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November 2010 Volume 5 • Number 9

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What You Need to Know to Woo, Win & Keep the Best and Brightest

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Lab Manager Magazine® (ISSN: 1931-3810) is published 10 times per year; monthly with combined issues in February/March and July/August, by LabX, P.O. Box 216, 478 Bay Street, Midland, ON Canada L4R 1K9. USPS 024-188 Periodical Postage Paid at Fulton, MO 65251 and at an additional mailing office. A requester publication, *Lab Manager*, is distributed to qualified subscribers. Non-qualified subscription rates in the U.S. and Canada: $120 per year. All other countries: $180 per year, payable in U.S. funds. Back issues may be purchased at a cost of $15 each in the U.S. and $20 elsewhere. While every attempt is made to ensure the accuracy of the information contained herein, the publisher and its employees cannot accept responsibility for the correctness of information supplied, advertisements or opinions expressed. POSTMASTER: Send address changes to *Lab Manager Magazine®*, P.O. Box 120, Georgetown, CT 06829.
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Garage sale, anyone?

A few years back I decided that a large, plastic, tumbling composter was just what I needed to amp up my backyard gardening efforts. The gardening catalog showed a smiling, neatly-dressed woman turning the handle of her tidy composter—no doubt thinking about the warm, nutrient-rich compost she'd be harvesting in a few short months. "That's for me," I thought. However, at some point between the delivery of the composter and autumn, I discovered that I didn't enjoy collecting slimy, smelly kitchen scraps in a bucket under my sink, and that there wasn't enough cut grass and leaves in my yard to sustain the composting enterprise. Realizing my folly, I looked for a way to unload my organic gardening dream machine. I advertised in the classified section of my local newspaper and on the local radio. No one called. More ads and a garage sale later, the composter remained—a painful reminder of my noble, but failed, effort. After another year of languishing in the back of my shed, I gave my composter to a local high school's gardening program—happy to have found it a home.

This month's issue has nothing to do with home gardening, but everything to do with getting rid of stuff—specifically, unutilized laboratory stuff. In the cover story, Bernard Tulsi tells us, "Abetted by a challenging economy, various types of laboratory equipment are increasingly being redeployed or sold to other users rather than being put out to pasture on schedule, as was the case not so long ago." And what was *not* the case with my composter, lab managers are finding increased opportunities to turn their unwanted equipment into cash. In addition, equipment manufacturers have begun taking a greater role in devising cradle-to-grave strategies and finding "innovative ways for customers to manage their installed base of equipment, cut costs from both the direct and indirect spend categories, and get more mechanical life out of the equipment." For more on that trend, turn to this month's Business Management article, "Instrument Life-Cycle Management," on page 68.

If you're tasked with hiring and retaining qualified staff with limited renumeration resources, you will find plenty to like in this month's Leadership & Staffing article, "Scientific Talent Wars." According to author F. Key Kidder, "While money is the routine starting point in the war for talent, a compelling variability between competing offerings for lab talent is found in the satisfiers, atmospherics and management's approach to soft benefits—reward and recognition programs, flextime and work/life balance, career training and development, and assorted conveniences and services." Turn to page 22 to learn a few new and creative approaches to managing talent.

Other articles of note this month include our "Ask the Expert" piece on implementing lab and data security. In that, Murat Kantarcioglu, Ph.D., assistant professor in the Department of Computer Science and director of the Data Security and Privacy Laboratory at the University of Texas at Dallas, shares his first-hand knowledge of setting up adequate data security in a lab. If lab security is not an issue for you, perhaps time management is. For that we offer "Time Out!" (page 18), in which author Joelle Jay promises that if "you learn how to maximize your time, not only will you stay sane in the midst of today's business environment, but you'll also become more valuable, more productive, and ultimately more at peace in all areas of your life."

Along with the November issue of *Lab Manager Magazine*, we are very proud to introduce our new, free-standing Product Resource Guide, which we hope you'll find valuable when it comes time to make your purchasing decisions. It contains a wealth of unique information, so keep it handy. As always, I welcome your feedback.

