharmaceuticals, biotechnology, food, and other regulated industries.

Disposables make sense for any process where cleaning and reuse must be validated. Apparent higher costs can often be justified on the basis of purified water and chemicals required to clean a multiuse filter and its housing, plus an operator’s time and the effort of validating the entire process. Eliminating cross-contamination is another obvious economic benefit, given the cost of a production campaign.

“Disposables make sense for any process where cleaning and reuse must be validated.”

Since all these industries rely heavily on laboratory-scale analytical support, development, and scale-down modeling for troubleshooting, disposable filtration has caught on at very small scales. The idea is to reproduce exactly all manufacturing-scale operations, including filtration, at liter or even milliliter scale.

Disposables are significantly more expensive than multiple-use filters, either ceramic frit designs or membranes in stainless steel or plastic supports. “But pharma-

ceutical and biotech companies in particular are willing to pay premium prices to reduce hands-on time,” says Ms. Storm.

Considerations around cleaning, validation, and cross-contamination have trickled over to pure science and service labs as well, but a dichotomy still exists between academic and commercial labs. Universities, where labor is cheap, are more likely to reuse filters (even some models designed for single use), whereas companies generating results on which serious money depends increasingly prefer disposables. Every lab must do the accounting for its own workflows to be certain whether disposables or multiple-use filters make more sense.

Providing equivalent filtration equipment at large and small scale is now standard at large filtration companies. Similarly, process intensification—essentially eliminating steps—has become a buzzword both in manufacturing and during development. EMD Millipore (Bedford, MA) will soon launch a new line of depth filters that can eliminate centrifugation at the critical “clarification” step in cell cultures. The need for continuity between lab, pilot, and industrial scale is driving, at least in part, development of the new product line.

Clarification is the first step after cells are removed from the bioreactor. The process fluid is first treated

with acid or a polymer flocculant to aggregate ruptured cells to cause them to clump together, thereby facilitating removal. "We realized that existing filters work better with cellular debris than with aggregated cells," says Neil Soice, Ph.D., principal scientist at EMD. "These particles are larger than what you would normally see in filtration applications and would therefore rapidly plug the filters."

The difficulty with centrifuges is that processes cannot be made fully disposable due to cleaning and associated validation. "Particularly at smaller scales, centrifuges are more trouble than they're worth," Dr. Soice adds. With the new depth filters, users need only flocculate the culture, filter, and concentrate before the first chromatography step, or sterile-filter the solution as is.

Anti-plugging strategies

Tangential flow filtration (TFF), also called cross-flow filtration, is a relatively modern technique that involves causing fluid to pass across instead of directly through a filter membrane's pores. The sweeping motion causes fluid to pass through and retains particles but significantly reduces clogging. TFF is used as an alternative to dialysis to concentrate large samples or process fluids containing proteins or viruses at the lab scale for biomolecules, nanoparticles, microspheres, or other particulates, and as a replacement for dialysis in buffer exchange.

But at small scale, centrifugation remains the method of choice for concentrating process fluids. Millipore's Centricon® centrifuge filtration tubes are one such product. "The problem with centrifugation is that it requires a lot of fluid transfer steps, and it's extremely time-consuming," says Michael Bransby, western regional sales manager at Spectrum Labs (Rancho Dominguez, CA).

Spectrum has pioneered miniaturized TFF that concentrates up to 50 mL of particles or cells down to 500 μ L in less than a minute. The technique involves a hollow-fiber cross-flow membrane in a tube fitted with several syringes. One syringe introduces the sample within the fiber, another collects fluid outside. A third syringe may be used to wash or collect the sample. In all, the process reduces the time to concentrate viruses or particles from a volume of 20 mL down to 500 μ L—a factor of 40—plus washing, from several hours to just a few minutes.

"Improvements in lab instrumentation and techniques demand a new level of sample preparation that was unnecessary a decade ago."

A group from the University of California, Los Angeles, published a paper late last year in the *Journal of Virological Methods* describing a technique based on TFF that concentrated a virus-containing sample by a factor of 2,000 in less than three hours.

Single-use cross-flow lab-scale filters are favorites in several industries out-

side pharmaceuticals and biotechnology, notes Karen Storm of Sartorius. The devices are used in water-purification and fish-breeding facilities to reduce volumes of water samples possibly containing viruses and to concentrate environmental samples as well.

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SPECIALIST TECHNIQUE BECOMES MORE ACCESSIBLE

by Angelo DePalma, Ph.D.

Although flow cytometry first appeared (as fluorescence-assisted cell sorting) in the late 1970s, the last three years have seen a surge of innovation in instrumentation and applications. A primary factor in this renaissance has been increasing demand for immunophenotyping cells undergoing development, which involves characterizing cells by virtue of their surface antigens. Immunophenotyping sheds light on how the body responds to diseases and drug regimens, and is applicable to both mature and stem cells.

Factors driving flow cytometry as an instrumental technique include innovations in laser and detector technologies, “fail-safe” modes that make cytometric data more robust (e.g., between multiple instruments and multiple labs) and greater ease of use, portability, and affordability. Flow cytometry has become a method of choice for preparing cells for analysis, characterization, and even culturing.

In particular, laser and detector technologies make possible a broad, rich variety of reagents for detecting specific cell types. “And this has resulted

in a concomitant increase in the experimental complexity and the richness of experimental data,” notes J. Clark Mason, Ph.D., senior director of global marketing, BD Biosciences (San Jose, CA).

Moving in two directions

Yet the intricacy of experiments has been largely offset and even enabled by the evolution of instrumentation, workflows, and data analysis—at least at some level—toward greater accessibility. These benefits have had a stabilizing effect on flow cytometry in general, to the point where results achieved at different locations by different groups are now comparable.

Flow cytometers that are relatively easy to use, portable, and affordable have caused an upsurge of interest in nontraditional markets such as marine biology, the study of microorganisms and plants, and environmental analysis. Flow cytometers are now more accessible than ever, both inside and outside core labs.

“Developments in genomics and proteomics focusing on single-cell analysis at the single-copy level are another driving force for growth,” says Dr. Mason. Next-generation sequencing and sequence detection with real-time PCR has caused a “new appraisal” of flow cytometry’s potential to sort single cells—particularly those existing in very low abundance.

T. Vincent Shankey, Ph.D., principal staff advanced research scientist at Beckman Coulter (Miami, FL), agrees to a point, but sees flow cytometry as “running in two directions, simultaneously toward simpler and more complicated instrumentation.” Major manufacturers are indeed creating “everyman”-type products that are less demanding and targeted toward both expert and occasional users. “But everyone is also interested in instruments that analyze more and more independent fluorophors, which is the opposite trend.”

With apologies to basic users everywhere, it is the complex end of the application spectrum that excites Dr. Shankey. He contrasts flow cytometry with NMR, which he says “performs a certain inter-

rogation, from which you get a limited set of answers. If you don't understand the data, you can find someone to help."

Flow cytometry, he says, requires a very broad range of skills that include knowledge of antibodies-antigen interactions, dye chemistry conjugates, electronics, and signal processing, not to mention some information about cell biology and data analysis and interpretation.

Some flow experiments are indeed straightforward; for example, how many cells are alive or dead. More complex is the question of how many cell types may be identified (and perhaps separated) using a particular set of antibodies to specific surface antigens. "The problem is that if half the cells are dead and you don't know it, your results will be different. With NMR there aren't as many 'maybes.'"

Dr. Shankey notes the trend in dumbing down instrumentation and methods. "I'm all for that. Flow cytometry should not be a sacred shrine into which only a select group of scientists may enter." However, that is not where the cutting edge exists today.

Most users, in fact even most core facilities, run routine experiments 80 percent of the time. "There is no point taking out the Ferrari when you can drive it only 20 miles per hour." However, the immunology literature is now dominated by extremely complex experiments based on flow cytometry, using multiple colors, multiple gatings, and examining multiple low-population cells responding to different stimuli over time. "Those require the Ferraris, the more sophisticated instruments."

High-end workflows increasingly rely on automated sample preparation and, at the back end, more automated data analysis, although Dr. Shankey describes data han-

dling for complex experiments as a "log-jam" that is in "desperate need of fixing." Current cell analysis, even at the high end, is based on applying multiple conditions or "gates" on which cells are counted. "And that's one of the areas where the field is stuck. We're only viewing data in two dimensions instead of in high-dimensional mathematical constructs."

Digging deeper inside cells

While flow cytometry has become the go-to tool for immunology labs, the explosion in reagent R&D has made other types of investigations possible. "Flow cytometry was once largely used to analyze cell surface receptors, but now more functional assay types are possible," says Mike Olszowy, Ph.D., director of flow cytometry systems at Life Technologies (Eugene, OR). Some of these include assays for cell proliferation, calcium flux, cell cycle analysis, and events occurring deep inside cells.

Life Technologies' acquisition of Molecular Probes in 2003 and Dynal in 2005 consolidated its leadership in nontraditional fluorescent probes for flow (and other) cell-based investigations. Cell-Trace™ Violet, used for studying cell proliferation, is one such reagent.

Life has also introduced an instrument, the Attune®, that speeds up cell analysis by a factor of ten. Attune uses a new cell-directing technique known as "acoustic focusing," which causes cells to line up narrowly as they pass through the flow cell. Normally, cells passing through in high-flow mode spread out within the flow stream. Some hit the "sweet spot" of the laser detector, but many do not, causing considerable variability. By squeezing cells into a very narrow path, acoustic focusing forces the cells into the narrow window of optimal laser operation.

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ESSENTIAL “FURNITURE” TO PROTECT SAMPLES, WORKERS

by Angelo DePalma, Ph.D.

Glove boxes are specialty enclosures that allow tight control over experimental conditions. Sizes range from less than five to several hundred cubic feet. Glove boxes are unique among lab enclosures. Unlike fume hoods, which are essentially open to the lab environment, or more sophisticated barrier or isolator systems, glove boxes maintain temperature, humidity, and process gas while protecting the experiment from operators, or vice versa, depending on the application. They also allow the introduction or removal of equipment and samples.

Not surprisingly, most glove boxes are found in biology and medical laboratories as well as in many chemistry labs. This is reflected in how glove boxes are used: 41 percent of respondents in a recent *Lab Manager Magazine* survey indicated that they used glove boxes for materials that were either dangerous or sensitive to air, moisture, or both. Twenty-two percent of respondents used glove boxes for culturing cells or bacteria. Nine percent, each, of applications involved storage of chemicals or working with delicate electronic components (e.g., sensors or microchips).

The largest percentage (61 percent) of labs tend to have one or two glove boxes. The numbers fall off rapidly, but 16 percent of those who responded maintain five or more glove boxes in their facility.

Glove boxes are considered laboratory “furniture” and are expected to have very low operating budgets. More than half of the respondents indicated that they

expected to spend “less than \$1,000” on annual repair, maintenance, and related supplies. Price was cited as the main factor (44 percent) entering into purchase decisions for a glove box, followed by ease of use (41 percent), safety (33 percent), and low maintenance/operating costs (31 percent).

Inside and outside the box

Kevin Murray, director of sales and marketing at Biospherix (Lacona, NY), notes that within the life sciences, users are beginning to demand that glove boxes support “esoteric” atmospheres; for example, oxygen-free atmospheres for experimenting with tumor cells. Murray calls customers specifying control of hydrogen sulfide, nitric oxide, and ozone “ahead of the curve” in terms of product requirements.

Labs contemplating a glove box purchase for cell cultures should look into designs where incubation and processing are separated in order to prevent contamination. This can be done by providing separate chambers within the box or by locating a stand-alone incubator within the glove box.

Some glove box manufacturers, like MBraun (Stratham, NH), have aggressively sought out markets and applications outside the life sciences. The company has teamed up with Bruker (Billerica, MA), which manufactures high-end analytical instrumentation, on glove box en-

closures for Bruker’s atomic force microscopes (AFMs). Bruker now sells turnkey AFM systems that are environmentally controlled—allowing less than one percent of either oxygen or water vapor.

In 2011, the National Renewable Energy Laboratory (NREL) described an MBraun glove box that was suitable for destructive physical analysis. This particular model featured oxygen and water vapor sensors to maintain levels of these gases at less than 5 ppm. This project is one of several MBraun has placed in the advanced materials market. Earlier, the company had produced a glove box for Cambridge Nanotech (Cambridge, MA) that was specifically designed for atomic layer deposition, which is a technique for forming thin electronic films in inert atmospheres. MBraun has also published on the advantages of glove boxes over “dry rooms” used for the fabrication of lithium-ion batteries. “Glove boxes provide a much cleaner, healthier process where operators are not exposed to the unhealthy working conditions found in most battery production lines,” according to MBraun GmbH Sales Manager Michael Gropper.

Safety first

Bob Applequist, product manager at Labconco (Kansas City, MO), says that a fair number of purchasers use glove boxes mostly to store radioisotopes, nanomaterials, and other dangerous materials.

They do this to enforce operator safety,

he explains. “Managers want to prevent people from removing toxic or radioactive materials nonchalantly, without thinking about it.” Fume hoods are easily opened and expensive to operate. Glove boxes provide protection with minimal venting of conditioned air.

“With a glove box, the material has to go through a transfer chamber.” That, he says, adds a layer of awareness that reinforces safety protocols.

Storage applications also help minimize a certain “ick” factor. Mr. Applequist recalls a government agency that employed a sophisticated glove box to store “crime evidence.” When pressed, he admitted that the stored items were indeed body parts. Another customer, a forensics laboratory, cleaned up human bones inside glove boxes.

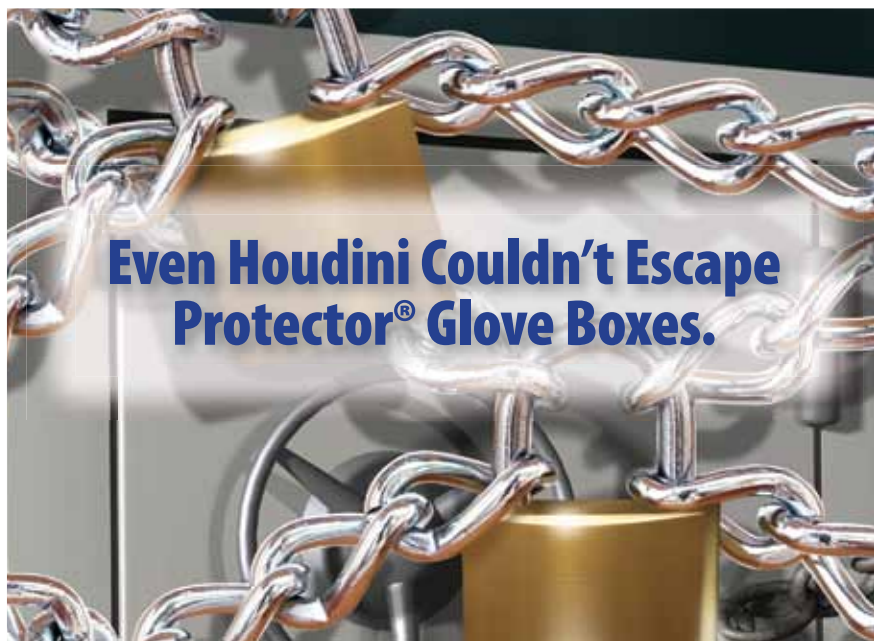
Because glove boxes are considered appliances or furniture—they do not, after all, generate data—price is always a critical consideration. A typical stainless-steel box with pressure control, oxygen and moisture removal, and sensors can cost about \$30,000. “That’s a chunk of change for most labs,” Mr. Applequist tells *Lab Manager Magazine*. “Customers have to balance what they want with how much they can spend, just as they do with a fume hood, water purification system, or laboratory casework.”

Yet, as with all lab expenditures, some customers insist on costly features or radical retrofits. “If we don’t get the opportunity to talk with a customer who over-specifies, we have a choice between saying ‘we don’t have it’ or quoting a very high price,” Mr. Applequist explains. Manufacturers specializing in off-the-shelf models can make some improvements, such as adding pass-through fittings and limited electrical upgrades, but customizing physical dimensions is very expensive.

Unusual dimensions or expanded sizes for glove boxes are not a good idea from a practical perspective, either. “Individuals in labs are always fighting for space,” observes Kevin Murray, and optimal—not necessarily the most space-saving or inclusive—design is the way to go. “Small boxes seem ideal from a space perspective because they fit atop a lab bench. But

if you suddenly need to bring in thirty plates, media, and pipettors, you’ll run out of room. You have to judge ahead on your space requirement.”

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ESTABLISHED TECHNOLOGY WITH CONTINUOUS DESIGN INNOVATION

by **Angelo DePalma, Ph.D.**

The wide variety of lab-shaker designs on the market reflects the increasing diversity of scientific experimentation. Labs now use a greater range of sample sizes than ever before, from liters to microliters. And while replicate and combinatorial studies increase the number of samples, requirements for environmental control create yet a third dimension that shaker designers must consider.

But variety can sometimes present a confusing array of choices.

Jeio Tech (Woburn, MA) categorizes shakers according to size (benchtop and floor models), shaking mechanism (e.g., rocking, waving, dual-action), or incubation capability. “Due to growth in biotech and pharma industries, experimental applications for shakers have broadened,” says Eric Stimac, sales and service manager. “Vendors serving these industries must offer a wide array of products.”

One might also categorize shakers according to shaking motion, number of shaking dimensions, size, capacity, and other characteristics. A useful classification might include one-dimensional orbital shakers, two-dimensional seesaw or rocking shak-

ers, three-dimensional gyratory or nutating shakers, wrist-action shakers that duplicate the action of a hand shaking a test tube, and incubator shakers. Several subcategories—related to speed range, orbit size, load capacity, and vessel type—exist within these groupings.

The 1D orbital shakers provide a circular shaking motion in a single horizontal plane and may be further subdivided into low-speed, high-speed, and vortexing styles as well as a variation that moves the sample back and forth along a line instead of in two dimensions within the plane. A further subtype that overlays all these designs is the incubator shaker, which heats or cools samples, sometimes under a carbon dioxide atmosphere.

The 2D, or seesaw, rocking shakers, tend to operate at slow speeds (3 rpm to 50 rpm or six tilts to 100 tilts per minute) and are employed for applications that require gentle rocking (e.g., washing blots, staining gels, or cell culture). Wave action helps ensure coverage of the sample with low volumes of wash/process liquid. Rocking shakers are often found in incubators and cold rooms.

The 3D gyratory, or nutating (think head-nodding), shakers combine the actions of 1D orbital and 2D rocking shakers. These combined motions produce a sort of rotating wave or washing action within the vessel. One of the most famous of these shakers is the aptly named Belly Dancer™ model manufactured by Stovall (Greensboro, NC) and sold by Sigma-Aldrich (St. Louis, MO), SPI (West Chester, PA), and other distributors. Three-dimensional shakers tend to operate at low speeds (3 rpm to 50 rpm).