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Editor-in-Chief

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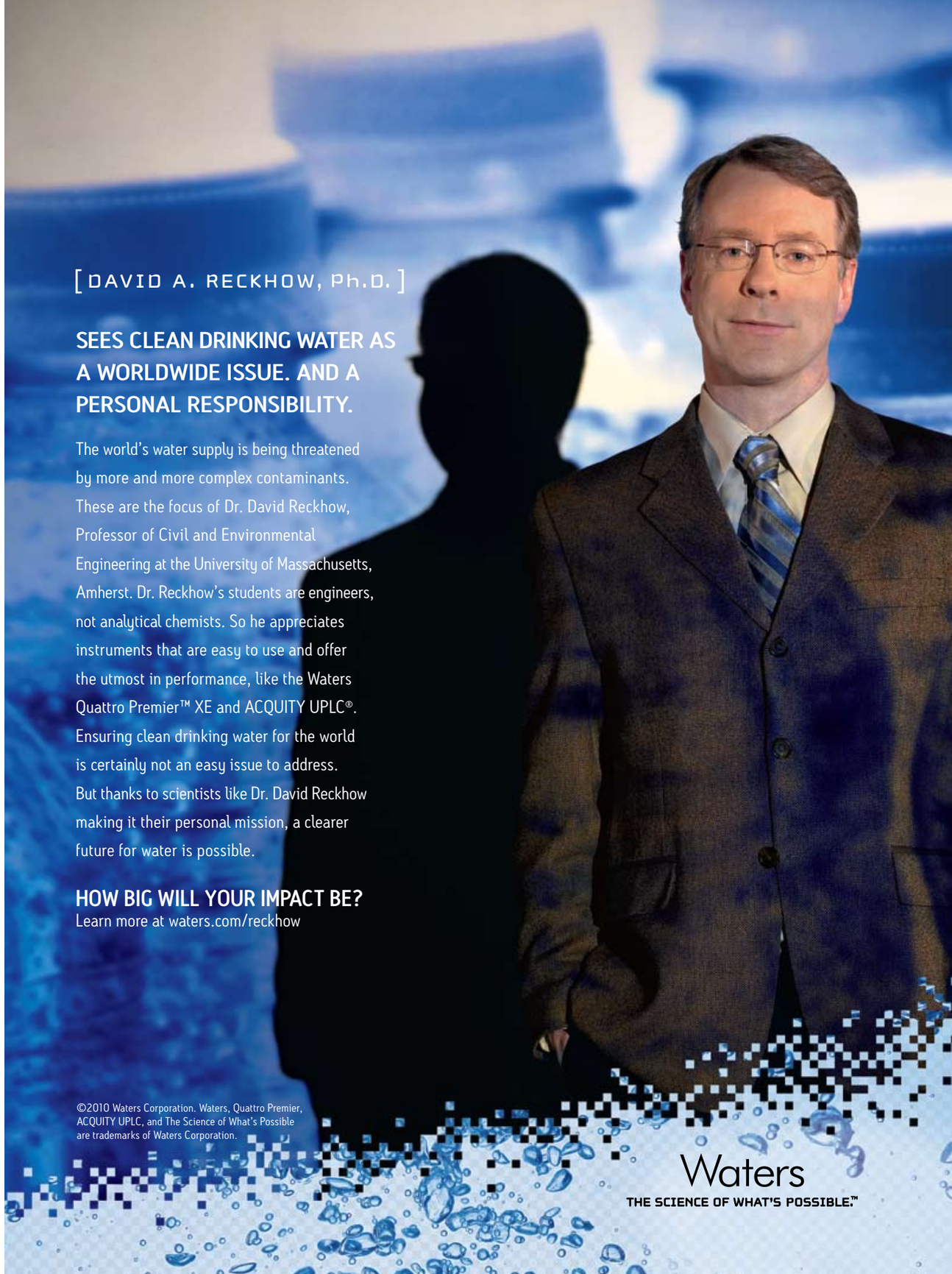

HIDDEN TREASURE

TURNING YOUR AGING AND UNUSED LAB EQUIPMENT INTO CASH

by Bernard Tulsi

Driven by the need for greater cost effectiveness and the desire to extract the most value from pricey assets, laboratory managers are eager to convert their unused, excess and replaced equipment into cash. Abetted by a challenging economy, various types of laboratory equipment—the undisputed thoroughbreds of the scientific enterprise—are increasingly being redeployed or sold to other users rather than being put out to pasture on schedule, as was the case not so long ago.

"Major laboratory equipment manufacturers are also involved in cradle-to-grave strategies."

By some estimates, sales of secondhand laboratory equipment could well be in the hundreds of millions of dollars annually—with some of the largest increases posted since 2008. Part of the reason is that some, although by no means most, leading companies have created recovery programs to capture the value of unutilized assets, according to Michael Sorensen, senior VP, North American Sales and Solutions, at GoIndustry DoveBid, which works with companies to develop best practices and programs around unused assets, including laboratory equipment. Studies suggest that when such programs are implemented, payback is rapid—around $30 for every dollar invested, according to Sorensen.

There are several reasons organizations should pay close attention to their unutilized assets and how to extract the greatest value from them. Apart from generating cash, this also opens the path to a major social benefit by "redeploying the asset rather than scrapping it, which is the absolute last resort," says Sorensen.

For many startups and other smaller, technology-driven entities, the ability to source and acquire excess or redundant lab equipment at substantially lower prices may have survival implications—casting a whole new light on the relativity of trash and treasure. To be sure, a number of larger players also participate enthusiastically in this process. Ryan McAuliffe, equipment sales manager at EquipNet, says, "Major pharmaceutical, biotech, chemical, refinery, and food and beverage companies hire EquipNet to assess, evaluate and act as a sales agent for their redundant or excess laboratory equipment."

Companies like EquipNet and GoIndustry DoveBid are among a handful of others that specialize in asset disposition. Often using different approaches, they have seen their businesses grow substantially during the past decade, with participation from industry, government agencies and academia.

This is still not a crowded area, and the key participants have been successful in differentiating themselves. GenTech Scientific (Arcade, NY), which started in 1995 largely as a GC/MS service provider, has grown into an analytical instrument refurbishment business that now covers a broad spectrum of instrument classes including GC, HPLC, ICP and AA systems, and works with a number of the major lab instrumentation makers. Harlow Scientific (Arlington, MA) also offers a broad range of new demo and refurbished equipment in a variety of classes, as does Pace Analytical (Minneapolis, MN), which has notable strengths in the environmental sector.

Dante Laterra, CEO of American Laboratory Trading, which is emerging as one of the major companies in this field, says, "We are providing opportunities for start

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ups, smaller companies, colleges and universities and others with budget concerns to get high-quality technical equipment at a discounted price so that they can conduct their research and other projects and compete in their fields on a limited budget."

American Laboratory Trading, which started operations almost 15 years ago, operates across the U.S. and has global operations. Laterra says that his company works with most of the major OEMs and a number of large companies across several industries globally. "The big company labs are all looking to save money on their equipment too. What we do benefits a lot of different sectors and segments of this business…we help to make sure that useful equipment gets put to its intended use rather than fill up dumpsters somewhere."

He adds, "We can outfit entire labs because we have one of the largest, if not the largest, inventories in this business. We completely refurbish, recondition and provide warranty and peace of mind." He says he expects to see the current growth spurt his company is experiencing now continue over the next three to five years. "I am not sure I see any ceiling on it, personally."

"There has always been a robust secondary market for used equipment."

Acknowledging academia as an important market for his company also, McAuliffe says, "More than a third of our laboratory equipment buyers are from universities. These are big buyers without big budgets." EquipNet provides disposal services to them as well. "In a number of cases, they use their grants to buy equipment for research projects that have short durations, and they use our services to sell the equipment they no longer need," he says.

EquipNet's business model does not require that the company take ownership of the equipment. Instead, it acts on behalf of sellers and provides them with a whole gamut of services. EquipNet's MarketPlace Web venue lets scientists ask questions (which are answered by experienced equipment specialists) and buy lab equipment. The company's international sales team markets equipment via trade shows, cold calls, blast e-mails and social media networks. It uses its warehouse to facilitate consignment arrangements with customers. "We display customers' equipment in our warehouse and make the items available to potential buyers who wish to test them. This works well for sellers because the equipment is stored in a clean, safe area, and it frees them up from answering technical questions associated with secondhand transactions," says McAuliffe.

Equipment acquired from discontinued projects or projects that did not launch becomes available for sale, often unused and in original packaging. McAuliffe continues, "With everyone looking to save now, such unused equipment, which is often documented, makes attractive deals because [items] could sometimes be bought for 50 to 60 percent less than their original price."

An important part of what GoIndustry DoveBid does is manage such sales, says Randy Small, VP Asset Sales and Services, North America: "We are given lists of assets for sale by clients—biotech, semiconductor, electronic, IT and automotive companies, among others—and we help them to figure out the best sales approaches."

Essentially, we look at the items being offered, figure out their potential value, and then formulate selling strategies based on the type of equipment involved. Everyday laboratory equipment, such as microscopes or HPLC instruments, for example, is usually included in our exchange sales, which are organized weekly in the form of online auctions.

"We get industry-specific equipment from all our sellers [for] the weekly online auctions. This provides would-be buyers with a continuous supply of equipment," says Small.

Major laboratory equipment manufacturers are also involved in cradle-to-grave strategies and are developing innovative ways for customers to manage the installed base of equipment, cut costs from both the

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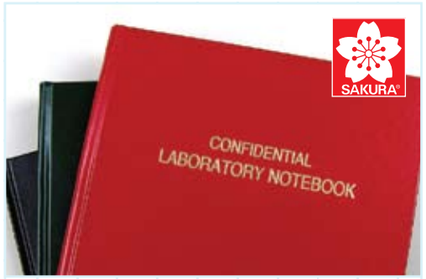

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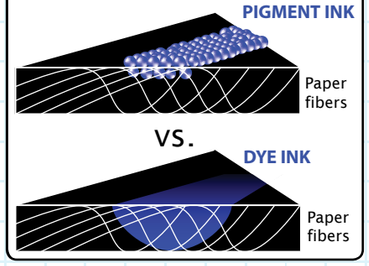

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direct and indirect spend categories, and get more mechanical life out of the equipment. Michael Pope, senior laboratory services consultant at Agilent Technologies, says, "Agilent can help with the whole life cycle from cradle to grave—[from] the acquisition to the disposal of equipment, and all other facets that make up the continuum of support."

Pope continues, "Agilent has its own pre-owned sales group and sales strategy and does not go out to the secondary market and engage third parties to dispose of equipment." For Agilent, this approach has started to take shape within the last 12 to 18 months and may have been partly necessitated by market conditions. "There has always been a robust secondary market for used equipment. Today there is a greater sense of legitimacy with the advent of the asset disposition companies, but there has been a secondary market for 15 to 20 years," says Pope.