Like its large competitors, IKA (Wilmington, NC) sells the gamut of shaker types and is planning to introduce an expanded product range atACHEMA 2012 in Frankfurt, Germany, next year. In addition to standard orbital and horizontal models, IKA will debut new roller-shakers, rockers, and overhead rotators targeted at medical and biological applications. “All the new models will be available in a basic and a digital version,” explains product manager Oliver Vogel-sang. This choice provides a price-point difference for the same basic model that will appeal to many customers.



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PRODUCT FOCUS: **LABORATORY SHAKERS**

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Motor trade-offs: AC or DC?

High-speed shakers primarily use brushless DC motors, belt systems, and digital electronics to achieve long motor life and reliability under continuous operation. Designers must employ large counterweights in these designs to offset the range of loads and to add stability. Otherwise, left to their own devices, high-speed shakers will shake their way off the benchtop and onto the floor. "Users must balance their loads when using these shakers to prevent 'walking,'" notes Michael Revesz, product manager at Southwest Science (Bordentown, NJ). Southwest designs and manufactures shakers under its own brand and, relabeled, for several of the largest distributors.

While DC brushless motors produce long life and high reliability, they do not provide the option of running smoothly at low speeds. The problem lies in the torque required to generate the shaking motion, which is achieved from brushless DC motors—only at higher motor speeds. "Speed controls prevent settings below about 50 rpm," Mr. Revesz adds.

By contrast, low-speed 1D, 2D, and 3D shakers typically use brushed DC motors and analog speed controls to achieve smooth shaking action while keeping manufacturing costs down. Brushed DC gear motors provide smooth acceleration, deceleration, and

operation at speeds below 100 rpm. Their drawback is that the carbon brushes wear, creating carbon dust inside the motor and eventually clogging the motor's electrical contacts.

Carbon-dust clogging causes slow operation and sometimes breakdowns requiring a motor change. The problem becomes acute for shakers operating around the clock or in a cold room.

"Shakers are designed for continuous operation over long time periods."

"To overcome brush wear, designers have tried changeable brushes, harder brush materials, and larger motors (with larger brushes), but noise generated by the shaker often becomes objectionable when harder brushes or larger motors are used," Mr. Revesz tells *Lab Manager Magazine*. "That is why the newest low-speed shaker designs now use brushless AC motors with variable-speed electronics to eliminate the carbon-brush dust problem while keeping noise levels down."

What to look for

Jeio's Eric Stimac suggests that purchasers consider the speed ranges for their particular samples, whether the shaker can support the sample weights, and in-

cluded or optional accessories. "These factors must be balanced, because oftentimes the sample weights will reduce or dampen the shaking speed," he said. As secondary must-have features, Mr. Stimac suggests looking into imbalance sensing (a safety feature), capability of clockwise and counterclockwise motions, and speed controls.

"Shakers are designed for continuous operation over long time periods," explains IKA's Oliver Vogelsang. Customers should therefore keep an eye open for construction that can withstand continued, repeated stresses. Other desirables on Mr. Vogelsang's list include digital display, straightforward interface, and a timer, "especially if the experiments must be reproducible and documented, for example, under Good Laboratory Practice Standards."

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SURVEY SAYS: ARE YOU IN THE MARKET FOR A THERMAL ANALYZER?

Pharmaceutical and polymer industries are increasingly interested in both TGA and DSC. Drug companies use these techniques to test for drug stability and crystalline state (or lack thereof). For example, some medicines work better in a particular crystalline polymorph, and others are more effective in an amorphous state. Polymer companies are interested in measuring numerous properties associated with heat, such as mechanical dimensions and stability, chemical stability, and physical states (e.g., glass transition) related to mechanical performance.

Thermal analysis is not only about high temperatures. Some instruments have a cooling function that enables monitoring of low-temperature events such as glass transition in polymers.

Type of materials respondents work with that require them to perform thermal analysis:

Polymers	33%
Pharmaceutical materials	18%
Metals	13%
Foods	10%
Chemicals	8%
Environmental materials	5%
Ceramics	3%
Other (please specify):	10%

Any property that alters with temperature change can be associated with some form of thermal analysis. This technique, also called calorimetry, correlates temperature-dependent events to physical characteristics of a sample including: physicochemical structure, reduction, oxidation, evolved gases, decomposition, elongation, brittleness, strength, structure, and mass. Every industry concerned with the relationship between energy and how their products behave in the real world uses thermal analyzers. Thermal measurements provide food companies with values for caloric (energy) content, materials manufacturers with phase transition temperatures, and academic researchers with insights into phases of matter. Every phase of a product's life cycle, from development to manufacturing, quality control and release involves thermal measurements.

Thermal analysis works best when investigators know what they're looking for, or at least know the identity of the sample. To reduce that uncertainty, some thermal analyzers incorporate a spectrophotometer in the mix. These techniques, known collectively as thermo-optical analysis, include thermospectrometry, thermorefractometry, thermoluminescence, and thermomicroscopy. All work on the principle that a sample's interaction with light changes with temperature. Numerous discrete and continuous thermally relevant events can be measured this way, including crystallization, melting, corrosion, phase transitions, drying, and polymorphism.

Vendors offer a very broad range of analyzers. Differential Scanning Calorimetry (DSC) is by far the number-one seller, with Thermogravimetric Analysis (TGA) coming in second. The two methods, moreover, are complementary, measuring fine or subtle properties and gross properties, respectively.

Type(s) of thermal analysis respondents are currently using or planning to purchase for their lab.

Differential Scanning Calorimetry	24%
Thermogravimetric Analysis	23%
Differential Thermal Analysis	13%
Dynamic Mechanical Analysis	8%
Thermomechanical Analysis	7%
Evolved Gas Analysis	6%
Dilatometry	4%
Thermo-optical Analysis	4%
Dielectric Thermal Analysis	3%
Other	8%

Vendors also offer Simultaneous Thermal Analyzers (STA) that combine TGA and DSC in a single instrument, a high-pressure DSC, and an instrument that allows users to swap out TGA and DSC cells.

Fifty-one percent of the respondents are currently performing or planning to perform Simultaneous Thermal Analysis (STA) in their labs.

Currently performing STA	16%
Not currently performing STA, but would like to use this method	35%
No, this method does not work for our analysis	49%

The top ten features / factors that influence our respondents in buying a thermal analyzer include:

Performance / Heat flow measurements (resolution, sensitivity, precision and accuracy)	100%
Wide temperature range	92%
Versatility — able to measure large and small sample material	86%
Safety of operators	81%
Availability of accessories and replacement parts	79%
Low operating/ownership cost	72%
Low maintenance/easy to clean	68%
Ease of use (calibration and adjustments)	67%
Service and support	63%
Warranty	50%



SURVEY SAYS: ARE YOU IN THE MARKET FOR AN HPLC SYSTEM?

Manufacturers of high-performance liquid chromatography (HPLC) systems continue to innovate, while simultaneously providing upgrade paths for older instruments. Modular HPLC systems provide maximum flexibility and upgradability compared with "one box" integrated chromatographs. By switching modules, users can access the latest technology while reducing downtime during repair or servicing. On the other hand, integrated systems are less expensive because they use only one power supply, one set of communication electronics, and one cover. Since HPLCs are long-lived instruments, upwards and downwards compatibility is a major concern. Compatibility also provides a relatively straightforward upgrade path, provided components are replaceable and the manufacturer has embraced open architecture. For example, older instruments may access quick-change valve technology, which facilitates plumbing tasks.

During the last decade we have witnessed the debut and evolution of ultra-high-performance LC (UHPLC), widespread adoption of mass detectors, and greater appreciation for rapid methods based on novel or revived column technologies. Compared with HPLC, UHPLC provides improved resolution, sensitivity, and throughput through the use of sub-2 μ particles, typically packed in 2.1mm or 1.0mm ID (internal diameter) columns. Since *Lab Manager Magazine's* HPLC survey in 2011, the number of UHPLC systems used in labs increased 3%.

In selecting an HPLC system, you want to look at identifying both operating and acquisition cost, service, support and training. Understanding your throughput requirements will let you know how much automation is required. Cost of ownership for an HPLC system increases with instrument complexity and usage and is complicated by several factors, for example operational robustness, minimal repairs and downtime, and rapid diagnostics for maintenance and repair. To manage operating costs, vendors are working to deliver systems that require less frequent maintenance and are easier to service. If your lab had purchased a new HPLC system in the last five years and you look at throughput and quality of data, the cost of ownership has dropped.

Don't confuse cost and value. The features most users look for in HPLC have not substantially changed over the past several years, according to one expert we spoke to recently.

Customers continue to look for:

- Productivity in terms of speed and cost per analysis and throughput, hence the increase interest in UHPLC systems.
- Reliability in terms of sensitivity and flow rates
- Ability to handle increasing complexity and wide range of challenges

Most important factors in the decision-making process when buying an HPLC system:

Reliability:

High Sensitivity	100%
Precise and accurate flow rates	98%

Productivity:

Quality of Data	100%
Increase lab throughput	87%

Other:

Availability of supplies and accessories	100%
Price	98%
Handle a wide range of analytical challenges	98%
Maintenance	96%
Ease-of-use	94%
Service and support	94%
Warranties	93%
Ease of installation	83%
Small footprint	81%

Here are the types of HPLC systems our respondents are using in their facilities:

Analytical HPLC	48%
UHPLC	17%
Ion Chromatograph	14%
Preparative HPLC	10%
GPC	7%
FPLC/Bio	2%
Other:	2%

An HPLC system consists of a mobile phase, a pump, an injector, a column and a detector. Manufacturers typically offer these components as a system; however, there can be a mixing of the system components from various vendors.

Which of the following HPLC system components do you also use?

Autosampler	21%
Column heater	20%
Data system	19%
Degasser	19%
Automated valve	11%
Fraction collector	6%
Solvent recycler	3%
Don't know	1%

Please select the field of work that most closely aligns with your lab.

Pharmaceutical industry	20%
Biochemistry and biology	13%
Environment	13%
Chemical	10%
Food and beverages	10%
Hospital/Medical Center	8%
Quality control	5%
Fuels	2%
Microbiology	2%
Plastics	2%
Other:	16%



For more information on HPLC systems, visit www.labmanager.com/hplc-systems



SURVEY SAYS: ARE YOU IN THE MARKET FOR A FLOW CYTOMETER?

Flow cytometry is a powerful technology that allows researchers and clinicians to perform complex cellular analysis quickly and efficiently by analyzing several parameters simultaneously. Just a few years ago, working with a flow cytometry instrument was generally done by teams of highly trained experts at core facilities, working on massive machines costing more than \$100,000. Today's instruments can be built for benchtop use and are getting ever cheaper. Much of the machine setup is now automated, which will likely continue to democratize the method. Benchtop, micro-capillary flow cytometers, paired with ready-to-use cell analysis kits, enable any researcher to leverage the power of flow cytometry, regardless of expertise or access to a core facility. These systems accommodate smaller sample volumes, generate less waste, have lower operating costs, and are easier to set up and run than traditional flow cytometers.

The amount of information obtained from a single sample can be further expanded by using multiple fluorescent reagents. The number and combinations of fluorescent reagents that can be used by a flow cytometer depend on the types of lasers, filters and detectors with which each instrument is equipped. The more lasers and detectors an instrument has, the more simultaneous detection of colors it is capable of. In response to reduced reliance on core lab services, manufacturers of flow cytometers have been busily upgrading instrument capabilities for expert and casual users.

Field of work respondents selected that most closely aligns with their lab.

Immunology	21%
Molecular Biology	13%
Microbiology	6%
Biochemistry	6%
Oncology	5%
Pharmaceuticals	4%
Hematology	4%
Plant Biology	3%
Hospital/Medical	3%
Pathology	2%
Marine Biology	1%
Other (please specify):	8%

Is "affordable" flow cytometry for you?

Seek the best fit for function. Today's new instruments haven't made the art of flow cytometry completely foolproof and users should understand what the technology can and can't do before making a purchase. When evaluating a flow cytometer purchase, buyers should seek the best fit for function. Users running simple assays involving cell viability or counting often do not require a high level of sophistication. These purchasers should balance ease of setup, of running samples, and acquiring/analyzing data against cost of use and investment in learning to use the instrument. Users should be able to operate a two-laser system within a few hours of opening the box; more complex instruments may require a three- to four-day training course.

Ask yourself where you will be 3-5 years. How many samples and what kind of assays will you be running? What parameters will you be looking at? Do you expect to increase the number or complexity of your applications and is it possible to upgrade the machine you're considering? If the instrument doesn't meet your future needs, you may better serve your lab in purchasing a higher-end instrument.

Factor in ongoing expenses. You'll be paying not only for assay reagent kits, filters, and other consumables, but also for replacement parts and the time it will take to install them.

Test it. If you do decide to take the leap, contact your core facility and ask them whether they've demoed the instrument.

Educate yourself and make sure you properly train your staff.

Here are the top 10 features our respondents found the most important in their decision to buy a flow cytometer:

	Important
High accuracy analysis	98%
More reliable lasers	98%
Service and support provided by vendor	96%
Low maintenance/easy to clean	91%
Price	90%
Warranty	87%
Ease of use	83%
Cell sorting	65%
Ongoing expenses for reagents, consumables, and parts	52%
Ease of Installation	52%



COMPLETED SURVEYS: 329 (includes survey results from our sister publication, *The Scientist*)



SURVEY SAYS: ARE YOU IN THE MARKET FOR A LAB OVEN?

Most laboratory workers view ovens almost as utilities, using them principally for drying glassware and heat-resistant equipment, regenerating desiccants and catalysts, gently heating samples, and curing or preparing materials and composites. Over 50 percent of our respondents have at least three or more ovens in their lab.

Common laboratory ovens maintain temperatures ranging from just above ambient to about 300° C and are ubiquitous in chemistry, biology, pharmaceutical, forensics, and environmental labs. Units operating at temperatures above 300° C are normally dedicated to specialized applications in physics, engineering, electronics, and materials processing. Typical lab ovens use four to six cubic feet of space and are located on bench-tops or stacked atop another oven; other units may be much larger.

Oven applications are expanding beyond simple drying. Chemists use ovens for thin film battery drying and solvent removal; the food industry desiccates samples inside ovens to determine moisture content; electronics and defense labs process integrated circuit boards and other components inside ovens; and there are many more applications.

Which of the following disciplines best fits the product application in your lab?

Heating and drying	49%
Temperature-linked experiments	24%
Evaporating	9%
Baking	6%
Sterilization	4%
Annealing	2%
Other	7%

Circulation ovens (the most common in labs) come in two types: gravity convection or mechanical (forced) draft. The former often suffer from temperature inhomogeneities and stagnation, which is why ASTM and AASHTO standards call for forced draft ovens.

Which type(s) of lab oven are you currently using? (Check all that apply)

General Purpose Oven	39%
Mechanical Convection Oven	19%
Gravity Convection Oven	13%
Vacuum Oven	12%
Microwave Oven	12%
Safety Oven	4%
Other	2%

One emerging trend in laboratory ovens is increasing demand for high-temperature ovens from engineering and materials processing labs along with energy efficiency, which is important mostly to lab supervisors and facility managers.

According to one expert, the single most important consideration for a potential oven purchaser is the type of temperature controller employed. Types of controllers include simple on-off, proportional, and proportional integral derivative (PID).

Temperature control, precision temperature distribution, and temperature ramping/programming are desirable features in an oven but not required for common drying applications. High-end ovens control temperature at 27 points inside the box, whereas ASTM standards require only nine-point control.

Until recently, almost nobody cared about energy efficiency but today it's high on the list of desirables. The increase in energy costs is driving the costs of operating lab ovens higher. Laboratory ovens — used for heating and drying processes — frequently run for lengthy, high temperature protocols and use large amounts of electricity. Some units run 24/7 to be prepared for rapid testing. Selection of an oven based on the energy footprint within the laboratory can provide significant cost savings over time.

Where lab space is at a premium, purchasers should also consider the unit's size and stack-ability.

Our respondents' top 10 factors in their decision to buy a lab oven:

Price	73%
Ease of Use	68%
Low maintenance / operating costs	68%
Safety	56%
Temperature ranges ambient +40C to 200C / 250C	41%
Service and support	33%
Warranty	32%
Smallest footprint possible with a large interior	30%
Energy efficient	29%
Controlled airflow to provide uniform temperature heat distribution	29%

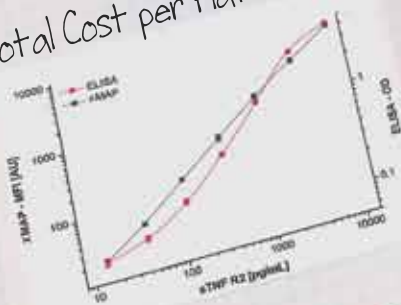
Other factors identified by respondents included: power requirements, ease of installation, availability of accessories / options, exhaust ports and dampers, and tightly-controlled level of contamination.



For more information on lab ovens, visit www.labmanager.com/lab-ovens

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by Rachel Muenz

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◀Recently, Molecular Devices announced the addition of the TUNE detection cartridge to the SpectraMax Paradigm Multi-Mode Microplate Detection Platform. The technology of TUNE with wavelength flexibility in a monochromator device and up to 10x the sensitivity benefits both the research and screening markets. TUNE helps make this microplate reader one of the most flexible on the market.

- Included software reduces the assay setup time by more than 50%
- Allows users to read what they want, when they want
- Provides on-the-fly detection for reduced read times
- Features a plate format of up to 1536-wells and dual PMTs
- A good fit for high sensitivity and throughput demands

Microplate readers are used to discern either physical, chemical, or biological events in microtiter plates and are common in academic organizations and the biotech, pharmaceutical, and drug discovery industries, as well as in research. These instruments are continuing to progress towards better throughput, flexibility and functionality as users demand even greater instrument reliability, easy-to-use software and a short learning curve. In academic research, 96-well plates are the most common, while in industry, 384-well plates are the norm. The latest microplate readers have also been affected by the need to use fewer reagents and consume less sample. Those looking to buy a new microplate reader should consider their current vs. future needs and whether or not they require single or multimode reading capabilities. Buyers should also think about system versatility, sensitivity, the number of staff they expect to use the instrument, and what specific applications they will be using the reader for. For medium- to high-throughput labs, throughput and automation are also important features to have in a microplate reader while they are not as significant in basic research and academic organizations. Consulting your vendor is also important in making the right choice of reader for your lab.

APPLICATIONS

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THIS LAB SUCCEEDS BY CHANGING OR ADAPTING BUSINESS STRATEGIES QUICKLY

by Sara Goudarzi



When developing new chemical entities, pharmaceutical and biotech companies often employ the help of contract research organizations (CRO). Bioanalytical CROs assist with method development, validation and sample analyses for preclinical and clinical drug development studies.

MicroConstants, Inc. is one such organization. This CRO provides GLP-compliant bioanalytical research services, enzyme-linked immunosorbent assays (ELISA), drug metabolism and pharmacokinetics (DMPK) assays, and pharmacokinetic analysis services to pharmaceutical and biotech companies worldwide.