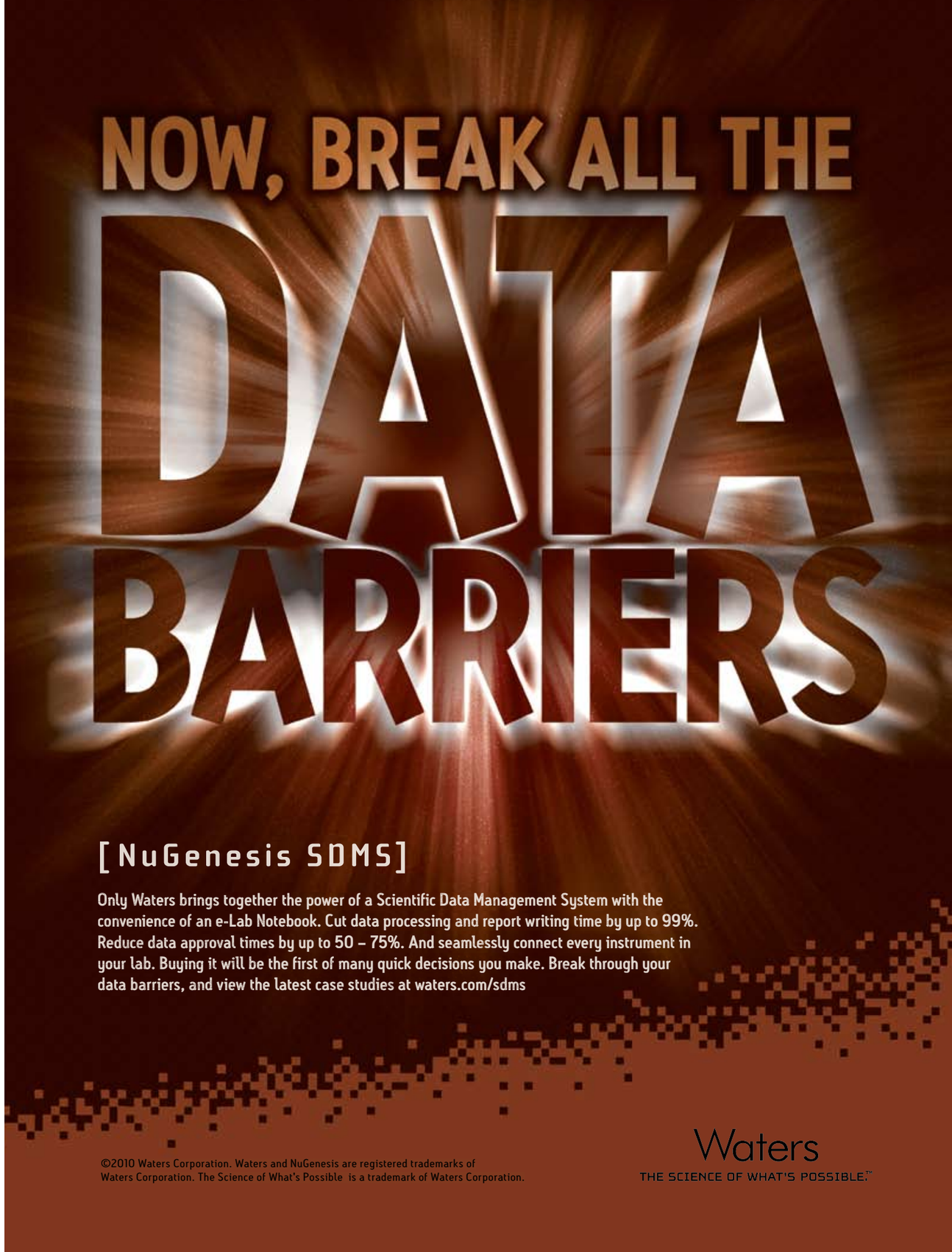
"Broker-dealers offer another channel for disposition."

To ensure that their customers enjoy the widest possible marketing exposure for their equipment, asset disposition companies use the listing portal known as LabX, which reaches a large spectrum of buyers and sellers. "This gives us access to a broader audience of potential buyers, because LabX has enormous reach," explains McAuliffe.

Prior to the advent of specialized asset disposition services, large amounts of replaced or redundant lab tools, a variety of both high- and low-end equipment, were sold at live auctions to the highest bidder. Broker-dealers offer another channel for disposition. They generally buy complete lots of equipment at the lowest possible prices, and then resell them at the highest prices the market will bear. "This means that while the labs successfully sell their excess equipment, they often take a substantial loss when compared to the amount of money they could have recouped," says McAuliffe.

Trained staffers from asset disposition companies go on-site at laboratories and inventory, photograph, assemble and compile equipment specifications. They then try to place the equipment with buyers, either on an individual basis or in lots of similar items. "If the seller has time and the deadline is several months out, we will opt to sell the equipment on our MarketPlace, which uses a bid-ask negotiation method online," says McAuliffe. "The items are listed individually for viewing by potential buyers, who make offers that are [then] submitted to the sellers for their decision. In general, the higher-priced items are routed to our MarketPlace for negotiated sales. That usually ensures higher [payments] to the seller.

"We usually set dollar level limits for our MarketPlace and for our monthly auction clearance events. That is usually dependent on client sensitivity, how soon the assets need to be removed to make way for replacements, whether the operation is being downsized and the space hous-



ing it will no longer be available. All such equipment may be routed to clearance events, which are usually [held for] one or two days online," says McAuliffe.

A substantial amount of equipment is transferred in this way from major multinational pharmaceutical companies to small biotech and startup entities, explains McAuliffe. "This is a great resource for the smaller players. They are able to buy high-end analytical lab equipment at about one-half or one-third the price of new [items], and it is available immediately with no real lead time. Some lab equipment is highly sophisticated and can take up to a year or more to manufacture.

"We do make recommendations sometimes that the equipment should go to scrap or be donated, or at one of the clearances we will mark it with a low reserve price. In the past, a lot of larger companies had to pay depot companies for the pickup and disposal of equipment they no longer wanted. What we provide for them is a disposition avenue, without any out-of-pocket expenses for them for their old and antiquated equipment. We offer a service that enables them to have quick sales within their deadlines, and an opportunity to recoup some funds—in the final analysis, we actually send them money."

> "Sales of secondhand laboratory equipment could well be in the hundreds of millions of dollars annually."

EquipNet also handles the scrapping of discarded equipment for its customers. "We engage contractors who will dismantle and destroy the equipment, and provide the necessary documentation to the seller, indicating that the equipment was properly disposed of. In the case of monitors and central processing units (CPUs), the paperwork will indicate that they were properly destroyed and that the hard drives were shredded to levels that ensure that no proprietary information is accessible," says McAuliffe.

The seller of the equipment is responsible for ensuring that disposal is performed in accordance with environmental regulations. EquipNet provides guidance and recommends disposal companies the seller could use to properly dispose of potentially hazardous liquids or items that have been in contact with radioactive elements. It also helps clients engage third-party companies that do cleaning and decontamination work and provides the necessary documentation stating that the required standards and guidelines were met during disposition of a particular piece of equipment—either by discarding or by resale. Some types of equipment contain radioactive sources, and this requires going back to the original manufacturer of the equipment (OEM) to power down the equipment.

There are other reasons OEMs remain involved. In a number of cases, proprietary software is embedded in equipment and the licensing agreements covering the software do not transfer to the new owners of the equipment, so the OEMs have to be engaged in the process. "We often get involved with OEMs for secondhand [sales], because they want to be helpful by ensuring that the new customers buy good pieces of their equipment secondhand, in the hope that as the customers get bigger and have more resources, they will buy their new equipment from them. The idea is to plant a seed and create a platform," says McAuliffe. In addition, this provides an opportunity for the OEMs to retain service and maintenance contracts with the new end users of their equipment. Manufacturers also use asset disposal companies to help them sell demo units and discontinued items.

There is considerable agreement that the aftermarket for laboratory equipment is a growth area. Overall, the secondhand equipment area has become easier to understand and seems more user-friendly now. The comfort level has increased for buyers now that sellers offer warranties and service agreements, often through the asset disposition companies, and there is far less trepidation about buying over the Internet. "There is now greater confidence among both buyers and sellers because of the availability of assistance such as better technical specifications and more accurate pricing," says McAuliffe.

Bernard Tulsi *is a freelance writer based in Newark, Del. He may be contacted at btulsi@comcast.net or 302-266-6420.*

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TIME OUT!

THREE STRATEGIES FOR STAYING SANE IN TODAY'S OVERLOADED WORK ENVIRONMENT

by Joelle Jay, Ph.D.

With all the recent layoffs and the unemployment rate hovering around the double-digit mark, those who are still employed face a tough dilemma. On the one hand, they're grateful for their job, but on the other hand, their workload may have become too much to bear. In fact, many people are now doing the work of two or even three people. They have more responsibility than ever before, and they feel that there's no way they can keep up. Their mantra has become: "There's simply never enough time."

Whether the issue is that you have too much to do, too little help, too daunting a task, or all the above, you may feel like there's no way to keep up. Without some kind of a plan for your time, you can feel stretched to the point of insanity. Fortunately, you can start to take control by learning to maximize your time.

"Address the tasks, projects, or activities that matter most to you first."

Manage vs. Maximize

In order to thrive in today's work environment, you need to change the way you look at time. The key is to learn to not just manage your time, but to maximize it.

Traditionally, time management is about getting more done in the time blocks within your calendar. In fact, if you look up the word "managing," you'll see terms such as "to deal with," "to cope," and "to wield." These words suggest a limited way of looking at time—that it's something to be dealt with, that it's against you, and that you have to contain it.

The problem is that even if you master the art of time management, you can still find yourself overworked. Your calendar may be a masterpiece of organization, and you may excel at getting things done, yet you may feel as if you're not making any real achievements. Your life seems to be one (sometimes meaningless) task after another. You spend your days sacrificing your sanity for a neatly crossed off to-do list.

You have a more powerful option. Instead of just managing your time as if it's working against you, you can maximize it and have time work for you.