"We specialize in method development, method validation and sample analysis of small molecules, proteins and peptides using LC-MS-MS, HPLC-UV and ELISA for drug discovery and

development studies," says David F. Beyerlein, Vice President of Global Operations at MicroConstants. "[Our organization] also assembles and distributes customized specimen collection kits for all types of clinical trials conducted throughout the world."

"One aspect of ensuring that all operations are running smoothly is managing the lab's inventory."

"We provide contract research services to pharmaceutical and biotech companies of all sizes, from virtual firms to big pharma," he adds. "Our clients are located all over the world—[we] have worked with over 270 clients in 27 different

countries and are in various stages of the drug development process."

Beyerlein, who co-founded MicroConstants, is responsible for managing all lab operations, project and sample oversight, information technology and purchasing operations for the organization.

Organizational structure

MicroConstants is headquartered in San Diego, California, with an additional location in Beijing, China.

The facility in San Diego, where Beyerlein is located, occupies 34,000 square feet of office and laboratory space and houses 16 liquid chromatography/tandem mass spectrometry (LC-MS-MS) systems. MicroConstants San Diego has an additional 2,000 square feet of off-site archive space.



◀ David Beyerlein, Vice President of Global Operations at MicroConstants.



▲ MicroConstants' facility in Sorrento Valley (San Diego).

"[This] makes us the largest bioanalytical LC-MS-MS laboratory on the West Coast of the United States," Beyerlein says. "I oversee all the lab and office areas, with the exception of the off-site archives, where only the facilities, IT and QA departments have access."

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management, metrology (QC), purchasing, facilities, and information technology (IT) departments, Beyerlein has 40 employees reporting to him. Seven of the 40 are direct reports.

In total, the organization has more than 50 employees at the San Diego facility. More than half of the staff works in the laboratories.

"At minimum, all our laboratory employees have a bachelor's degree in chemistry, biochemistry, molecular and/or cell biology or immunology, as appropriate for their position," Beyerlein says of his staff. "The majority of our LC-MS-MS bioanalytical work can be best classified as analytical chemistry; however, many of the compounds we are asked to analyze are biologicals and require experience and education spanning both chemistry and biology."

Beyerlein himself is educated in chemistry, has been in the bioanalytical chemistry field for the majority of his career and has more than 13 years of experience managing laboratory operations.

"I have been operating and maintaining mass spectrometers and training others to do so since 1994," he says. "I co-founded MicroConstants with Dr. Gilbert Lam in 1998. Prior to that I was part of the mass spectrometry group at Covance's facility in Madison, Wisconsin. Before joining Covance, I was a senior research and development scientist in the bioanalytical/mass spectrometry group at the Madison, Wisconsin facility of PPD-Pharmaco, where I started their bioanalytical LC-MS-MS department."

Inventory and maintenance

On average, MicroConstants' San Diego facility receives about 10,000 samples per month. Analyzing the samples accounts for about half of the scientific staff's workload. They spend the rest of their



▲ Temperature-controlled specimen sample storage.

time developing and validating methods.

With such a challenging workload, it's important for the lab to stay organized. One aspect of ensuring that all operations are running smoothly is managing the lab's inventory.

"Our laboratory supplies are divided into four categories: reagents, biological matrices, general lab supplies/consumables, and chromatography products, including both high-performance liquid chromatography (HPLC) columns and solid-phase extraction plates," Beyerlein says. "Four teams of two scientists, one primary and one backup, are designated to monitor the inventory of each of the four categories."

When the lab reaches an inventory trigger point on a particular item, the scientist responsible will submit a purchase order request form to the organization's purchasing department. Purchasing staff will research the item by contacting approved vendors, or by searching the



▲ Scientist reviewing LC-MS-MS data results.

Internet if the product is not distributed by an existing approved vendor.

Once the best options for an item are identified—based on quality, price and availability—the purchasing staff will submit the options to Beyerlein for approval; he will give the final go-ahead to place the order.

“Special orders—such as chiral columns, derivatizing reagents, hepatocytes or other unique biological matrices—that are required for specific client projects are typically requested by the principal investigator assigned to that client’s project,” Beyerlein says.

MicroConstants has a dedicated quality control unit called the metrology department, which handles the majority of the organization’s equipment maintenance and calibration. Any maintenance that can’t be handled internally is sent out.

“We provide in-house training for our metrologists and ensure that they have a fully stocked QC lab area with plenty of spare parts for each instrument we own,” Beyerlein says. “We outsource maintenance and/or calibration for analytical balances, balance weight sets, low-volume pipettes, fume hoods, biological safety cabinets, all fire-suppression systems and the deionized water system.”

Hiring

Once a week, Beyerlein meets with all the department heads to discuss future scheduling and resource needs. During these meetings, if the team leaders notice workload surges or special needs within a department, they reallocate resources between groups to ensure that deadlines don’t suffer while they are resolving any conflicting instrument or personnel needs.

“We project our schedule, as best as possible, for many months in advance,” Beyerlein says.

Should any team leaders determine that they might face a potential increase in workload, they will bring it up at the meetings, where the group decides on hiring the necessary personnel.

“Our training time for new scientists is at least three months of intense one-on-one training, and it’s about another three months before they are allowed to work independently,” Beyerlein says.

“To hire and train a new employee, we need to accurately anticipate an increase in our workload at least four months in advance. When a need is identified, we post the open position on our website, on various employment websites, at appropriate conferences, and on professional organizations’ websites [and] job boards that target the desired candidate.”

The organization’s human resources department screens applicants based on the position requirements by reviewing resumes and conducting phone interviews.

“This process helps narrow the field to a reasonable number of candidates for in-person interviews,” Beyerlein says. “For an entry-level scientist position, we typically interview between five and 10 candidates.”

Personnel

With the right personnel in place, it’s important to ensure that they’re treated as professionals. This benefits both the employees and the company.

“One incentive we provide our employees is a flexible work schedule,” Beyerlein says. “When I interview new employees for the lab, I always tell them that science does not often follow a 9-to-5 work schedule. Some days will be longer and some will be shorter; you just can’t walk away mid-experiment.”

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In addition to allowing flexibility in the work schedule, the company and its management encourage their employees to continually advance their careers. One way to do this is to facilitate participation in professional development opportunities and provide reimbursement for conference and seminar attendance.

The company offers additional incentives to keep its staff happy.

"We offer 'Above and Beyond Awards' for exceptional accomplishments, plan six to eight company events and happy hours each year, and have a great benefits package," Beyerlein says. "Our benefits program includes medical, dental and vision care coverage; paid vacation, sick leave and holidays; flexible health care spending accounts; group life insurance; long-term disability insurance; and a company-matched SIMPLE IRA plan."

Communication

The employees are also encouraged to openly communicate with each other. Managers such as Beyerlein ensure that they know what's going on within each department.

"I not only believe in an open-door policy, but I also walk around through the lab areas and office areas to ask people how their projects are going," he says. "Any issues that may exist get resolved much more quickly when you approach people, as opposed to just being approachable."

Additionally, Beyerlein holds scheduled internal meetings to go over specific objectives and the associated timelines.

"I typically attend only four scheduled internal meetings each week," he says. "My department managers [also] hold meetings with their teams and individual employees



▲ *MicroConstants scientist performing bio-analytical analysis.*

as frequently as needed throughout the week to ensure that their projects are running smoothly."

To communicate with clients, the company has a dedicated project manager and a principal investigator assigned to each client.

"Many clients have scheduled weekly teleconferences, and we are available to meet with them or talk to them on the phone anytime they have questions," Beyerlein says. "We send out weekly project updates and send data as soon as it becomes available. In some cases we are providing 24-hour turnaround on sample analysis. For these types of studies, the communication needs to be seamless to ensure that the deadlines are met."

"Each client has different expectations, and we adjust as needed to meet those expectations. Our general philosophy is to increase the frequency of updates and communication to a point where our clients never need to contact us requesting an update," he adds.

Challenges

In a regulated environment such as a contract lab like MicroConstants, one of the biggest challenges for the leaders of the organization is training new personnel in a timely manner. To ensure that the training process is

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smooth and thorough, over the years, the staff and team leaders have put together training guides for various positions and tasks. These training guides have been turned into records. Each employee is asked to fill out a record each time he or she performs a task. While the results of this practice are invaluable for training purposes, it does pose some challenges.

"Although creating more forms and records ensures that people are being trained consistently and that tasks are being performed correctly, it can definitely slow the workflow," Beyerlein says. "Also, most people don't like to fill out more paperwork to get their jobs done. So to streamline our documentation process without

negatively impacting productivity, we have made our records as simple as possible to use."

"At our employees' suggestion, we set up a committee to review new records, test them before they are finally released and find ways to simplify their use," he adds. "This helps get the employees' buy-in on any new records or record revisions."

But the challenges of a laboratory are many. Years ago, Beyerlein and his colleagues experienced a drop in productivity due to vendor scheduling for yearly requalification of analytical instrumentation.

"All the cost-effective vendors wanted to perform the instrument

qualifications for all our systems within a three-week time frame once a year," he says. "This created a serious hardship on the production of our laboratory during that time and also required one or two employees to work with them throughout the process to ensure that they completed the qualifications before their due dates."

The team experienced a similar issue with the annual recalibration of temperature monitoring probes, causing the lab to reduce the frequency of the probe calibration to every two years.

"It became apparent that we needed to perform all these functions in-house," Beyerlein says. "Our QC department wrote protocols and records for all these

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activities; our IT department designed a custom, validated LIMS system to track instrument maintenance, calibration and qualification; and we brought this work in-house."

"By performing most of the qualifications earlier during the first year, we staggered them to occur throughout the year. This allowed the lab to function normally throughout the year with no significant interruption and allowed us to revise our SOPs for the temperature monitoring probes back to an annual recalibration," he adds.

This, Beyerlein explains, is an adaptation strategy necessary for anyone running a business. "As a lab manager, it is extremely important to have the ability to recognize what isn't working within your organization and to be able to change and/or adapt your strategy quickly," he adds.

Ultimately, challenge is something this lab manager thrives on. A love for the job and the need to figure out solutions are the fuel that has kept Beyerlein in the bioanalytical industry for almost 20 years.

"I expect to be challenged each day by new compounds with new issues that we need to overcome and to enjoy working with my scientists to find solutions to those challenges," he says. "To have a successful career, it is important to choose something you enjoy, and for me the mental stimulation is very motivating. I truly enjoy coming in to work."

Sara Goudarzi, is a freelance writer based in New York City. Her website is www.saragoudarzi.com.

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- Includes a touchscreen notebook computer preinstalled with Windows®-based software



Cianflone Scientific Instruments

www.cianflone.com

Laser Particle Size Analyzer

Booth 2635 1090LD

- Integrates liquid and dry dispersion in a single rugged and compact instrument
- Designed with two lasers, providing accuracy and precision from 0.04 to 500 microns
- Optical components are permanently mounted on a cast iron base plate to ensure the system is always in alignment



Cilas Particle Size

www.particle-size.com

PRODUCT SPOTLIGHT

DUAL LIGHT MAKES IT RIGHT PARTICLE SIZE ANALYZER COMBINES TWO LIGHT SCATTERING MEASUREMENTS IN A SINGLE OPTICAL SYSTEM

Visitors to Pittcon 2012 will have a chance to check out a breakthrough technology in Cilas Particle Size's NanoDS dual light scattering particle size analyzer. The system is the first to combine dynamic light scattering and static light scattering measurement in one single optical system, providing repeatability and accuracy across the entire 0.3 nm to 10 µm size range.



"Traditional nano particle size analyzers use only dynamic light scattering technology, which limits the size range of the particles they can measure," Cilas project manager Jean-Paul DuFour said. "By combining DLS and SLS in one measurement system, the Cilas NanoDS can measure and analyze a wider range of particles."

He added that combination means labs won't have to purchase two different instruments, saving money, space needs, and training time. The NanoDS offers a number of other advantages in addition to being able to both measure fine particles and characterize coarse ones:

"If a user is measuring a sample with a multi-modal distribution, the NanoDS is able to analyze the sample in a single measurement," he said. "This means the user only needs to prepare one sample cuvette and only needs to learn one software to make all their measurements."

Because the NanoDS software runs DLS and SLS in one step, less time is taken up and greater accuracy is ensured since the exact same sample cuvette is being used for both measurement types, Mr. DuFour explained.

He added the analyzer is particularly well-suited to research and development as well as quality or process control.

For more information, visit www.particle-size.com. To take a look at the NanoDS, visit Cilas Particle Size at booth 2635 during Pittcon 2012 in Orlando, Florida.

Raman Spectrometers

Booth 926

Rapid•ID, Reporter, Pharma•ID, and Advantage

- Allow manufacturers to improve product quality through increased testing and reduction in laboratory costs
- Pharma•ID is equipped with Pass/Fail capabilities, and enables users to be 21 CFR Part 11 compliant
- Advantage bench top systems come in a variety of wavelengths and are easy to operate



DeltaNu

www.deltanu.com

CREATE A CONVERSATION

Post comments to articles you read on the Lab Manager website.



Have an opinion, idea, or input pertaining to something you have seen or read in our print or digital publication? Let us know and post a comment on our site today.

Connect with other Lab Managers by expressing your opinions.



X-ray Fluorescence Analyzer

Booth 1170 Element Xr 6000

- Offered with a Proportional Counter Detection System, Si-PIN Detector or Silicon Drift Detector (SDD)
- All analyzers feature a large slotted chamber and newly developed software
- Provides results quickly and accurately for virtually all metallic coating measurement needs



Eastern Applied Research

www.easternapplied.com

ED-XRF Spectrometer

Booth 1170 Xenometrix RoHS-SDD

- Provides a wider scope of analysis than the RoHS-Vision system
- Can exceed the lower limits of detection required by hazardous substance regulations
- Supplies qualitative and quantitative analysis of elements from Sodium through Uranium



Eastern Applied Research

www.easternapplied.com

Tandem Pyrolyzer for GC & GC/MS

Booth 3423 PY-3030Dx

- Utilizes two independently controlled micro-furnaces
- Reaction chamber allows introduction of a reagent gas to react with pyrolyzates formed in the 1st furnace; reaction products from the 2nd furnace are then analyzed by GC/MS
- Provides a powerful and versatile tool to characterize many kinds of materials under reactive gas and catalytic conditions



Frontier Laboratories

www.frontier-lab.com

LC/MS Purification System

Booth 3519 Gilson

- Combines the Trilution LC platform and integrated control of the PerkinElmer FLEXAR SQ 300 MS Detector to trigger mass-based fraction collection
- Allows for utilizing UV, DAD and/or ELSD and up to seven target masses with 1 to 3 adducts per target mass
- Makes the collection of fractions a quick and easy process



Gilson

www.gilson.com

Micro Volume Spectrophotometer

Booth 875 NanoPhotometer® P-Class

- Includes NanoVolume (0.3ul) analysis, cuvette capability, a built-in vortexer, and standalone operation
- Enables reliable micro volume quantification over a wide dynamic range of 2-18,750ng/ul (dsDNA) and 0.08-543mg/ml (BSA) with spectrum scans in 3.5 seconds per reading
- Designed with no moving parts



Implen

www.implen.com

LC/GC/MS & Elevating UHPLC benches

Booth 3510 IonBench™

- Mass Spec IonBench™ products integrate MS peripherals, a built-in vacuum pump noise reduction enclosure and reduce vibration by 99%
- Vacuum pump enclosure reduces noise emissions by 75% down in perception
- UHPLC IonBench™ tables, on caster wheels, can be easily lifted up or down by commuting a switch



IonBench

www.ionbench.com

Quadrupole-based PTR-MS System

Booth 3703 PTR-QMS 500 Series

- Provides detection limits of < 1 pptv for VOCs monitoring, based on Proton Transfer Reaction – Mass Spectrometry
- Features reduced size and weight, but improved maintainability
- Includes a touchscreen display and new heating chamber layout
- ULTRA-PURE ion source delivers a precursor ion intensity not seen before



IONICON

www.ionicon.com

UV-Vis/NIR Microscopic Spectrophotometer

Booth 1407 MSV-5300

- Incorporates a double-beam scanning spectrophotometer for optimum measurements in the UV-Vis to NIR region (200-2700 nm)
- Provides continuous transmittance/reflectance measurements for the entire spectral range desired
- Optional automated XYZ stage also available



JASCO

www.jascoinc.com

Macro Analyzer

Booth 2718 TruMac CNS

- Adds sulfur analysis capabilities to the instrument's existing carbon/nitrogen configuration
- Quickly analyzes macro sample sizes with a low cost-per-analysis
- Ensures the complete oxidation of macro samples
- Large, reusable ceramic boats simplify the sample handling process



LECO

www.leco.com

Laser Diffraction Particle Size Analyzer

Booth 3641 Mastersizer 3000

- Delivers precise high-resolution wet and dry sample measurement from 10 nm to 3.5 mm, with rapid operator-independent measurement
- A range of sample dispersion accessories provides a solution for every application
- Features intuitive software designed to lighten the analyst's workload



Malvern Instruments

www.malvern.com

Automated VOC Analysis Instrument

Booth 1780, 1781 CIA Advantage™

- Designed for the VOC analysis of air and gas sampled using canisters
- Well-suited to those using US EPA Method TO-15 and other methods involving an extended range of pollutants
- Offers additional functionality of sorbent tube analysis



Markes International

www.markes.com

System for Protein Quantitation

Booth 2259 Direct Detect™

- Offers fast, accurate protein quantitation with minimal sample preparation
- Features an infrared (IR)-based spectrometry system and novel membrane technology
- Requires only a small sample volume (2 µL) and can measure protein concentrations from 0.2 mg/mL to 5 mg/mL within minutes



EMD Millipore

www.millipore.com

Core-Shell HPLC/UHPLC Columns

Booth 1549 Aeris™

- Specially designed for the analysis of proteins and peptides
- Produce sub-2 micron results on any LC instrument
- With virtually no bleed, are highly compatible with MS
- Offered in wide- and small-pore configurations



Phenomenex

www.phenomenex.com

Core-Shell HPLC/UHPLC Columns

Booth 1549 Kinetex®

- Now with a Phenyl-Hexyl phase
- Offer a unique selectivity for the separation of compounds that are difficult to resolve using traditional phenyl phases
- Available in 2.6- and 1.7-micron particle sizes



Phenomenex

www.phenomenex.com

UHPLC Column Protection System

Booth 1549 SecurityGuard™ ULTRA

- Extends UHPLC column life
- Suits virtually any manufacturer's UHPLC, sub-2-micron or core-shell columns
- Protects against the damaging effects of chemical contaminants and microparticulates



Phenomenex

www.phenomenex.com

Low-Temperature Evaporative Light-Scattering Detector

Booth 3635 SEDEX 90LT

- Provides Picogram Level Sensitivities, Overall Direct Linearity, Broad Dynamic Range, Excellent Efficiency and Response Consistency
- Features a novel detection technology
- High-performance aerosol-based detector for universal solutions



SEDERE

www.sedere.com

5 % Phenyl GC Column Range

Booth 2459 BP5MS

- Includes BP5 for general purpose use, the highly inert BPX5, HT5 for high temperature applications and now mass spec ready BP5MS
- Completes the SGE range of 5% Phenyl capillary columns