Maximizing your time is about getting the most out of your time so you can do more with less. Literally, the term "maximizing" means "to make as big as possible," "to make the most of," and "to find maximum value in something."

When you maximize your time, in addition to accomplishing daily tasks, you're making space for the things that matter most—your goals, priorities, and the bigger vision of success for you and your organization.

To keep up in today's world and still have a meaningful professional and personal life, you need to maximize your time. The following strategies are three time-maximizing techniques that can help.

STRATEGY #1: GO TO THE CALENDAR

"Going to the calendar" is a great strategy for making the most of your time. You stop taking every e-mail, phone call, meeting, and problem as it comes up, and instead you start scheduling things in a way that makes sense.

Going to the calendar means literally opening up your calendar, turning on the PDA, getting out your schedule, and physically putting into place a written, concrete plan to use every hour in the most productive way.

The key to making this work is to start with a blank calendar and address the tasks, projects, or activities that matter most to you first, before you take those calls and e-mails. Ask yourself, "What's the best use of my time?" and "Where am I going to get maximum value?" Schedule those things first. Then you can see where the other tasks can go in your calendar. You may find that not

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everything can fit…and that's okay. If you're focusing on what matters most, the secondary items can usually slide. Either you'll realize they are just "busy work" that doesn't really need to be done, or you'll suddenly see shortcuts to the tasks that you did not realize before.

Remember, just as you can control your time, you can also control your calendar. Don't let it control you.

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STRATEGY #2:
THE 5 Ds

Whenever your time is being eaten up by a stack of e-mails, a stack of paper, a stack of voice mail messages, or just stacks and stacks of work, the 5 Ds work especially well. You will drastically cut the time you need to get through the stack, and you can then get to the other high-impact activities that make the best use of your time. The 5 Ds stand for:

- Do It. Stop pushing around a task and do it now. Use this for any task that takes fifteen minutes or less.
- Delete It. There are some things that do not require your response. Just because someone sent you the message/document/suggestion doesn't mean you have to reply. If an item doesn't advance a relationship or achieve an important goal, get rid of it.

> "Just as you can control your time, you can also control your calendar."

- Delegate It. As often as possible, pass a task on to someone else who can handle the job. They don't have to do it better than you; they don't even have to do it as quickly. They probably won't. But unless it's a top priority or specific result that you and only you can deliver, you're not the right person to do it. Pass it on.
- Decide On It. No more moving items from one stack to another, telling yourself, "I'll get back to that." Will you attend the meeting or won't you? Will you agree to that request or won't you? Make a decision. Move on.
- Date It. Choose when you will give big-ticket items your undivided time and attention. Figure out how much time you need and block it out in your schedule. You can forget about it until then.

The 5 Ds will save you time, and potentially a lot of it. Before you fill up that time with more meaningless tasks, give some thought to the most powerful way you can use the time you save.

STRATEGY #3:
PROJECTS 1-2-3

When you feel like many big activities are crowding you out, you can become overwhelmed and not know where to start. After all, it's so much easier to tinker in the minutiae than to tackle the most important tasks. The danger is that most of the important things never get done. Unfortunately, too many people today don't take the time to choose what to spend their time on.

They're simply answering fire alarms all day or taking things on a "first come, first served" basis.

To help you manage your sanity and maximize your time, you need to figure out what the priority is. So, sit back and identify Projects One, Two, and Three. Choose one project or one action item to tackle that will allow you to make the biggest impact with your time. Keep sight of which project you'll grant top priority, and give it the best of your time. Then you can turn to the rest.

Time IS on your side

The fact is you will never have control of your time unless you take control of your time. That means stopping long enough to get a handle on what's happening, reflecting on whether it's working, and learning new ways to maximize the time you have. Rethinking your relationship to time takes an open mind, it takes commitment, and (ironically) it takes time. But the investment you make in maximizing your time will pay you back hour after precious hour. When you learn how to maximize your time, not only will you stay sane in the midst of today's business environment, but you'll also become more valuable, more productive, and ultimately more at peace in all areas of your life.

Dr. Joelle K. Jay, Ph. D., *is an executive coach and the senior managing partner of the leadership development firm Pillar Consulting. She is the author of* The Inner Edge: The 10 Practices of Personal Leadership. *For a free sample chapter, go to www.TheInnerEdge.com or e-mail Info@TheInnerEdge.com.*

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SCIENTIFIC TALENT WARS

WHAT YOU NEED TO KNOW TO WOO, WIN AND KEEP THE BEST AND BRIGHTEST

by F. Key Kidder

These are nervous times in laboratories. Staff shortages abound and the workforce is aging, but the recession acts as a defibrillator keeping the laboratory heartbeat humming as veterans postpone retirement. Acting to stem this shortfall and generate interest in science careers, the U.S. National Academies, to considerable fanfare, earlier rolled out a study calling for educational and policy reforms to ramp up the supply of domestic scientific and engineering talent, entitled "Rising Above the Gathering Storm."

The storm has broken over America's laboratories. Vexed by acute personnel shortages, medical labs have mobilized into a full-court press—lobbying and working policy levers to attract and retain talent, promoting their profession, and warning of the impact on quality care. Job vacancy rates exceed 50 percent in some states. New lab staffing models with less rigorous educational requirements are being floated.

"As the war for talent intensifies, so does the weight on lab managers tasked with stroking high potential stars."

"I think we have workforce challenges in front us that cannot be fully mitigated," says consultant Paul L. Epner, citing demand from an aging population and a concomitant rise in testing that outstrips lab automation measures. Epner, who spent 31 years with Abbott Laboratories, helped create Abbott's *Labs Are Vital*™ program to address the profession's lack of public awareness, particularly the students it aspires to attract, most of whom are unaware that the profession is a career option.

Nearly 60 percent of the more than $4 trillion spent on global health care annually supports the clinical workforce, according to management consulting firm McKinsey & Company, and ASCP, like other groups, is pulling out all the stops to raise the profession's visibility. *Labs Are Vital* "was not just about selling the profession to non-laboratorians," says Epner, "but also about boosting a grassroots effort of lab professionals toward their own profession to improve self-esteem." ASCP, ASCOF, COMA, AACC and APHL all pitched, says Epner, hoping to earn favorable publicity on word of mouth to attract up-and-coming talent. According to a survey by the Coordinating Council for the Clinical Laboratory Workshop—a coalition of about a dozen lab associations—conversations with friends or relatives are far and away the leading mechanism that sparks interest in a lab career.

The demand for true talent always exceeds supply. In a 2007 HR Priorities Survey by ORC Worldwide, nearly two-thirds of respondents identified talent management as their most urgent strategic issue. They have not been disappointed. With waves of workers at retirement age in industrialized nations, and increased competition from developing nations, it's a seller's market. As the war for talent intensifies, so does the weight on lab managers tasked with stroking high potential stars.

Workers, goes the old adage, don't quit bad jobs—they quit bad bosses. Nor do they necessarily follow the money. In the great global game to woo and win scientific talent, more employers—most notably medical labs—are extending noncash motivators as the proverbial carrot. Attracting and retaining talent without pay increases is

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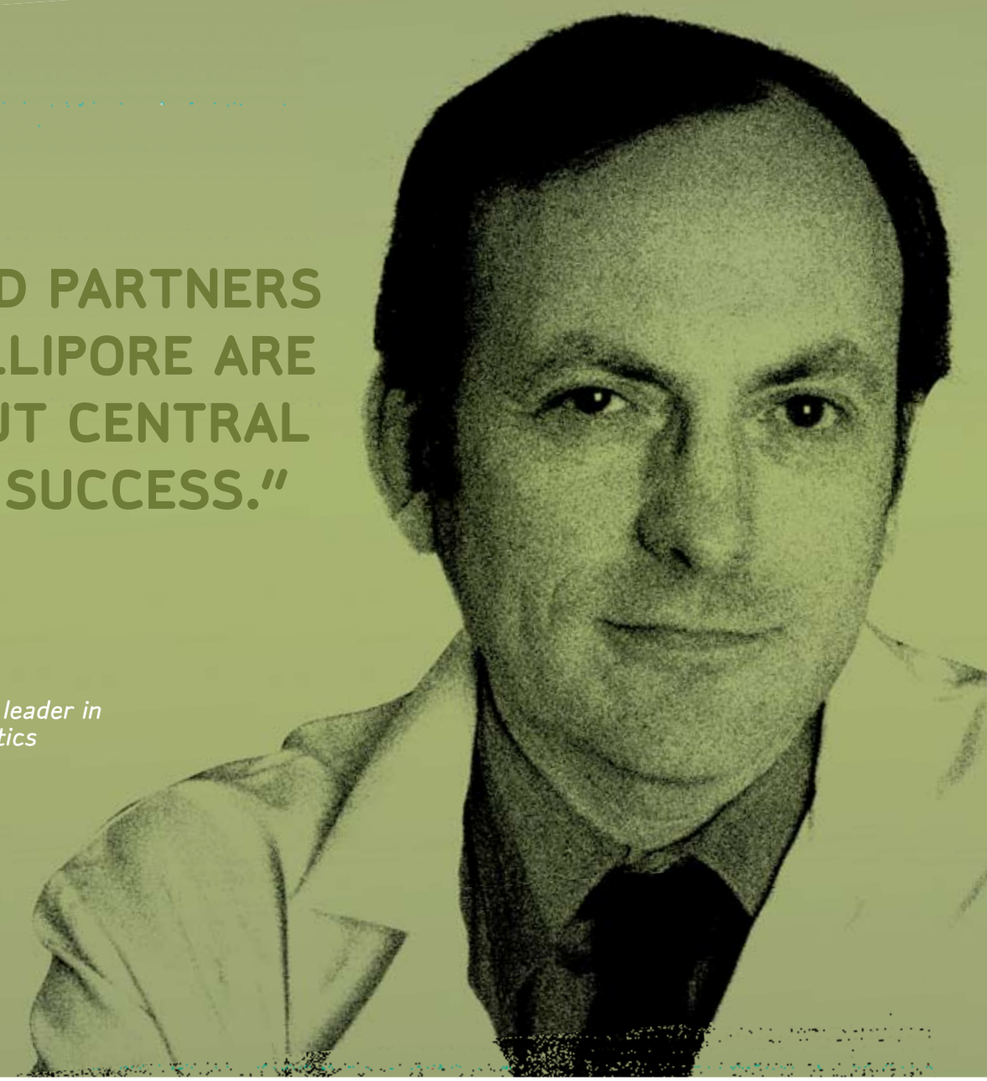

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"absolutely" a discussion people are having, says Kathy Doig, associate dean at Michigan State University and a national leader in medical lab workforce issues.