SGE Analytical Science

www.sge.com

GC Ferrule System

Booth 2459 SilTite™ Fingertite

- Now available for wide bore capillary columns
- Delivers an easy installation for capillary columns without the use of any tools
- Results in low dead volume fittings, allowing for optimal peak shapes
- Achieve a perfect, reliable seal for even the most sensitive GCMS systems



SGE Analytical Science

www.sge.com

GC Connector

Booth 2459 SilTite™ µ-union

- Simplifies connecting GC guard columns or two-dimensional GC
- Is chemically inert and has superb operational stability
- Also provides low dead volume, is easy to install and provides a leak free connection
- Achieves a perfect, reliable seal even for sensitive GCMS systems



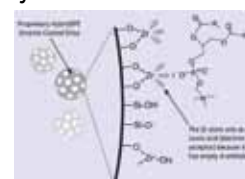
SGE Analytical Science

www.sge.com

Complete Phospholipid & Protein Removal

Booth 2040 Supelco HybridSPE® Plus

- Phospholipid removal reduces matrix effects and improves reproducibility
- Concurrent protein precipitation and filtration extends column lifetime
- Generic methodology minimizes method development, increases throughput
- Comes as a half-skirt 96-well plate



Sigma-Aldrich

www.sigma-aldrich.com

Ionic Liquid GC Column

Booth 2040 Supelco SLB™-IL111

- Provides significant chromatographic improvements over existing columns for several applications
- Offered in 15 m x 0.10 mm I.D., 30 m x 0.25 mm I.D., 60 m x 0.25 mm I.D., and 100 m x 0.25 mm I.D. dimensions
- Extremely polar (270 °C maximum temperature)



Sigma-Aldrich

www.sigmaaldrich.com

UV-Vis Microvolume Spectrophotometer

Booth 2665 NanoDrop Lite

- Complements the full-featured NanoDrop™ 2000/2000c and NanoDrop 8000 instruments
- Small enough to fit in a drawer
- Powerful enough to help accelerate life science workflows related to sequencing



Thermo Fisher Scientific

www.thermo.com

Hybrid SEM Microscope

Booth 1659 Aquila

- Allows users to observe samples with an optical and electron microscope simultaneously
- In optical mode, users can quickly and accurately target samples for the electron beam
- Full-color optical image is independently controlled for maximum observation convenience
- Side-by-side views of the sample make locating other targets quick and simple



Topcon

www.topconsem.com

Portable GC-MS

Booth 3523 TRIDION™-9

- Allows users to collect and concentrate analytes quickly without the need for other extraction equipment or solvents
- Weighs only 32 pounds
- Ready for sample analysis in ~5 min from a "cold start"
- Run-to-run cycle times are typically ~5 min



Torion Technologies

www.torion.com

Dumas Nitrogen Analyzer

Booth 3051 NDA 701

- Provides very high limits of detection and readability and an RSD lower than 0.5% for EDTA
- Allows samples to be loaded in nearly 120 positions
- Runs fully automatically for strong reproducibility and comparability of results
- Complies with all standards in the food and feed markets



Velp Scientifica

www.velp.com

Ultra-High Pressure UHPLC Injector

Booth 2205 Cheminert® C72

- Features a proprietary stator coating that permits pressures up to 15,000 or 20,000 psi
- All models are compatible with any VICI actuation option
- Built into a compact and lightweight package, available in 4, 6, 8, and 10 port configurations with a choice of .004", .006" or .010" bore



VICI Valco

www.vici.com

BASIC LAB**Ductless Fume Hood**

Booth 1159 INDEPENDENCE™

- Includes AirClean® Operating System which provides constant control and monitoring of all features
- Features AirSafe™ TOUCH automatic safety controller
- Chemical reference library and application validation system also included
- Combines 'true zero' gas measurement with multiple gas detection methods



AirClean Systems

www.aircleansystems.com

Fume Hood

Booth 2183 Green Solution Hood

- Features Neutrodine® Filtration Technology which saves 96% on energy without compromising usage, performance or safety
- Ensures there are no chemical emissions to the atmosphere
- Involves no HVAC infrastructure costs



Air Master Systems

www.airmastersystems.com

Benchtop Scanning Electron Microscope

Booth 1282 ASPEX EXpress™

- Designed for "out of the lab" applications emphasizing speed, reliability and low cost of ownership
- Requires no liquid nitrogen
- Comes equipped with the Perception software suite
- Also includes an LN-free EDX spectrometer



ASPEX Corporation and FEI Company

www.aspexcorp.com

Ampule Opener

Booth 1219 Scienceware® Break-Safe™

- Allows users to easily open up to 3 ampules at a time
- Uses the lid of the box to easily snap ampule necks while containing all glass pieces within the box
- Copolyester plastic construction provides broad chemical resistance
- Includes four inserts that open 1ml, 2ml, 5ml and 10ml ampules



Bel-Art Products

www.belart.com

Test Tube Capper

Booth 1219 Scienceware®

- Reduces finger soreness and hand stress
- Designed for use with recessed center test tube caps and capping can be performed on glass or plastic test tubes
- Allows users to quickly cap rows of test tubes when lined up in a rack, or single tubes can be capped while held in the opposite hand



Bel-Art Products

www.belart.com

Tissue Disaggregator

Booth 1219 Scienceware®

- Reduces processing time and decreases per sample costs
- Facilitates the production of isolated cell suspensions for flow cytometry analysis and/or cell culture
- Features 70-micron stainless steel screens
- Allows tissues to remain viable until they are processed



Bel-Art Products

www.belart.com

Pipette Leak Tester

Booth 1853 BRAND PLT™

- Provides a quick daily functional check of air displacement pipettes
- Quantifies leakage from the entire pipette system
- Gives a simple PASS/FAIL result for all common brands and sizes of pipettes
- Testing takes only seconds using menu-driven software



BrandTech Scientific

www.BrandTech.com

-100.0 Platinum Freezer Thermometer

Booth 3529 Traceable® RTD

- Accurately monitors temperatures in freezers, water baths, heating blocks, incubators, and refrigerators
- Features range of -99.9 to 199.9°C with a resolution of 0.1° and an accuracy of $\pm 2^\circ\text{C}$
- Includes probe, carrying case, and 9-volt alkaline battery



Control Company

www.control3.com

Environmental/Pharmaceutical Lab Control Products

Booth 3522 HD45, HD2103, HD404, TP480

- HD45 CO₂/Temperature/Humidity Wall Mounted Meter: automates lab air management
- HD2103 Hot Wire Air Speed Meter: Provides accurate checks for laminar fume hoods
- HD404 Differential Pressure Meter: controls and regulates clean room pressure status
- TP480 Dew Point probe and meter: Determines best working conditions of compressed air lines



DELTA OHM

www.deltaohm.com

Water Purification Systems

Booth 960 PURELAB Flex 3 & 4

- Ensure accurate, consistent results
- Both systems deliver up to 10 liters of ultrapure water per day and up to 2 liters per minute
- The Flex 3 delivers ultrapure water direct from potable tap water and the Flex 4 requires a pre-purified feed



ELGA

www.elgalabwater.com

CO₂ Incubator

Booths 1180-1181 CelCulture

- Features the VivoCell™ temperature, CO₂, and humidity control technology
- New model comes with suppressed O₂ control
- Includes new Voyager® Software option
- Backed by a 2-year warranty



Esco

www.escoglobal.com

TOC Analyzer

Booth 2610 Sievers InnovOx

- Achieves superior TOC recoveries regardless of organic compounds and particulate impurities in the sample
- New enhancements include faster, more intuitive navigation; additional user-managed security options; and conversion factors for reporting units like BOD or COD
- A new repeat criteria option improves calibration or grab sample speed



GE Analytical Instruments

www.geinstruments.com

One-Touch Vibratory Sieve Shaker

Booth 2829 SS-10

- Provides fast, accurate separations of materials 2mm and finer
- Touchscreen programmable controller allows selection of vibration level, time, and pauses
- Allows storage of 99 testing profiles in non-volatile memory
- For 8in and 200mm sieves

Gilson Company
www.globalgilson.com



Digital Pulse Mixer

Booth 3728

- Can be automated or customized for any vessel
- Perform high or low speed orbital mixing with repeatable mixing results
- Easily adapted for the various vials associated with the QuEChERS procedure
- Suited to applications involving solution phase synthesis

Glas-Col



www.glascol.com

ARC Sensors

Booth 1619 Oxyferm, Oxygold, and Conducell

- Oxyferm FDA: for electrochemical dissolved oxygen measurement in pharmaceutical fermentation processes
- Oxygold G and B: for low-ppb dissolved oxygen trace measurements in water & beverages
- Conducell PWSE: delivers low conductivity (0.01 to 2,000 $\mu\text{S}/\text{cm}$) measurements in pure & ultra-pure water

Hamilton Company
www.hamiltoncompany.com



Fume Hoods

Booth 2911 SE Aire-Stream

- AUL 1805 certified and offered in 48", 60", 72" and 96" widths
- Available in either constant air volume or restricted bypass models
- Feature white, molded one-piece seamless fume chambers with coved corners for easy cleaning and light reflectivity
- Maximize user protection and energy savings

HEMCO



www.hemcocrp.com

Preparative SFC System

Booth 1407 Prep-2088

- Back-pressure regulator allows control of system pressure regardless of solvent composition and flow rate
- New PU-2088 pumps deliver up to 120ml/min of CO_2 and up to 80 ml/min of modifier and flush solvents at pressures up to 35 MPa (5000 psi)
- Sample injection can be manual or fully automated

JASCO



www.jascoinc.com

Coulometric AQ-300 KF Titrator

Booth 2381 AQUACOUNTER®

- Reliable and easy-to-use
- Determines moisture quickly and accurately down to 1ppm with just a simple injection of the sample
- Four files with preset conditions can be stored in memory
- CE approved; has an international voltage input (100-240V)

JM Science

www.jmscience.com



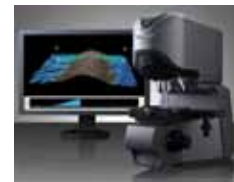
3D Laser Scanning Microscope

Booth 1006 VK-X200

- Performs profile, roughness and thickness measurements with 0.5 nm z-resolution
- Microscope captures fully-focused 2D images and acquires 3D data on surfaces with angles approaching 90 degrees
- Newly-designed automation function allows users to scan and measure a target with the touch of a button

KEYENCE

www.digitalmicroscope.com



Vacuum Pump System

Booth 2080 SC950

- Features a high 50 l/min pumping capacity and a deep 1.5 Torr end vacuum
- Wireless remote control enables the system to be operated within a fume hood with the sash closed
- Conserves valuable laboratory space
- Includes four operating modes

KNF Neuberger

www.knflab.com



Digital Economy Polarimeter

Booth 2325 P3000

- High-speed measurement reduces measuring time to just 1 second irrespective of the angle of the sample
- Includes an intuitive touch screen with basic functions
- Well suited to industries like the sugar industry which don't need more than 2 digits after the decimal point and perform standardized measuring

A.KRÜSS Optronic

www.kruess.com



Bio-Concentrator

Booth 1318 RevElution™

- Allows samples as large as two liters to be concentrated at a rate up to 100 ml/minute
- Recovers as many as 90 percent or more microbes
- Operates with the press of one button
- Measures only 6.0" wide x 14.0" deep and 11.2" tall



Labconco

www.labconco.com

Automated Liquid Level Monitor

Booth 3470 aequus

- Specifically for analytical instrumentation fluids
- Provides a simple, low cost, non-contact answer to solvent level monitoring
- Allows laboratory managers to easily keep track of solvents used in the everyday running of analytical equipment



TTP Labtech
www.ttplabtech.com

Lab Refrigerator

Booth 2264 6CARFM

- Features a new forced air evaporator system for even greater temperature control and uniformity
- Includes three adjustable, full depth, perforated metal cantilever shelves
- A positive close door hinging system reduces "door ajar" events
- Fits easily under lab benches and can be fully integrated into casework



Marvel Scientific

www.marvelscientific.com

Professional and IC Amperometric Detectors

Booth 2219 896 & 850

- Features optimized measuring cells
- Provides sensitive and accurate determination of concentrations down to the ng/L-range when electroactive components are to be determined
- Offered as a detector block (850 IC Amperometric Detector) or as a stand-alone detector module (896 Professional Detector)



Metrohm USA

www.metrohmusa.com

Compact Titrator

Booth 2219 Ti-Touch

- Available for both Karl Fischer and potentiometric titrations
- Allows up to 14 shortcuts to be defined for instant access to methods or routine operations
- Features a small footprint, chemical resistant housing, rugged touchscreen, and full network integration without a PC



Metrohm USA

www.metrohmusa.com

Air Circulation Chamber Furnaces

Booth 1522 NAC 120/65 - NAC 500/65

- Stainless steel inner chamber protects against impurities from the insulation
- A good fit for processes which require a clean atmosphere at the charge and on the shop floor
- Depending on design and required clean room class, these furnaces can be upgraded for this application



Nabertherm

www.nabertherm.com

Ultra-Low Upright -86C Freezers

Booth 3071 Select™ Series

- Now available in three upright sizes
- Features an operating temperature range of -50C to -86C
- Includes high/low audible & visual temperature alarms, remote alarm contacts, patent pending voltage buck/boost
- Contains 1HP low noise high-efficiency compressors



Nor-Lake Scientific

www.norlakescientific.com

Water Activity Meter

Booth 3082 LabTouch-aw

- Driven by the ease of use and fast menu access of a touchscreen
- Semi-temperature-stabilized measurement chamber provides consistent and reproducible measurement results (aw-value)
- Features the latest sensor and measurement technology coupled with re-useable humidity calibration standards



Novasina

www.novasina.com

LC-MS Nitrogen Generator

Booth 3659 NitroFlow 60

- Produces up to 60 slpm of pure LC/MS grade nitrogen at pressures of up to 110 psig
- Suits multiple LC/MS and new LC/MS instruments requiring high flow
- Includes integrated scroll compressor technology, a small footprint, mobility, and whisper-quiet operation



Parker Balston

www.parker.com

Digital Scientific Camera

Booth 2070 xSCell

- Features 1000 frames per second (fps) at a resolution of 1024 x 1024
- Provides readout noise of less than 2 e- rms and quantum efficiency of 65%
- Offers flexible readout modes, in-camera processing and true pixel binning as part of its standard package



PHOTONIS USA

www.photonis.com

Circulating Water Baths

Booth 2759 Various Models

- Available with temperature ranges as broad as -40° to $+200^{\circ}\text{C}$
- Feature temperature stabilities as precise as $\pm 0.005^{\circ}\text{C}$
- Six different temperature controllers are available, including two programmable models
- Include a swiveling control head for 180° viewing of the temperature display



PolyScience

www.polyscience.com

375-785nm, 1-100mW Instrument Quality Laser Module

Booth 3148 CK Series

- Created specifically to address the needs of high-end OEM applications
- Features an onboard microprocessor
- Contains a precision current source and ultra-stable, active temperature control for the laser diode
- Has a low operating voltage



Power Technology

www.powertechnology.com

Mixers, Rockers and Stirrers

Booth 3744 Lab Plus Series

- Series includes the VSN-5 Nutating Mixer, the VSM-3 Vortex Mixer, the VSR-50 Variable Speed Rocker, the VSOS-4P Orbital Shaker and HPS-7 Hot Plate Stirrers
- Features a variety of available accessories for an array of applications
- Can be integrated into current lab procedures with ease
- Simplifies everyday lab processes such as mixing, blending and resuspending



PRO Scientific

www.proscientific.com

Gas Generator Systems

Booth 3959 NiGen LCMS & STACKABLE

- Provide ultra-high purity gas with consistent and predictable results
- LCMS generators feature high capacities and are suitable for analytical laboratories with multiple instruments
- Proton OnSite's hydrogen, nitrogen and zero air generators are available in a wide range of customizable, stackable systems



Proton OnSite

www.Protononsite.com

Evaporator/Condenser

Booth 719 Centrifan PE

- Uses no vacuum and no blow-down gas to evaporate solvents
- Now has an optional coiled tubing insert available to implement a flowing coolant arrangement from hood plumbing or a lab circulator
- Modular SFC now provides the Polyscience IP-60 Immersion Cooler to implement unattended chilling of the Centrifan's cold trap



Quasar Instruments

www.quasarinstruments.com

Analytical Balance

Booth 3541 XA 82/220/2Y

- Features intuitive operation and high operating comfort
- Includes user-defined settings and a range of functions and applications
- Autotest system allows automatic control of balance's quality
- Also lets users transfer and exchange data between balances
- Designed and manufactured in Poland



RADWAG USA

www.radwagusa.com

PRODUCT SPOTLIGHT

GET SMART WITH SAMPLE STORAGE

AUTOMATED FREEZER MAKES LIFE EASIER IN THE LAB

The SmartFreezer from RURO and Angelantoni is the only fully automated freezer that individually stores and retrieves sample vials at temperatures of -80°C , using a traditional mechanical freezer, or at -180°C using a liquid nitrogen tank (vapor phase).

RURO VP of operations Vera Terekhina said the SmartFreezer offers a number of improvements in the lab.

"The SmartFreezer allows a hands-free retrieval of the vials, and is performed by a robotic arm that is a part of the device," she said. "Furthermore, it is integrated with an inventory system — FreezerPro — that enables a seamless integration between the SmartFreezer, the inventory software and the mechanical freezers in the facility. Hence, lab personnel always know where the inventory is located without having to open any actual freezers."

The system is also speedy; for example, a tray of five vials can be loaded or retrieved in 30-60 seconds, Ms. Terekhina added.

She said any modern research laboratory would be a good fit for the SmartFreezer, including labs that work with cell lines, biorepositories and pharma companies.

Though the SmartFreezer is a bit more expensive than the standard mechanical freezer, Ms. Terekhina said the investment is worth it as it pays for itself in under a year.

"The SmartFreezer permits lab personnel to quickly locate their placement of their inventory without opening the device, thus providing safety and security compliance," she said. "It also gives a 'bird's eye view' to the managing personnel."

In addition, the freezer is independently validated and certified to be fully compliant with the FDA's current GLP/GMP requirements.

For more information, visit <http://www.ruro.com/rfid-solutions/smart-freezer> or check out booth 1961 at Pittcon 2012 in Orlando, Florida.



Medium Flow Controller

Booth 2327 Smart-Trak® 50 Series

- Increases the maximum flow range of the Smart-Trak® 50 Series from 50 slpm to 200 slpm
- Provides a standard accuracy of $\pm 1.5\%$ of full scale that works for nearly all common semiconductor purge and carrier gases
- Features a flexible and powerful direct-acting frictionless-hovering control valve



Sierra Instruments

www.sierrainstruments.com

High-Volume Ultrasonic Probe

Booth 1073 Vibra-Cell™

- Can be used in conjunction with Sonics' Vibra-Cell™ 750 & 1500 watt ultrasonic systems to process large volumes of liquid
- Features a unique and proprietary arrangement of energy points, which promote and enhance the cavitation effect thus leading to better yields of material processing
- Completely autoclaveable and resistant to most chemistries



Sonics & Materials

www.sonics.com

Borosilicate Glass Fiber Filter

Booth 1929 934-AH

- Widely used to establish water quality in suspended solids content
- The binderless borosilicate microfiber enables its use with volatile suspended solids and other samples up to 550°C
- Features a 1.5 micron size particle retention
- Available in a variety of diameters



Sterlitech Corporation

www.sterlitech.com

Vacuum Network Pumps

Booth 1851 VARIO®

- Used as server pumps for multi-user VACUUM • LAN® local vacuum networks
- Provides only as much vacuum as needed to meet current demand
- Gives users high performance vacuum at bench ports (as low as 1.5 Torr)
- Can save as much as 90 percent of the energy usually needed



VACUUBRAND

www.vacuubrand.com

CHEMICALS, KITS & REAGENTS

Multicomponent Organics

Booth 910-912

FTPH-M17C, PAH-HM16C, PCB-MD7C, CSS-ME8270-M6C

- Manufactured according to ISO Guide 34 specifications
- FTPH-M17C: 17-component even alkane mixture
- PAH-HM16C: 16-component polynuclear aromatic hydrocarbon mixture
- PCB-MD7C: 7-component PCB Congener mixture
- CSS-ME8270-M6C: 6 components in Methylene Chloride

High-Purity Standards

www.highpuritystandards.com

Single Element Calibration Standards

Booth 3566 A+

- Designed for use for ICP-MS, ICP-AES, AA and other spectrometric techniques
- Assayed in accordance with the High Performance ICP (HP-ICP-AES) method that was developed by NIST
- Ensures the highest accuracy standards available, which translates into better analytical results



VHG Labs

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LAB AUTOMATION

NAP/PCR Workstation

Booth 1704 VERSA 1100

- Provides a large volume range (nL to mL)
- Features a multi-channel liquid handling module
- Maximizes accuracy, precision and throughput
- Aurora also offers atomic absorption spectrometers, atomic fluorescence spectrometers, microwave digestions systems, and reagents



Aurora Instruments

www.aurora-instr.com

DNA-CE System

Booth 3612 Qsep100™

- Uses pen-shaped disposable gel-cartridges to improve efficiency
- Designed to accommodate the standard 96-well PCR plate
- Compact design allows users to set up and operate the instrument intuitively
- Features disposable gel-cartridge with integrated pre-programmed test methods



BiOptic

www.biopic.com.tw/

High-Throughput Circular Dichroism (CD) Measurement System

Booth 1407 HDX-CD

- Automates CD and UV/Visible absorbance measurements for large numbers of samples
- A third detection option also allows simultaneous fluorescence measurement of the samples
- Offers precise micro sampling and eliminates complications



JASCO

www.jascoinc.com

Sample Changer

Booth 2219 898 XYZ

- Automated for fast and reliable analysis of large sample series
- High throughput and plenty of space allow for 82 samples
- Features ti amo® control for easy operation
- Can be operated with various sample racks
- Application and service support included



Metrohm USA

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Automated Homogenizer/Liquid Handling System

Booth 3904 LH96

- Combines multiple sample prep steps into one platform
- Features multi-sample homogenizing, liquid handling, pipetting & sample weighing
- Space-saving footprint fits inside most fume hoods
- Offers substantial time savings over traditional manual sample prep methods



Omni International

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LIFE SCIENCES

Fluorescent Western Blotting Membrane

Booth 1412 Immun-Blot®

- Provides low autofluorescence and high signal-to-background ratio
- Offers binding capacity of 300 µg/cm² and improves the ability to capture more proteins
- Precut membrane and filter paper sets — saves time and eliminates excessive membrane handling and potential contamination



Bio-Rad Laboratories

www.bio-rad.com

Sensor Chip

Booth 1412 ProteOn HTE™

- Suitable for label-free analysis of protein-small molecule interactions
- Reusable chip decreases cost per data point by 90%
- Enables on-chip purification
- Saves time, sample and money required for purification



Bio-Rad Laboratories

www.bio-rad.com

Flow Calorimeter

Booth 3470 chipCAL

- Designed for thermodynamic profiling of microlitre volumes of biological sample
- Well-suited to enzyme screening and the study of enzyme kinetics
- With fast, real time readouts, its non-invasive approach can also be of value in the detection of microbial activity and cell metabolism



TTP Labtech

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Cell Analyzer

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- Software and touchscreen interface provide results in only a few steps
- Validated assays provide rapid answers on cell concentration, viability, measurement of apoptotic status and cell cycle
- Provides simple operation in a low cost platform



EMD Millipore

www.millipore.com/muse

LIMS & SOFTWARE

Technique-Specific Software

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- Provide data format support for all major instruments
- Integrate chemical structure with analytical data so users can extract answers from their experiments
- Include multi-technique processing and interpretation
- Surpass traditional data storage and access



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www.acdlabs.com

Business and Laboratory Management Software

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- Tailored to meet customer's specific requirements
- Suits many disciplines such as clinical trials, bio-banking, pharmaceutical and environmental industries
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- Automatically converts scanned graphs into useful (x,y) data using a simple drag and drop interface
- Works with any scanner or image file
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Booth 1619 Microlab® 600

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- Includes a new package of compliance features for labs in regulated environments
- Now available in ten languages



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LIMS

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- Compendial Search provides a useful resource for lab tests



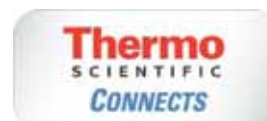
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- Delivers improved access to real-time information, regulatory compliance and data integrity
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- Protects tubing from bite damage through 304 stainless steel tubing, which covers the flexible Teflon tube at the hub end
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- Store various styles of storage boxes, slide boxes, reverse PCR® racks and assay plates, depending on the model
- Models include 3 x 3, 4 x 4, and 2 x 3 upright racks and a 4 x 1 chest freezer rack



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Fitting for UHPLC

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- Incorporates a novel patent-pending design that allows the system to be used up-to ten assembly cycles with no impact on pressure holding ability or carryover
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- Features PEEK™ polymer-blend ferrule



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www.idex-hs.com

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- Provide fast, economical, on-the-spot measurement of trace chemicals in liquids
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Most manufacturers know that accurately determining the density of raw materials is a critical part of the production process. Why is it so important? It can help control the quality of the final product, and it can help control materials for production and processing. In some industries, it can mean the difference between profit and loss.

Adam Equipment's density kit is a valuable tool to help manufacturers accurately determine the density of their materials. Combine the density kit with the Adam PW analytical balance and the process becomes even more reliable and precise.



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Fax: 203-792-3406
www.adamequipment.com

Adam Equipment's Density Kit a Winner for Quality Control in Manufacturing and Production

Traditionally, density determination has required measuring the sample material: figuring out the volume, weighing the sample, dividing the volume by the mass, and finally coming up with the density. The process is not only complicated and tedious; it is far less accurate, especially when the shape of the raw material is irregular.

Testing of both solids and liquids is possible using the density kit. That means that even samples with densities greater or less than that of water can be determined. The balance software will calculate density using water, ethanol or paraffin as selectable references. The software also allows the user to enter the density of any reference liquid directly.

The density kit is installed on the floor of the PW's enclosed weighing chamber. The kit's beaker holds the reference liquid and may be reused to test as many samples as needed. The user simply selects the density application from the built-in menu options. If a reference liquid is used other than what is already programmed into the balance, the user can enter the density for that reference liquid. The application prompts the user through the process: weigh the sample in air using the sample cup on top of the stand, then in the reference liquid using the sample cup suspended on the wire. The balance software calculates the density automatically.

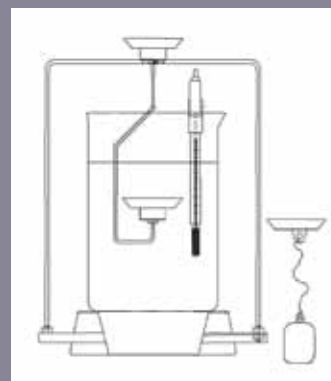
Shown with Adam Equipment's PW analytical balance, the density kit consists of a glass beaker, a suspended weighing cradle to replace the standard pan, independent support for the beaker of fluid, thermometer with clip for suspension in the fluid and glass sinker of known volume for determination of fluid density.

Adam's PW analytical balances offer a quick and easy way to measure to 0.1mg. The PW provides 16 weighing units, including a custom unit and features durable metal construction, standard internal motorized calibration and a large backlit dual display that shows text prompts to help the user set up the balance quickly. Highlighted tare keys stand out for accessibility, while other buttons operate set-up functions, turn the balance on or off, send data to a printer, calibrate and change modes and weighing units.

The bi-directional RS-232 interface enables data transfer from the balance to printers or computers. This allows foolproof data recording and traceability, letting the operator focus on data analysis. Other useful features include built-in applications for density, percentage, comparison and check weighing, plus counting and dynamic or animal weighing.

About Adam Equipment

Adam Equipment manufactures and distributes a full selection of precision balances and scales for the lab, education, industrial, retail, health/fitness, animal/veterinary and jewelry markets. The company is headquartered in England and has offices in the United States, South Africa, Australia and China. Founded in 1972, Adam is proudly celebrating its 40th anniversary in 2012. Since its inception, Adam has provided its customers with the winning combination of speed, performance and value. For more information about the company and its products, go to www.adamequipment.com.



Energy Efficient Engineered Cabinets from The Baker Company

For 60 years The Baker Company has been at the forefront of engineering, testing and production of reliable laboratory contamination control equipment. Our cabinets and hoods are crafted with precision for your unique situation. We have built our reputation by taking no chances with your safety and making no compromises when it comes to protecting the success of your research. Our latest product offerings continue to build on this reputation with focus on optimum energy efficiency and extended filter life to help reduce your annual operating costs.

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BioChemGARD e3

Biological safety cabinets are critical in the protection of personnel from exposure to harmful particulates within the cabinet and the protection of product from contaminants outside the cabinet environment. Type B2 total exhaust biosafety cabinets are designed to exhaust all HEPA-filtered air through the building exhaust system. This exhausted air must be replaced by the laboratory's air supply system and is typically heated or cooled.

A significant amount of energy is required to maintain the necessary airflow, so total exhaust cabinets can incur major operating costs for a facility. Because BSCs are often operated continuously, hot or cold conditioned air adds considerable costs for a laboratory, typically ranging anywhere from \$4 -\$8 per cubic feet per minute (CFM) per year.

The BioChemGARD e3, a revolutionary Type B2 total exhaust BSC from The Baker Company, couples a change in airflow throughout the cabinet with many unique energy-saving features, including a patent-pending sealed-access filter-exchange system, a motor/blower system with variable frequency drive technology and a low-flow operating mode.

With the BioChemGARD e3, a reduction in exhaust airflow and resistance cuts the electrical power, noise and static pressure requirements for the facility and reduces the volume of conditioned air exhausted from the laboratory. The 4-foot model operates at 664 CFM, using three-phase Variable Frequency Drive (VFD) motor technology to help deliver a reduction of up to 86% in electrical power when compared to traditional Type B2 total exhaust cabinets. This combination contributes to an overall reduction in the power consumption required

for most facility exhaust systems of up to 23%, providing a potential for annual operational cost savings of up to 49% over traditional Type B2 total exhaust cabinets. Performance and productivity remain high, while protection for both the product and personnel exceed NSF standards. Download our full white paper online at www.bakerco.com/biochemgard.

Energy Saving Technologies from Baker

Our new generation of energy efficient biosafety cabinets incorporates multiple energy-saving features that can mean significant ongoing cost savings for your facility.

StediFLOW™ self-adjusting motor technology uses less energy, produces less heat, and extends filter life without sacrificing performance.

With our exclusive ReadySAFE™ mode, the motor speed can be reduced and the cabinet will continuously operate and maintain safe conditions while the viewscreen is closed, saving significant energy.

Our FlexAIR™ Exhaust Connection combines the safety of a traditional canopy exhaust connection with the lower exhaust flows of a traditional hard exhaust connection, providing energy savings without sacrificing performance.

Discover our full line of e3 products at www.bakerco.com.



BioTek Continues to Set the Standard in Microplate Washing with the New 405™ Touch

For nearly 30 years, BioTek has led the market in developing microplate washing technologies, and is well recognized for the industry standard ELx405™ Microplate Washer. As a market leader, BioTek closely interacts with customers, responding to feedback and monitoring market trends. Combining their microplate instrument and software expertise with responsiveness to customer needs, BioTek introduces the 405™ Touch Microplate Washer. This radically new touch screen interface will reshape 96- and 384-well microplate washing routines, and set the microplate washing standard yet again.



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Fax: 802-655-7941
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www.biotek.com

Touch Screen Interface

A high-resolution, LED backlit touch screen provides the same simple, graphical interface seen in today's mobile devices. This modern interface provides users with enhanced, intuitive custom protocol creation, pre-defined wash protocols, flexible wash process execution and complete instrument maintenance. Users can start their wash process with as few as two screen touches! The touch screen uses resistive technology, so it can be used while wearing gloves. It can also be operated with a pointing device, if preferred. The large 5.7" screen allows open access for programming and viewing comfort.

USB Ports

Two integrated USB ports allow multiple users to conveniently store, run or transfer programs and settings. Users can operate the 405 Touch from their own personal memory stick via the USB ports, from the touch screen, or from a computer, thus enhancing operator convenience and increasing efficiency.

Software

The 405 Touch is powered by a fast Intel® processor for immediate instrument start-up and instant command responsiveness. BioTek's Liquid Handling Control™ (LHC™) Software is on-board for complete programming capability and full-color instructional videos provide clear direction on instrument setup and basic use. The context-sensitive Help system provides recommendations, links, diagrams and images and is available at the touch of a finger. LHC Software is also available in a 21 CFR Part 11 compliant version for regulated labs or those simply looking for extra security.

Legacy Features

The 405 Touch incorporates many of the features of the industry-leading ELx405 washers, including the Dual-Action™ manifold for independent control of tube position during filling and evacuation, overflow washing and overflow protection, and the patent-pending Ultrasonic Advantage™ for complete ultrasonic cleaning of salt or protein deposits in the tubes. The 405 Touch brings new features like tool-free quick-change manifolds and optional integrated buffer switching to allow automatic selection of up to four fluids without an external valve module. Several 405 Touch models are available for many applications, including optimized cell washing with gentle, low-flow rates ideal for loosely adherent cell monolayers, vacuum filtration and biomagnetic separation bead-based assays. The 405 Touch can be coupled with BioTek's BioStack™ Microplate Stacker and other robotic systems for unattended batch processing.

For more information on the 405 Touch, visit www.405touch.com



PURELAB flex- innovating water purity

ELGA's new innovative Type I ultrapure water purification system ensures accurate consistent results. The PURELAB flex 3 & 4 are the latest additions to the award winning PURELAB flex range of systems. Both systems deliver up to 10 liters of ultrapure water per day and up to 2 liters per minute. The PURELAB flex 3 delivers ultrapure water direct from potable tap water and PURELAB flex 4 requires a pre purified feed.

The PURELAB flex offers many advantages for analytical and lifescience applications. It allows users to focus on routine test work, without having to worry about the water quality affecting any test results. The PURELAB flex 3 and 4 are flexible water purification systems which can be adapted to respond to a laboratory's changing water purity needs today and tomorrow.

ELGA

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The water quality conforms to international water standards e.g. CLSI, CLRW, ISO 3696: Grade 1,2,3, ASTM D1193-06, Pharmacopeia USP, EP and JP. The PURELAB flex can be used for analytical and lifescience applications in all pharmaceutical, university, hospital, food and beverage laboratories.

The PURELAB flex is easily adaptable to facilitate changes to laboratory design layouts and applications.

Handset designed for today's laboratory

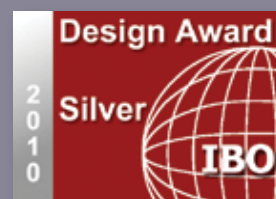
- Intuitive to use
- Ergonomic handset design
- Clear water purity for absolute confidence as you dispense
- Handset displays prioritized information shown at all times (system status, TOC, alarm)
- POU filters for multiple applications to remove endotoxins, DNase, RNase and bacteria
- Flexible dispensing in four different ways
 - o Variable flow — drop by drop or up to 2 liters per minute
 - o Autovolume dispense from 50ml to 60ml and repeat dispensing
 - o Hands free with optional foot pedal
 - o Locked dispense for glassware filling

Water Purification made easy

- Fast and simple sanitization to minimize microbial growth
- Data capture via USB port for system validation
- User settings can be customized via the web and uploaded using the USB port in seconds
- Multiple dispense positioning
 - o Wall, bench, height adjustable arm, hand-held dispensing



▲ The PURELAB flex delivers 18.2 MΩ-cm water quality.



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New Brunswick Scientific's world renowned laboratory shakers are known for dependable operation and innovative design. New Brunswick offers the widest selection of biological shakers in the industry, with more than 30 models available to suit your exact needs. Our top-of-the-line Innova Lab Shakers feature the New Brunswick triple-eccentric drive for uniform motion and superb reliability under the most adverse conditions. Many of these shakers now provide the added convenience of a programmable controller for automating multiple changes to temperature, speed and running time. Several stackable shakers are also offered, including the Innova 42 & refrigerated Innova 42R - with new lower profile enabling them to also fit on or under your lab bench.

Innova Shakers are versatile, dependable and easy-to-use with wide speed range, options for incubation, refrigeration, photosynthetic lighting, UV germicidal lighting and in- flask gassing, enabling the growth of virtually any cell type. Exceptionally accurate microprocessor-controlled temperature and speed ensure consistent results with specifications of $\pm 0.1^{\circ}\text{C}$ at 37°C with a nominal uniformity of 0.25°C in incubated/refrigerated models and ± 1 rpm, all models. With unmatched convenience and reproducibility the programmable controller automates changes to setpoints, ramps temperature and speed up/down, and turns optional photosynthetic and UV germicidal lights on/off. Additional advantages include: run timed studies with automated agitation shut-off, 0.1 - 99.9 hour timer, in 0.1 hr increments and end-of-study alarm and status light. Virtually all models allow communications with standard laboratory software such as New Brunswick's optional BioCommand SFI or HyperTerminal to allow downloading of your data to a PC. Known to be the quietest shakers in the industry, the Innova Shakers provide a more favorable work environment. Benefits of ownership include a low maintenance, long-life cool-running brushless motors which never requires lubrication. High-quality components provide years of long life. Supporting our products is a comprehensive warranty of three years for parts and two years on labor which covers the entire machine, not just the drive.

What makes Innova Shakers so reliable? -- Heavy-duty construction allows us to guarantee that our shakers will perform to our specifications, even when fully loaded and operating at top speed: Dependable operation is due in large part to New Brunswick's often imitated, but never duplicated, Triple-Eccentric Counterbalanced Drive. Our components are fabricated to exacting specifications. Drive shafts, for example, are machined to tolerances of 0.0005 cm (0.0002 in), ensuring stable, vibration-free operation, even when operated at speeds up to 500 rpm. With the highest-quality materials, superior design and precision fabrication, we guarantee our shakers will provide worry-free operation for many years to come. Other manufacturers may offer triple-eccentric drives; only New Brunswick shakers use a broad-based cast-iron support mechanism — the most stable in the industry — properly sized to each shaker, and specifically designed to support high- speed applications and heavy workloads.



▲ New Brunswick, often-imitated, but never duplicated heavy-duty, counterbalanced Triple-Eccentric Drive ensures uniform motion is imparted to every flask, regardless of position on the platform. Heavy-duty construction allows us to guarantee that our shakers will perform to our specifications, even when fully loaded and operating at top speed.

Captair® Flex™— Ductless Mobile Fume Hoods with Modular Filtration Column

From the people who brought you the energy saving GreenFumeHood®, ERLAB, the one and only inventor of the ductless filtering fume hood and worldwide leader since 1968 innovates once again with the low cost Captair® Flex™ Technology, an all in one filtration fume hood design configurable at will for use in chemistry, biochemistry, pharmacology, forensics, histology/pathology and more. New modular filtration column can handle liquids and powders individually or at the same time. Innovative liquid seal technology insures filtration integrity for both molecular and HEPA filters. Unique design allows for single or double back-up safety filtration to comply with the AFNOR NFX 15-211 Class I and II safety standard.



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Fume Hood Safety & Flexibility – Like never before

Captair solutions are designed with safety in mind. The Captair Flex filtration technology is based on the proven principal of molecular adsorption; the toxins emitted in the workstation are adsorbed by the activated carbon within the filtration column and captured – keeping the user and the environment safe.

The Flex also has a unique modular filtration design which allows the hood to handle liquids and powders individually or at the same time. This interchangeability of the filters allows the filtration column to be configured specifically for the applications carried out within the enclosure.

The containment and filtration effectiveness of the Captair Flex, make this shared protective equipment a reliable, economical, flexible and environmentally-friendly solution.

The Captair Flex can:

1) Save on energy costs in your lab

The air balance necessary to run ducted systems results in high energy consumption. A Captair solution eliminates the energy costs related to systems for extracting and supplying conditioned air. It is able to keep operating costs low, even when the cost related to filter replacement is taken into account.

2) Eliminate installation costs associated with fume hoods

Implementing a Captair Flex is simple and quick. It does not involve the installation of a

ventilation system for air supply and extraction as required by ducted systems. A single electrical outlet is all you need to run the Captair® Flex® fume hood. It can be installed at any time, without complex planning.

3) Easily transport and instantly use your fume hood

Captair solutions may be moved from one location to another within the same laboratory according to protection needs. They can be easily relocated without affecting the air balance of the equipment

4) Protect the environment

Free of any ducted airflow system, Captair solutions eliminate the direct emission of pollutants into the atmosphere and help to protect the environment. They also avoid the pollution generated as a result of the energy needed to run the airflow systems of traditional ducted fume hoods.



▲ Captair Flex, designed to protect the user, the environment and your budget.

Gilson®

Designed to meet the growing need for personalized solutions, Gilson's PLC 2020 Personal Purification System is a fully-functioning purification system in a compact footprint intended to support an individual researcher or a small group of chemists. The PLC 2020 is designed for all levels of purification, and offers the flexibility to perform FLASH, normal-phase and reverse-phase purification. This completely integrated purification system is compact enough to fit into most fume hoods and takes up minimal bench space compared to other purification systems. In response to the growing need for easy-to-use, self-contained systems, Gilson developed the PLC 2020 Personal Purification System to meet the demand for quick and easy purification without sacrificing accuracy.



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It's Your Chemistry... Make it Personal!

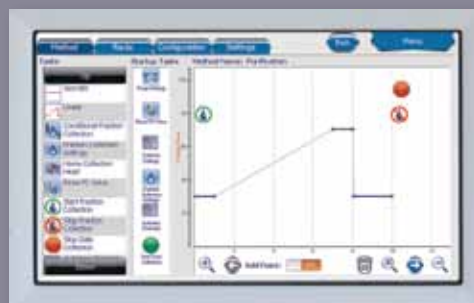
The PLC 2020 offers an intuitive, easy-to-use software interface that allows users to start purifying compounds within minutes. The graphical icons with drag-and-drop functionality give users the ability to adjust mobile phase conditions on the fly and see on the screen where each fraction and its corresponding tube are located on the bed. With this real-time graphical sample tracking software, users can easily monitor pressure, flow rate, and % B. The unique touchscreen monitor eliminates the need for a separate PC, saving valuable bench space. To further save on space, the upper tray of the PLC 2020 holds up to four 4 L solvent bottles, giving users the ability to have four solvent lines on Pump B.

Interchangeable pump heads offer the flexibility of handling flow rates from 1–100 mL/min and pressure up to 4060psi depending on the application needs. In addition, the manual sample injection process (with electronic software-controlled positions for Load and Inject with graphical indicator) provides an electronic actuation resulting in higher reproducibility than a lever-based manual injection process. Sample loops are available from 20 µL to 5 mL, with 10 mL loops available with adapter fittings. The bed can accommodate up to three racks with customizable racks available upon request.

The PLC 2020 offers manual control options for advancing fraction collection or diverting to waste without affecting the rest of the purification run. This allows users to interrupt the normal method operation and prime the system from the run screen. Likewise, users have the ability to modify conditions—including tasks and mobile phase—mid-run so that samples can be quickly collected while they are being purified.

Built with convenience in mind, Gilson's PLC 2020 has three USB ports, giving users the option to connect to a printer, keyboard, mouse, or USB drive for convenient transfer of data. The system also features automatic stopping of the mobile phase at the end of a run with a gradual ramp-down so there are no worries about the mobile phase running dry or waste overfilling. Run light indicators above the fraction tubes and racks automatically turn off, notifying the users when the system is no longer in operation. These lights will also flash when an error has occurred in the method, so users can easily see from across the room if there are any issues.

To learn more visit www.gilson.com/plc2020



i.C³™ from Helmer

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The next generation of i.Series® monitoring features the i.C³ User Interface which offers constant temperature monitoring and control on all i.Series refrigerators and Freezers.

The i.C³ is icon driven, featuring a 7" full-color touchscreen that is door mounted at eye-level on all upright models. Undercounter models feature an angled screen for easy viewing. Multiple information logs with historical data can be downloaded and saved.

Easy-to-use touch navigation guides the user through the i.C³. Audible and visual indicators and alarms alert users to out-of-range conditions so that prompt action can be taken. Settings parameters are password protected providing further security.

The interactive temperature graph provides access to temperature data over the previous 42 days and can be viewed in daily or weekly increments. Alarm conditions, alarm tests, and defrost events are all recorded on the graph. Temperature data, including alarms and tests, can be downloaded and saved.

i.Act™ on-screen event acknowledgement allows users to immediately record corrective action at the time of the event. Information is date stamped to validate each entry and can not be changed providing a secure record of every corrective action. Data records can also be downloaded.

Optional i.D™ Integrated Electronic Access Control offers secure access to the unit via on-screen PIN entry. It provides data capture of who accessed the unit and documents how and when this occurred. The Access Control display can be used as an alternative Home screen allowing users to customize each unit.

In addition to the i.C³, i.Series models will now feature more capacity, energy saving LED spot lighting, rechargeable battery backup, and optional leveling feet.

Contact Helmer at www.helmerinc.com or sales@helmerinc.com for more information on i.Series products.



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The Next Generation of Vacuum Pump Systems; Clean, Quiet and Energy Efficient

by Roland Anderson, Laboratory Products Manager,
KNF Neuberger, Inc.



2 Black Forest Road
Trenton NJ 08691-1810 USA
Tel: 609-890-8600
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www.knflab.com

Vacuum pumps systems no longer have to be loud, noisy, filled with oil that leaks and smokes, or complicated to use. Today's researchers are looking for vacuum systems characterized by reliable, deep vacuum performance, for use in a wide variety of applications, high flow capacities, shorter process times, precise pressure control, accurate, repeatable results, and clean, quiet, and efficient operation. Also important are environmentally friendly products without sacrificing performance. All of these requirements are now met by new products using a sophisticated, patented pump diaphragm and valve technology.

KNF Lab again extends their wide range of oil-free vacuum pumps and systems with the introduction of the SC950 vacuum pump system with wireless remote control. This innovative vacuum system features a high 50 LPM pumping capacity and a deep 1.5 Torr end vacuum to enable shorter processing time with a wide range of solvents.

This new system combines KNF's latest diaphragm pump technology with a smart electronic control and efficient motor, saving labs time, energy, money, while protecting the environment.

The heart of the system is a newly developed, four-stage diaphragm pump. Patented diaphragm technology ensures high pneumatic pumping capacity in a small package with minimal operating noise level. All components of the vacuum pump system that come into contact with media are made of chemically-resistant materials for a long trouble-free life. In addition to being extremely quiet, the pump's performance is precisely controlled by advanced internal electronics.

The system electronics provides four operating modes to ensure the maximum flexibility in a range of laboratory applications; vessel evacuation, constant pressure control, automatic vapor pressure determination and individual pressure function (operates according to a user-defined pressure curve) are all chosen from the handheld remote or via a USB PC control interface.

The pump is driven by an efficient, speed-controlled DC motor utilizing low energy consumption. The motor is capable of starting against vacuum. Powered from 100V to 240V at 50Hz to 60Hz. This makes the system more tolerant of power fluctuations. The unit converts incoming voltages into the DC voltage for the drive motor, while motor speed is constantly adjusted by internal control electronics.

The space-saving design conserves valuable laboratory space by positioning the system in remote locations such as within a cabinet or on a shelf. When located inside a fume hood, the wireless remote allows the operator complete control, even with the sash closed for added safety and HVAC energy savings. Researcher safety is improved by a closed glass shield between them and their reaction. Featuring both an inlet separator and liquid-cooled outlet trap, the SC950 provides excellent solvent recovery yields and keeps the atmosphere clean by eliminating virtually all vapors in the exhaust.

This new vacuum pump system sets new standards in laboratory vacuum systems with respect to shorter process times, precise vacuum control, energy efficiency and solvent recovery.

To learn more about the SC950 system, and our other products, visit KNF at Booth #2080 during Pittcon 2012 in Orlando, FL from March 11th through the 15th or visit us online at www.knflab.com



Labconco's NEW RapidVap® Vertex Dry Evaporator uses a dry heat block to quickly evaporate samples under nitrogen stream.

by Jenny Sprung, Product Manager, Labconco Corporation



Protecting your
laboratory environment

LABCONCO®

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Combinatorial chemistry can be traced back to the 1960's, but didn't gain popularity until 1990 when pharmaceutical companies started compounding large amounts of potential new drugs into libraries. Now, combinatorial chemistry has moved into other disciplines such as materials science, biotechnology and even semiconductors.

Because combinatorial chemistry requires multiple samples to be run in parallel, the RapidVap Vertex Evaporator, accommodating up to 50 samples, is the perfect choice for this type of research and development. During operation, each product is synthesized in separate reaction vessels. The advantage of parallel synthesis is that the composition of each compound is known, but generally, the split and mix procedure can generate many more compounds in the same amount of time. The samples are evaporated in the Vertex simultaneously which speeds throughput and keeps all samples under the same conditions. The nitrogen supply is controlled in rows of 10 so nitrogen can be conserved in smaller sample runs.

The RapidVap Vertex Evaporator uses a dry heat block to quickly evaporate samples under a gentle stream of nitrogen. Unlike water baths, a dry block does not evaporate during the run which can result in condensation from the bath — condensation which could drip into the samples causing contamination. A dry block requires less maintenance and requires no distilled water or additives.

The RapidVap Vertex accommodates tube sizes ranging from microcentrifuges up to 28mm in diameter. A convenient LCD touch screen allows easy programming of time and temperature and up to ten different programs may be stored in its microprocessor for protocol consistency. A microprocessor-controlled heater supplies heat to the block and is programmable from 30° C to 100° C in 1 degree increments.

Nitrogen blow down reduces the partial pressure directly over the liquid to speed evaporation and help remove the solvent as it evaporates. Heat helps speed the process. The samples are angled thus increasing the surface area for faster evaporation and optimized recovery. The temperature sensor probe may be positioned on the block or in a sample to monitor temperature.

There are seven interchangeable aluminum blocks to choose from and are sold separately — five hold samples as small as two milliliters; two additional blocks hold 28 mm tubes with samples sizes of 40 and 60 milliliters.



XPert® Nano™ Enclosures protect users during nanoparticle manipulation and dry powder chemical handling.

XPert Nano Enclosures provide user protection by keeping hazardous powders and particulates contained during procedures such as nanoparticle manipulation and dry powder chemical handling. The patented containment design filters the air through a 99.999% bag-in/bag-out ULPA filter before returning the clean air to the laboratory. The all stainless steel interior (sides, work surface, removable baffle and removable airfoil) is designed for easy wipe down and cleaning procedures. An optional built-in ionizer neutralizes static charge on interior surfaces by emitting ions into the airstream, which helps reduce weighing errors and attraction of particles to the enclosure surfaces. The XPert Nano is the first and only enclosure validated for nanomaterial containment. Learn more at www.labconco.com.



Protecting your laboratory environment

LABCONCO®

Brian Garrett, LEED Green Associate, Product Specialist

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Purifier® Cell Logic® Biosafety Cabinets safely accommodate a microscope and keep samples at optimum temperature.

Labconco's Purifier Cell Logic was designed specifically for cell culture and cell research applications. The Purifier Cell Logic incorporates several unique features into the biosafety cabinet to facilitate cell culture procedures. With the Cell Logic, scientists can clearly and safely use their microscope inside a biosafety cabinet without vibration issues while accurately maintaining sample temperature.

The Scope-Ready™ package incorporates the Pure-Vu™ eyepiece seal into the biosafety cabinet's glass sash and is designed to accommodate a wide range of microscope sizes and configurations, including inverted and stereo scopes. The Pure-Vu seal ensures user safety and provides protection against contamination of the sample. The Pure-Vu seal has passed ASHRAE testing and meets the requirements for NSF 49 compliance. Other manufacturers have designed microscope seals that are opaque, limiting the user's vision of the sample at all times inside the biosafety cabinet. Labconco solved this problem using an exclusive material that is both chemically resistant and flexible, while also being completely transparent.

The Scope-Ready package also includes a vibration isolating microscope base plate. The Stand-Still™ isolation platform isolates cabinet vibration from the microscope, providing a 300% improvement in microscope stability. In addition, the Stand-Still isolation platform helps maintain airflow across the work surface to prevent areas of static airflow under the microscope.

Another package available on the Cell Logic is the

Temp-Zone™ work surface. During cell culturing and research procedures samples are often incubated for growth or chilled for preservation. These samples are susceptible when removed from the heated or chilled environment. Labconco designed the Temp-Zone work surface to maintain the sample media temperature. The Temp-Zone work surface can be chilled to 2° Celsius or heated to temperatures exceeding those needed for cell culturing procedures. Distinctive laser micro-etching outlines the Temp-Zone area for the user without sacrificing cleanliness of the work surface.

The Cell Logic also includes the unique and patented features of the Purifier Logic Biosafety Cabinet. The electronically commutated motor (ECM) is the most energy efficient motor technology in the industry. Labconco's patented airflow monitoring technology utilizes the ECM to precisely maintain the proper airflow through the biosafety cabinet. In addition, the LCD display is conveniently located and displays valuable information to the user. An industry first, the Filter Life Remaining bar graph takes the guesswork out of when to replace the biosafety cabinet's HEPA filters. The LCD display also provides visual indication of alarm conditions and incorporates interval and countdown timers.

The Cell Logic can be configured in three ways — Scope-Ready, Temp-Zone, or Scope-Ready plus Temp-Zone. Please contact Labconco for help determining which configuration is most appropriate for your customer.



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Metrohm has long been pioneers in ion analysis; in fact, our piston burette of 1956 laid the foundation for automatic titration (a design that's still in use today), and we've been innovators and groundbreakers in the field ever since.

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Laboratory Refrigerators and Freezers.

Nor-Lake® Scientific Select™ Laboratory Refrigerators and Freezers are designed for heavy-duty long term cold storage for a wide range of demanding laboratory, scientific, pharmacy and life science applications. Product selection includes full-size reach-in +4C Solid and Glass Door Refrigerators, Sliding Glass Door Refrigerators, Pass-thru Refrigerators and -25C Freezers. Select™ Refrigerator and Freezer models are available with one, two or three doors. Pass-thru models are available in two, four and six door configurations with solid or glass door combinations. Chamber capacities include internal volumes of 24ft³, 33ft³, 53ft² and 80ft³.

Select™ models feature advanced digital LCD 4x20 character display, microprocessor control system with key pad. Includes audible and visual high/low alarms, 2 product sensors with glycerin bottles, 2 to 10 volt DC output, remote alarm contacts, door ajar alarm, password protection of set points and factory settings, real time clock, operation diagnostic monitoring of defrost, compressor and fan, low and high alarm test, event logging and sensor failure alarm.

Cabinet construction features include white painted exterior front, sides and back, with galvanized steel on the top and bottom. The interior is white and there are three epoxy-coated shelves per door, which can be adjusted in 1" increments. Standard features include interior lights (switch activated), easy roll low profile casters, magnetic door gaskets, key door locks, and 1" diameter lead sensor port.

Cabinets are formed-in-place with high-density CFC-free polyurethane foam insulation. Doors have heavy-duty pivot hinges and pull handles. Select™ Refrigerators and Freezers feature top-mounted refrigeration, air-cooled condensing unit and automatic condensate evaporation. The combined features of the Select™ control refrigeration system and cabinet construction produce a precise, uniform controlled temperature environment and energy efficient operation for long lasting reliable and durable performance.

Available options (depending on model) include: extra shelves, stainless steel drawers, sliding basket drawers, temperature chart recorder and chart paper, stainless steel interior and/or exterior, reverse hinge doors, 4-20ma output, RS485, seismic mounting, Secure Guard lock system, internal electrical outlet, access port 2" sleeve with cover and export crating.

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▲ Nor-Lake® Scientific pass-thru refrigerators have a front door and a rear door, so they can be accessed from two sides. They are available with one pair, two pairs or three pairs of doors in a variety of materials: with glass front door and solid back door, with all glass doors or with all solid doors. Available with sliding baskets as shown.

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NuAire's Polypropylene NU-162 and NU-164 By-Pass Fume Hoods are manufactured using ½ inch stress-relieved, fully seam-welded, white 100% Polypropylene. A Combination Vertical / Horizontal Sash offer the user an option of opening the sash by sliding the window up and down or if preferred, slide the window from side to side. The NU-164 provides quality personnel protection and is an excellent choice for long lasting, highly corrosive resistant, metal free applications. NuAire fume hoods are the ideal solution for professionals in chemical and electrical engineering, environmental toxic analysis, toxicology, analytical chemistry, and trace metal analysis fields. Each cabinet is inspected and certified to SEFA 1-1992 performance and are independently tested to meet the requirements of ASHRAE Standard 110-1995.

Cabinets and Casework are also manufactured using stress-relieved, fully seam-welded, white corrosive-resistant polypropylene. Walls and floors are reinforced to maintain structural integrity. Outer cabinet shell, kick plate and shelves are constructed from ½ inch polypropylene. Each cabinet incorporates easy-to-clean shelves, handles, hinges and screws also made of 100% polypropylene. Doors are secured with Teflon® coated magnetic catches.

NuAire's "Metal Free" Clean Room Pass Thru is constructed entirely from ½" thick stress relieved seam-welded white Polypropylene, including the handles, latches, and screws. Designed with a 24" x 24" ½" pass thru open area with clear Polycarbonate viewing window on both sides of the pass thru. This Clean Room Pass Thru can be custom ordered with or without an interlock allowing only one door to open at a time.

Laboratory Supply Cart allows for rapid access to supplies needed during sensitive research protocols. This polypropylene cart allows for users to move materials between labs in one mobile solution. With 3 side-wall bins for pipettes, compartment for gloves, a drawer to carry lint-free wipe, and a large storage compartment to carry all your laboratory supplies. NuAire's Supply Cart utilizes a spill-proof lip to keep sensitive or hazardous substances contained. The heavy duty castors / brakes make moving the cart easy and secure the cart from rolling away.

In an effort to help keep your Laboratory looking crisp and clean, NuAire has designed a Plumbing / Utility Chase to cover plumbing pipes that may be exposed in your laboratory. This Chase is made from ½" white or black polypropylene, 24 inches wide by 6 inches deep, the height is built according to customer specifications, also included are two (2) 24 inch x 20 inch removable access panels. Flanges can be added for wall mounting.

Peg Boards made of all virgin polypropylene with a 1" back board and ¼" drip trough. The boards are available in high gloss white or black and weigh a third of common epoxy resin peg board making it easier to work with. The drip trough comes standard with ½" FPT coupling; a drainage tube can be installed for directing liquids into a sink basin. The Pegs are molded from chemical resistant polypropylene 6" long, with a 30° angle, and are removable for cleaning or for accommodating larger glassware items. A 30" x 30" Board contains 46 pegs; a 30" x 36" Board contains 52 pegs.

NuAire supplies laboratory professionals with quality Polypropylene products that are designed to conform to the specific needs of your laboratory applications and requirements.



Miniature Spectrometers and Accessories from Ocean Optics



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www.oceanoptics.com

Ocean Optics, inventors of the world's first miniature spectrometer, introduces the latest additions to its portfolio of miniature photonics products. Our small-footprint UV to NIR spectrometers are easily customized for thousands of absorbance, reflectance and emission applications. In addition, we offer fiber optic chemical sensors for pH and oxygen measurement and OEM spectrometers, sub-assemblies and components.

Spectrometers

We've boosted our line of high-sensitivity spectrometers with the additions of the Maya2000 Pro-VIS-NIR and the QE65 Pro. The Maya2000 Pro-VIS-NIR is a back-thinned 2D FFT-CCD spectrometer with high sensitivity, 80% peak quantum efficiency and excellent response from ~400-1100 nm. It's ideal for Raman applications, analysis of gases used in semiconductor processing and measurement of biological samples in the life sciences.

The QE65 Pro is scientific-grade, thermoelectrically cooled spectrometer with high sensitivity and low stray light performance. In addition, the QE65 Pro has excellent spectrometer thermal wavelength stability, triggering functions and a replaceable slit for added convenience. An extensive range of gratings offers flexibility in optimizing applications such as modular Raman analysis, fluorescence and low light level measurements.

There's more. Our line of NIRQuest NIR spectrometers has been expanded with the addition of models covering various ranges from ~800-2500 nm, with applications ranging from determination of moisture content and chemical composition to characterization of high-resolution lasers. Our Torus spectrometer is the only concave grating spectrometer available with a Toroidal grating design, which results in remarkable stray light performance and excellent thermal wavelength stability for a spectrometer of its size and price. Torus is especially handy for color measurement of LEDs and absorbance measurements up to 3.0 OD. And we've added UV response and improved sensitivity for the STS,

a micro-spectrometer that packs great performance into a tiny footprint — it's not much bigger than a matchbox — and is ideal for high-volume OEM applications.

Fiber Optic Chemical Sensors

Our line of optical oxygen and pH sensors are designed for accurate, real-time, in situ measurements in various media. The proprietary sensor coating materials do not consume the sample and can be applied to substrates such as probes, self-adhesive acrylic patches and microtiter wells. Coating options are available for general lab use, food processing lines and hydrocarbon-rich environments. Depending on the application, oxygen presence or pH can be determined by a fluorometer (oxygen or pH) or a spectrometer (pH).

Fiber Optic Accessories

Ocean Optics offers hundreds of optical fibers, light sources and sampling accessories to complement its line of miniature spectrometers. All accessories have SMA 905 terminations and easily couple to spectrometers and other accessories to meet most any application challenge.

Among are newest accessories are two light sources. BluLoop is a compact, LED-based source with balanced spectral output across the Visible (400-700 nm) range. When coupled to a miniature spectrometer, optical fibers and sampling accessories, BluLoop is ideal for color and reflectance measurements and general-purpose VIS-NIR spectroscopy. For applications requiring high-power NIR illumination, the Vivo Light Source comprises four tungsten halogen sources arranged for reflection measurements with a built-in fan to keep the unit operating optimally. Vivo is a good choice for analyzing samples with NIR response, such as pharmaceuticals and foods.



Parker Balston

Parker Balston Gas Generators eliminate the need for expensive, dangerous, high pressure cylinders of hydrogen, helium, and nitrogen in the laboratory. It is no longer necessary to interrupt important analyses to change cylinders. Whether it's directly on the laboratory bench or in a process monitoring application, Parker Balston Gas Generators are the dependable standard to deliver safe, high purity gases.

Parker's leading global presence and portfolio of product technologies is unrivaled within the industry. At Parker, our mission is to provide our customers with premier service and high quality product solutions that ensure the quality of your products and operations and save you downtime.



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Parker Balston Hydrogen Generators

When selecting the proper carrier gas for gas chromatography (GC), a laboratory manager traditionally has three choices; nitrogen, helium or hydrogen. Recent global supply issues related to helium have led to shortages and significant price increases in both gas costs and cylinder rental fees. As a result, many laboratories are re-evaluating the best carrier gas to provide maximum analysis time while offering

safety and cost effectiveness. The use of hydrogen as a carrier gas offers a reliable, safe and cost effective alternative to nitrogen and helium.

Parker Balston Hydrogen Generators produce 99.99999% hydrogen which exceeds carrier gas purity requirements. The generators offer a safe source of hydrogen, producing only the required amount of gas and eliminates the need for high volume, high pressure cylinders. Hydrogen Generators eliminate the need for expensive, dangerous, high pressure cylinders of hydrogen in the laboratory. It is no longer necessary to interrupt important analyses to change cylinders. Generator flow capacities of up to 1200 cc/min. of ultra-high purity hydrogen are available.

Parker Balston Hydrogen Generators are compact benchtop instruments designed for use in the laboratory or in the field. Hydrogen gas is produced by electrolytic dissociation of water. The resultant hydrogen stream then passes through a palladium membrane. Only hydrogen and its isotopes can penetrate the palladium membrane; therefore, the purity of the output gas is guaranteed to be

99.99999+% consistently. This technology produces hydrogen at a purity two orders of magnitude greater than competitive technologies using silica gel, desiccants, and drying tubes.

Parker Balston Hydrogen Generators offer many special features to ensure safe and convenient operation. These features include low-water audible alarms to indicate when the water reservoir needs filling and automatic shutdown to protect expensive laboratory equipment.

Benefits of Parker Balston Hydrogen Generators:

- Eliminates dangerous and expensive hydrogen gas cylinders
- from the laboratory
- Exceeds OSHA 1910.103 and NFPA 50A safety requirements
- Safe - produces only as much gas as you need
- Unique electron beam palladium cell technology
- Produces a continuous supply of 99.99999+% pure hydrogen gas, ideal for carrier and fuel gas applications
- Compact and reliable — only one square foot of bench space required and designed to run
- continuously 24 hours/day -includes automatic water fill
- Simple annual maintenance, no desiccant cartridges
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Proton OnSite Nitrogen generation systems

On-site gas generation specialist, Proton OnSite, now offers a full laboratory line of hydrogen, nitrogen and zero air generators. Its line of nitrogen generators from the NiGen™ Micro with an output capacity of 500cc/minute to the NiGen LCMS 100 that can produce as much as 100L/minute offers carrier gas solutions for laboratories of any size.

Proton OnSite's fully stackable nitrogen laboratory units offer ultra high purity, while using very little lab space. Also, each of the nitrogen products in the line install easily, require little clearance and are low maintenance the Proton OnSite laboratory line of nitrogen generators offers laboratories a safer, inexpensive and more reliable source of inert gas.



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Nitrogen, whenever it's needed

It might be an inert, uninteresting gas, but the applications for a constant, reliable supply of high purity nitrogen gas are certainly more interesting and can even be the difference between life and death in some laboratories.

For the application of Liquid Chromatography/Mass Spectroscopy (LC/MS), nitrogen is most commonly used as the nebulizer gas to carry an ionized analyte through a mass spectrometer. This means, for a successful detection of a particular compound, the carrier gas supply must be constant and it must be available at all times. The only solution to ensure such a constant gas supply is from a source of nitrogen generated on-site.

The typical mass spectrometer demands between 1.5L and 2.5L per minute of nebulizer gas, which adds up, especially if a laboratory is running a test for eight or even 24 hours. Also, if the experiment demands a drying gas, that can raise the nitrogen demand during operation to as much as 32L per minute for certain periods of the process. In those situations, for practical, financial and safety reasons, on-site gas generation is a must.

As well as a stable supply, MS demands a stable flow. A mass spectrometer may demand as much as 100 PSIG of feed pressure to ensure flow controllers through the system work properly without that constant pressure, it can take a lot longer to get a stable gas flow. Using cylinders that have to be regularly replaced means a flow may not be maintained and the spectrometer's detector may not pick up ions being passed through the system - that's why a gas generator with an internal compressor means a better, more reliable experiment.

The financial cost of any process is always an issue for labs, so the ability to rely on a gas generator rather than constantly monitoring and replacing cylinders of nitrogen is much more cost-effective. In addition, the ability to ensure that a prepared operation will continue with a constant nebulizing gas supply is also cost-effective if a gas supply is lost, the process must be repeated, resulting in wasted time and money.

Because so many diverse and vital laboratories need to rely on LC/MS instrumentation, the ability to offer a cost-effective, constant and reliable flow of nitrogen is a must. From a university needing a source of nebulizing gas to ensure experimental parity, to a neo-natal lab that needs a mass spectrometer to assess a sample of a sick infant's blood in an instant, the benefits of an on-site source of nitrogen are numerous, but the greatest benefit is control.

Control is what any LC/MS user demands - whether it's to create life-saving drugs or to test contaminated water, the user needs to be sure the process will work the risk of ceding control by relying on a source of nitrogen gas that is not being generated on-site is one variable that can be avoided with on-site nitrogen generation. For nitrogen gas when it's needed, choose a nitrogen gas generator.

Proton OnSite's range of nitrogen generators is a market leader in terms of reliability and performance. Not only can Proton OnSite guarantee 14,000 hours of maintenance-free compressor service, but using Pressure Swing Absorption technology and high efficiency hydrocarbon removal columns, Proton OnSite's Carbon Molecular Sieves ensures high-pressure nitrogen gas with purity of up to 99.9%.



Today's researchers demand precision and efficiency in their laboratories. Accounting for hundreds, thousands and even millions of samples is a task that requires a software system that will manage the volume while handling the complexities of your inventory intuitively.

FreezerPro by RURO, Inc. is one of the most comprehensive systems on the market that manages all of your freezer inventory so you can locate it fast, manage it virtually and handle inventory procedures with the click of a button.

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- FreezerPro Enterprise 2012 is the only freezer inventory management system that comes standard with RFID compatibility.
- FreezerPro works seamlessly with LIMS or HIS systems in the marketplace to deliver the most information with the least amount of effort.
- FreezerPro LIMS Elite 2012 is the only virtual frozen sample manager that is customizable with it's own custom LIMS application. FP LIMS Elite is tailor made to suit your laboratory. It manages your workflows and your inventory using one simple platform that combines RURO's LIMS system and FreezerPro 2012.
- Custom solutions are typically expensive solutions. FP LIMS Elite makes custom solutions affordable for any lab and just like FP Enterprise, FP LIMS Elite is RFID ready now!! Ask your RURO representative for more details surrounding Freezer Pro LIMS Elite 2012.

The Freezer Pro 2012 family is the inventory management solution affordable enough for small labs and academia while delivering features large enough to handle the inventory of a multibillion-dollar corporation. Give them a call and find out which FreezerPro solution works best for you.

**The FreezerPro 2012 family from RURO, Inc. includes FreezerPro Standard, FreezerPro Enterprise and the FreezerPro LIMS Elite edition.*



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Consumer Safety Compliance Standards

SPEX CertiPrep offers a line of Consumer Safety Compliance Standards designed for the testing of consumer goods. Recent RoHS/WEEE regulations have restricted levels of heavy metals in consumer products and waste electronics. USP 232 has been enacted to control the levels of elemental impurities in pharmaceuticals. Additional regulations have also been enacted to control a variety of metals and phthalates in plastics and children's products.

SPEX CertiPrep actively conducts research on many interesting topics. Our most recent, "Preparation and Examination of Imported Children's Toys for Phthalates and Bisphenol A Using Novel Cryogenic Grinding Methods, Certified Reference Materials and GC-MS Analysis," is being presented at Pittcon on Thursday 3/15, 9:35AM, Room 307D. Visit our YouTube channel and website for more information and to view previous presentations.

Wine Standards

Wine is a complex combination of water, alcohol, acids, pectins, polyphenols, sugars, tannins and other flavonoid compounds. SPEX CertiPrep is introducing Certified Reference Materials for trace metals analysis in a natural wine matrix. Visit SPEX CertiPrep at booths #2330 & 2333 for more information about our new wine standard.

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Do you need a standard to comply with a specific regulation or method? Can't find the standard you're looking for? SPEX CertiPrep can create custom standards to meet your specific laboratory requirements. Our specialists will be happy to discuss your requirements, combination of elements and concentrations, and preferred matrix. Our chemists will then work with you and to design the most compatible, stable mixture using our comprehensive supply of starting materials and certified solutions.

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Introducing the new Thermo Scientific NanoDrop Lite Spectrophotometer



A compact, personal UV-Vis microvolume spectrophotometer, the new NanoDrop™ Lite delivers where it counts: rapid, accurate and reproducible microvolume measurements without the need for dilutions.

It uses the same sample retention technology that has become a hallmark of NanoDrop instruments. NanoDrop Lite is a local control instrument and has an optional docking printer (sold separately) that prints freezer compatible, adhesive labels. The NanoDrop Lite measures nucleic acid and protein concentration in sample sizes between 1 – 2 μ L and measures 260/280 ratios for nucleic acids.

NanoDrop instruments were the first microvolume UV-Vis spectrophotometers and fluorospectrometers designed specifically for the life science market. The patented sample-retention system* enables direct measurement of 0.5 – 2 μ L samples without wasteful dilutions and expensive consumables. The innovative pedestal design and pre-programmed methods make the process as simple as pipette, measure, and wipe clean. Highly polished stainless steel pedestals ensure no sample carryover. By reducing sample waste and providing accurate results in seconds, NanoDrop instruments have fundamentally changed the way scientists analyze DNA, RNA and proteins.

With over 30,000 instruments in labs worldwide, NanoDrop instruments have become the recognized standard for microvolume instrumentation. Today, thousands of scientists rely on NanoDrop instruments to deliver accurate sample concentration and purity assessment for everything —

from routine quality checks to evaluation of precious samples for demanding, downstream applications. NanoDrop instruments are utilized in academic, research, commercial, manufacturing and QC labs focused on such diverse fields such as genomics, proteomics, drug discovery, molecular diagnostics and bio-processing.

Our patented sample-retention system remains a groundbreaking technology in microvolume measurements. Only NanoDrop instruments use surface tension to contain a 1 μ L of sample between two optical fibers. With the instrument arm open, a sample is pipetted directly onto the pedestal. When the arm is lowered a column is formed, thus eliminating the need for cuvettes or other containment devices.



*Patents US6628382 and US6809826

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NanoDrop™ 8000 Spectrophotometer

Delivers full-spectrum UV-Vis absorbance measurements for up to eight samples at one time. Use an eight-channel pipette to dispense samples from tubes or plates onto a linear array of pedestals, measure and wipe clean.

NanoDrop™ Lite Spectrophotometer

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NanoDrop™ 3300 Fluorospectrometer

Brings the sensitivity and selectivity of fluorescence spectroscopy to microvolume samples. Using our patented sample-retention technology, it performs broad-spectrum fluorescence analysis in a versatile, high-performance instrument.

Experience NanoDrop instrumentation in your lab with our **free trial program**. This program allows scientists to try any NanoDrop instrument in their lab for a one-week period — for free.

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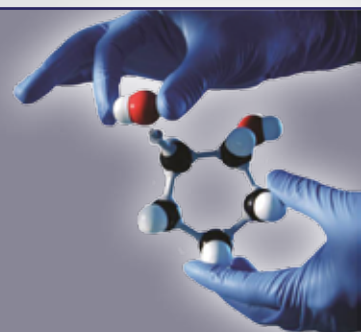
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Increase Productivity



▲ *Uncomplicated access to the highest quality instrument and laboratory services to spend more time on discovery, less on anything else.*

Consolidation and Cost Savings using new Quality Control Solutions targeted for new Integrated Instrument Systems



With the introduction of the new Thermo Scientific MAS Omni quality control products, clinical laboratories can streamline and reduce daily QC testing

requirements. The MAS Omni control offering provides consolidation of both routine and specialty testing in the areas of immunoassay, clinical chemistry and serum protein testing. Three unique MAS Omni controls are offered: MAS Omni•IMMUNE, Omni•IMMUNE PRO and Omni•CORE. These controls are targeted for use on the new generation of integrated instrument systems from Abbott Diagnostics, Beckman Coulter, Roche Diagnostics, Siemens Healthcare, Ortho Clinical Diagnostics and Tosoh Biosciences. MAS Omni controls offer a much needed consolidation of routine QC testing to align with these new instrument technologies.

Quality control testing in the clinical laboratory has been slow to adapt to the new technologies available to users. These include communication enhancements with increased reliability on the Internet and most importantly, the consolidation of multiple testing technologies into a single instrument system. Several years ago, it was considered the standard practice to utilize dedicated instruments for each technology used within the laboratory. Instrument manufacturers have driven the integration of technologies to the point where virtually all testing completed by a medium to large laboratory can now be performed on just a single instrument or multiples of the same instrument bolted together to form a singular workflow solution.

Quality control during this time has been primarily focused on creation of new products to cover the new assays being

introduced to the clinical laboratory. There had been little to no focus on consolidating individual QC products to better align with the new customer testing requirements. With the launch of Thermo Scientific MAS Omni controls, the focal point has now shifted to better align with the next generation laboratory, the newer instruments and making consolidation now a reality.

MAS Omni controls are focused towards consolidation of two key areas of testing: immunoassay and clinical chemistry. MAS Omni•IMMUNE and MAS Omni•IMMUNE PRO products combine routine immunoassay analytes, cancer markers and several specialty analytes including Vitamin D and PTH. While the MAS Omni•IMMUNE PRO provides Anti-Tg, Anti-TPO and SHBG in addition to the MAS Omni•IMMUNE control product.

MAS Omni•CORE combines the traditional "core laboratory" clinical chemistry with serum protein/immunology analytes including CRP and Rheumatoid Factor. By offering the combination of multiple control products into a few, all encompassing products the clinical laboratory is offered a solution to the day-to-day tedium related to QC testing.

Laboratories will see significant efficiency improvements across several areas of the laboratory through reduced part numbers to maintain, less space required to store QC and the freeing up of valuable rack space on instrumentation that can be better utilized with patient samples. The MAS Omni control consolidation concept is new but when considered it makes absolute sense when compared with the instrument technology now used routinely in the clinical laboratory reliability and quality.

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Beckman Coulter UniCel DxI/DxC Systems

Beckman Coulter Access/Access II

Roche Cobas 6000

Roche Modular/Elecsys Systems

OCD VITROS Immunoassay Systems

Siemens Dimension Vista

Siemens Centaur/Centaur CP

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▲ *The Thermo Scientific MAS Omni Controls consolidate workload.*

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CytoOne® plates offer consistent, crystal-clear surfaces for optimum growth and distortion-free microscopy. 6-, 12-, 24-, 48-, and 96-well plates have molded alphanumeric for well identification, frosted writing surfaces, and complete 360° Protection Perimeter™ chimney wells to minimize edge effects and prevent cross contamination. 384-well plates have molded alphanumeric and raised well rims. Ridged bases secure your grip and vented skirts allow air circulation between stacked plates.

Non-reversible lids with condensation rings minimize contamination and are vented for improved gas exchange. Unique support tabs reduce surface contact when lids are set aside or propped open.

Dishes

Large CytoOne® dishes have ergonomically placed grip tabs for a secure grasp with less strain. Small dishes have beveled outer edges to avoid accidental lid displacement. All have sturdy, flat bases that resist bowing and warping for even growth and distortion-free microscopy.

Vented lids improve gas exchange and are non-treated to minimize condensation. The stacking rings are also vented for better thermal equalization. Small sleeve quantities minimize contamination risks.

Flasks

CytoOne® flasks are supplied in easy open, resealable zip top bags that protect unused flasks. Anti-tip skirts and base bars improve

stability during handling. Flasks also feature molded volume graduations and frosted writing surfaces.

Wide, anti-drip necks provide easy access for pipets and scrapers. CytoOne® is available with filter caps or two-position plug seal caps that let you choose secure manual venting or an airtight seal. Vented stacking rims aid thermal equalization.

All flasks are 100% pressure tested for leak-free assurance. Crystal-clear consistent surfaces provide distortion-free microscopy.

Scrapers

CytoOne® scrapers and lifters have flexible silicone rubber blades for excellent contact and cell removal. They are available in three sizes for cell harvesting in a variety of dishes, flasks, or plates. Pivoting blade scrapers reach into corners and have a flexible ABS handle for better contact inside flasks. The fixed blade scraper lifts cells from 6-, 12-, or 24-well plates or dishes.

Cell Counting Chambers

Eliminate the concerns of cleaning, drying, and handling fragile glass counting slides. The CytoOne® cell counting chamber is designed for one-time use to guarantee cleanliness and save time. Counting chambers have integrated cover slips for error-free filling.



▲ Premium quality CytoOne® provides excellent results and offers many user-friendly features.



▲ Large dishes have grip tabs for secure handling and less strain on smaller hands.

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HPLC 2012



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A Crevice-Free Display and Keyboard Mounting System

Problem: As computer interfaces become more prevalent in the healthcare industry, the deficiencies of traditional office mounting products are becoming more of a concern. Typical display and keyboard mounting products have been designed for the office and home environment. While these products provide ergonomic articulation, they aren't up to the increased durability and cleanability demands of the healthcare environment. Loose cables and crevice-filled designs make these units impossible to clean, while the lightweight construction, acceptable for the office environment, doesn't stand up to the rigors of a clean room or lab environment.

Solution: A crevice-free display and keyboard mounting system that also provides an industrial-strength, ergonomic, PC-based solution in environments where cleanability is a priority can help solve these challenges. The CleanMount by Strongarm Designs is the first example of such a system.

Such a system improves cleanability in two ways. The first is the concealment of all display, keyboard, pointer, and power cables. Rather than hanging loosely off the back of the various components, the cables are all run through the main body of the mounting system. Specially designed sealed displays and keyboards are integrated into the mounting system such that their cables run directly into the system with no connections exposed. The second way cleanability is improved is through a smooth exterior surface that is free of crevices and sharp corners. The curved surfaces throughout the unit discourage the accumulation of air-borne particulates, and the entire unit can be easily wiped down.

Durability and safety is another concern addressed by mounting systems such as the CleanMount. Unlike office-grade products, which are made primarily from plastic, the CleanMount, in particular, is built from cast aluminum alloy to withstand the rigors of more demanding environments. Mounting

systems also provide a greater degree of ergonomic adjustment. For example, the CleanMount unit provides 16" of vertical counterbalanced adjustment allowing for simple one-hand positioning. The display can be tilted and also rotated 340 degrees, while the CleanMount itself features 180 degrees of swiveling articulation on the mounting end. This maneuverability allows the interface to be placed in the most comfortable position, whether the operator is standing, sitting, or moving around. The entire unit locks in place for safety, and the CleanMount specifically can be folded to a compact 7" when not in use to save space.

Mounting systems can be configured to the exact requirements of the user's application. Component selections include a wide range of displays in various sizes, with or without touch-screen technology. Keyboard selections range from sealed, mechanical switch keyboards to slide-out work surfaces. Systems like the CleanMount can be mounted on a rail system, directly to the wall, or anywhere else an interface is needed; they also offer a variety of optional extensions that allow them to be installed and made easily accessible in many environments.

For more information, please visit www.strongarm.com/News/CleanMount.htm



▲The Strongarm Designs CleanMount system.



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with Pamela Jett

EFFECTIVE COMMUNICATION IN YOUR LAB

2:00pm Monday,
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Discover startling facts about how most professionals are sabotaging their **communication success** and reap the rewards of learning remarkable communication techniques proven to **better relationships at work and at home.**

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1. Discover how easy it is to build professional relationships with one great question.
2. Uncover self-sabotage & retrain your brain to think & communicate positively.
3. Acquire remarkable words and phrases to communicate with even the most difficult people and to put an end to toxic relationships.

Pamela Jett is a communication skills expert who believes that "words matter." As a speaker, trainer, coach, and author she helps professionals communicate in positive ways that increase employee engagement, reduce conflict, and enhance teamwork. With an emphasis on the actual words to choose (not simply theory or feel good fluff), Pamela provides leaders and team members alike with language patterns and templates that make difficult conversations easier, communication tools to help everyone feel respected and appreciated, and useful knowledge on how to avoid the perils and pitfalls created by choosing the wrong words. Pamela is known for her high energy, her innovative techniques, and her unique blend of humor and practical application. Her programs will leave audiences well equipped to use remarkable communication to achieve remarkable results.

Lab Manager MAGAZINE

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A High-Capacity, Ultra-Low Temp Freezer with Robotic Handling Abilities

Problem: Accurately maintaining large inventories is a time-consuming process. It becomes even more challenging when dealing with thousands of identical-looking little vials, constantly going in and out of different freezers shared among multiple collaborators. Furthermore, regulatory compliance, security, safety and temperature requirements could make the process much more difficult and would require the full attention of one or even several scientists.

For years, researchers have wanted a high capacity freezer that would store frozen samples at -180°C without all of the handling that comes with traditional LN₂ storage.

Solution: One example of a solution to such issues is Angelantoni and RURO's SmartFreezer which utilizes an advanced robotics system coupled with a liquid nitrogen tank. This quiet system, and others like it, are designed to be used at the workbench, but can also be put in the storage room. Storing and retrieving vials is simple; the robot will pick up vials from the tray and safely put them into the LN₂ tank within the machine. The user-friendly interface on such products is also an important part of making the storage and retrieval process more intuitive. For instance, the SmartFreezer's interface, powered by RURO's FreezerPro software, allows the entire inventory to be always at a glance and also features touchscreen technology, adding to the system's ease of use.



▲The SmartFreezer by Angelantoni and RURO.

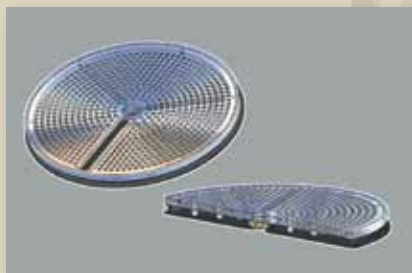
For more information, visit www.ruro.com/SmartFreezer.



▲Robot gripper holding the vial.

Compliance and user access are a premium. With the software on systems like the SmartFreezer, users are able to access only the inventory they are given access to using advanced administrative options and automated records of both storage and retrieval complete with a date and time stamp are readily accessible. These options make it easier to know where samples are and more importantly, where they have been.

Further benefits of systems like the SmartFreezer include: -180°C sample storage, a capacity of 17,000 vials, a precise robotics system that takes the human element out of the LN₂ tank, WiFi or Ethernet connectivity, RFID and 2D barcode enabled to account for samples utilizing either methods of tracking, and enterprise-ready inventory management and compliance. Such a solution also allows users to access samples from a laptop, a desktop, an iPad or a smart phone from anywhere in the world.



▲One of the internal storage disks inside the SmartFreezer's LN₂ tank.

How to Calculate the Costs and Quantify the Financial Benefits of Chemical Inventory Management



Laboratory activities are never stand-alone. How each task is performed affects all related tasks. This webinar examines the costs and financial benefits that result when lab tasks associated with chemical inventory management are optimized.

Presenting the results of an in-depth survey conducted of ChemSW's CISPro® chemical inventory system customers, the webinar will explore how technology has benefited laboratories that streamlined chemical inventory management processes.

"All the areas where workflows can be optimized and labor hours reduced with CISPro were found to benefit our customers financially," explains Darryl Braaksma, Senior Business and Financial Consultant at ChemSW. "But there's always more to the equation than just performing a specific task faster and more efficiently. For example, a comprehensive chemical inventory system like CISPro also enables associated activities such as reporting to be streamlined, making it easier to generate Tier II, Fire Code, DHS and other regulatory reports. Once the activities surrounding chemical management are optimized, all related workflows are also streamlined in a domino effect that benefits everyone in the lab."

Darryl Braaksma is a Sr. Business and Financial consultant for ChemSW. He is a graduate with post-graduate education in Pharmacology from UC Santa Barbara and earned an MBA from Saint Mary's College in Moraga. He has more than 25 years experience serving a major corporation in the research and analytical laboratories, environmental management and financial comptroller roles. Darryl has implemented and managed financial programs for global service cost distribution and recovery, served as the IT Project Manager to manage environmental liabilities and reserve forecasts for Superfund and RCRA programs, and served as a Lead Project Chemist for establishing a State Certified Testing and Analytical Laboratory for the Testing of Hazardous Waste and Waste Water in California.

Attendees will learn how to:

- Reduce lab labor hours
- Optimize lab chemical management tasks
- Calculate chemical inventory costs
- Reduce chemical management costs

TUNE INTO OUR LIVE WEBINAR to hear Darryl explain ways in which technology enables laboratories to manage chemical inventory more efficiently. He will also present a cost benefit case study that explains how laboratories can calculate their own Return on Investment (ROI).





A Rapid Test System for Food & Beverage Microbiology

Problem: The detection of pathogenic or spoiling microorganisms has always been an important topic in the food and beverage industry. Adequate microbial examination can be time-consuming, and yet short shelf life dates and the costs related to storing freshly prepared food for extended periods demand that products be shipped in a timely manner. Upsetting this balance can lead to costly recall campaigns: For example in 2011, 15 people died and 84 fell ill, from a Listeriosis outbreak after consuming contaminated cantaloupe grown by Jensen Farms in Colorado, USA. More recently, in January 2012, the Centers for Disease Control and Prevention (Georgia, USA) reported 19 individuals were sickened by a "multi-drug resistant strain of *Salmonella* Typhimurium" after consuming tainted beef sold by Hannaford grocery stores.

One of today's major problems is the changing behaviour of food consumption coupled with an increasing demand for a longer shelf life. For a growing variety of food products, the trend towards "ready-to-eat" and "ready-to-cook" products addresses this issue by prolonged storage at low temperatures (4 – 8 °C). In addition, emerging preparation technologies to extend shelf life, such as "Cook & Chill" and "sous vide," lead to increasing microorganism contamination.

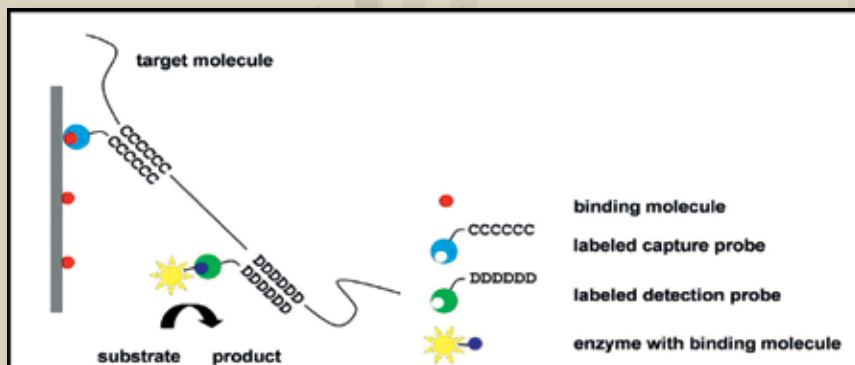
Solution: Rapid methods for detection of microorganisms are in demand. HybriScan is a recent example of a rapid method that saves up to 10 days compared to traditional cultivation methods. The HybriScan test system is capable of detecting groups of organisms (e.g. all bacteria, *Listeria* spp.) and specific species, for example *Listeria monocytogenes*. No PCR is required, and the result is based on genetic information; the target molecule is the ribosomal RNA (rRNA).

This test method is designed on a simple 96-well microplate, with 12 strips of 8 wells, and is a sandwich hybridization assay. The principle of the analysis is based on the detection of hybridization events between two specific oligonucleotide probes and target nucleic acids. The capture probe is used to immobilize the target sequence on a solid support and the detection probe is labelled with a detectable marker (Figure 1). The test is not sensitive enough to sample matrices and detects only living

cells; therefore, no special equipment is needed and the test is complete in approximately 2 to 2.5 hours. A positive result is visible to the naked eye, but it is also possible, by a standard microplate reader, to quantify the number of cells at 450 nm (based on the fact that the average number of ribosomes is similar from cell to cell).

Also, the sandwich hybridization is relatively sensitive and can be performed with crude biological samples. These types of assays from crude cell samples, or in connection to PCR, have been extensively used in clinical diagnostics for detection of nucleic acids from bacteria and viruses. The sandwich hybridization method is ideal for an identification of specific rRNAs in bacterial cells and yeasts. Although a direct detection of the ribosomal RNA does not match the sensitivity of a PCR-based DNA assay, it offers advantages like quantification, live/dead-discrimination, and no additional amplification steps; plus, simple assay protocols with a standard laboratory equipment. The sensitivity reaches up to 1 CFU per 1 ml or 25 g with a pre-enrichment step (24 - 30 hours). For the assay itself, 1000-2000 bacteria or about 100 yeasts are needed. The available kits were validated according to the official methods in Germany (§ 64 LFGB).

For more information, visit www.sigma-aldrich.com/hybriscan



▲ Figure 1: The capture probe is used to immobilize the target sequence on a solid support and the detection probe is labelled with a detectable marker.



IMACS

INTERNATIONAL MEETING ON AUTOMATED COMPLIANCE SYSTEMS

May 8 & 9, 2012
Boston, MA (USA)

The ninth annual IMACS conference is the only technical and management conference dedicated to automating compliance-based processes for cGMP operations. This conference is designed to outline implemented solutions for laboratory-based operations in the pharmaceutical, biotechnology, medical device, CRO, CMO and generic fields. The conference fosters a stimulating information exchange on best practices and lean operating initiatives between senior analytical lab managers, IT groups and QC/QA GMP electronic notebook users with implementation details and performance metrics in automating quality systems for regulated environments.

IMACS 2012 will be held in conjunction with the Accelrys user group meeting. All IMACS attendees can participate in the full agenda. All papers and panel sessions are delivered by experienced pharmaceutical industry experts on subjects such as:

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- Implementation approaches for best practice technology harmonization on a local and global basis
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PARTING POINTS

Takeaways from this month's issue:



IS THE ROLLER COASTER RIDE OVER?

Despite robust growth from the late 1990s until 2003, during the latter half of 2008, the laboratory industry embarked on a roller coaster ride with multiple ups and downs, including:

- Across-the-board budget cuts
- The U.S. American Recovery and Reinvestment Act of 2009
- The first market contraction in more than a decade in 2009
- A huge bounce-back in 2010

12



WHAT WOULD STEVE JOBS DO?

Although we don't often think about it this way, at its core, your job as a manager is to make a difference. Here are some ways to avoid sticking to the status quo:

- Listen with purpose to your staff
- Think of three things you can do to improve communication in your lab
- Spot some little things that get in the way of your staff and fix them
- Think of one way to immediately improve your work climate to retain staff

20



WE NEED BACKUP!

Making sure your laboratory automation systems are protected from power failures is extremely important. Here are some quick tips on how you can make sure a power failure isn't fatal for your lab:

- Use a high-grade computer UPS
- Protect your system with a specific and purpose-built instrumentation power protection system (IPPS)
- Make sure you have an emergency generator

30



TRENDS IN LABORATORY QA/QC

Michael Noble, Ph.D., professor in the Department of Pathology and Laboratory Medicine at the University of British Columbia and chair of the Program Office for Laboratory Quality Management explains recent QA/QC trends such as:

- A stronger emphasis on the importance of standardization
- Improvements in accreditation, proficiency and monitoring
- Problems in the area of molecular diagnostics
- Better awareness and education

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PERSPECTIVE ON: A CONTRACT LAB

When developing new chemical entities, pharmaceutical and biotech companies often employ the help of contract research organizations (CRO). MicroConstants, Inc. is one such organization. Here are some quick facts about this CRO:

- Has worked with over 270 clients in 27 different countries
- Headquartered in San Diego, California with another location in Beijing
- In total, the organization has more than 50 employees in San Diego
- On average, the San Diego location receives about 10,000 samples per month

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