"Too many approach the retention of key employees by throwing financial incentives" at rainmakers, says McKinsey. Studies show that money doesn't buy their happiness, and there's less of it to go around besides—many HR directors have pulled back remuneration expenditures by 15 percent or more, according to *Forbes* magazine.

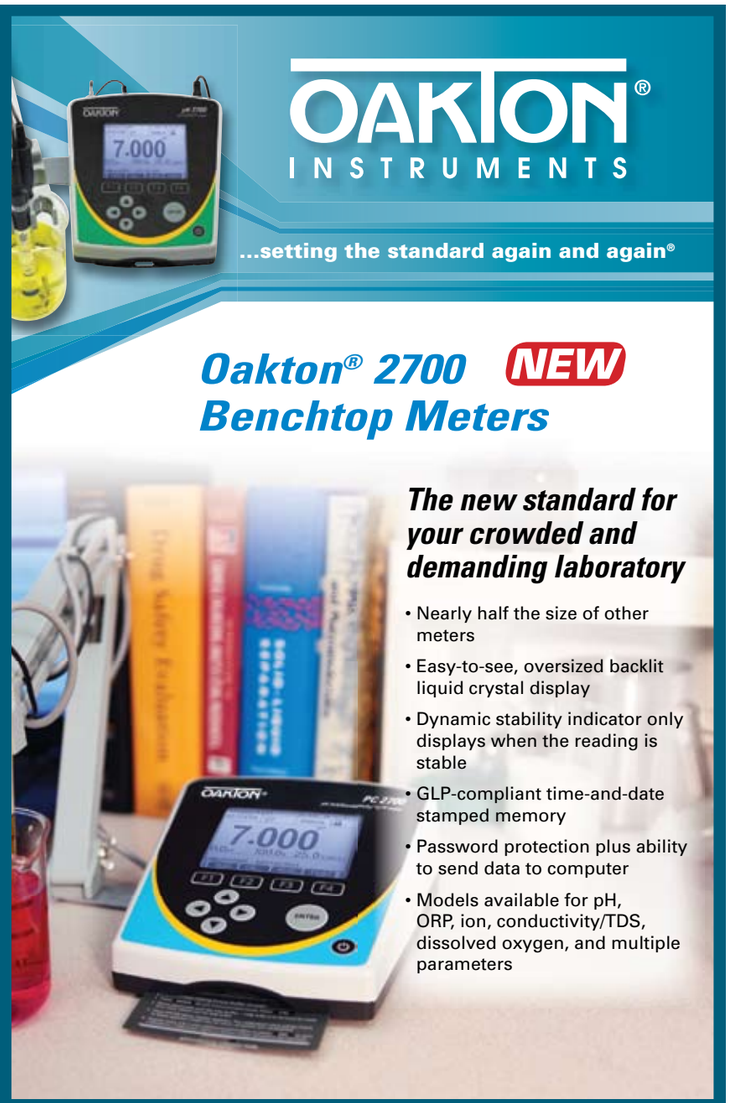
Remuneration—the bargain between employer and employee—is an often fluid concept for lab talent. Human resource and management personnel were among the first to study happiness and contentment while trying to understand the linkages between worker satisfaction and workforce production and innovation. The underpinnings of this aspect of business behavioral theory are traceable to psychologist Abraham Maslow's hierarchy of needs theory, and his contemporary Frederick Herzberg, whose research on the psychology of motivation is considered "HR 101," according to Doig.

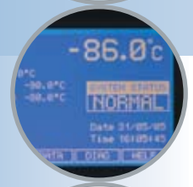
Herzberg's theories may have been slow to get traction, but he left managers a dichotomy to ponder as his legacy: that which satisfies and motivates workers is quite different from what displeases them.

Job satisfiers, wrote Herzberg, "deal with the factors involved in doing the job," whereas dissatisfiers "deal with factors that involve the job context," or work environment. Salary, supervision, company policy and culture, and interpersonal relations are job dissatisfiers that can cause lab talent to rock the boat. Where the rubber really meets the road lies in satisfiers with the potential to engage and stimulate workers—challenge and achievement, recognition, responsibility, advancement, and the nature of the job itself. The ultimate expression of such engagement is the mental state of "flow," which enhances performance and innovation.

Satisfiers have long-term positive results in attitude and performance. Adjusting dissatisfiers can produce short-term changes, but attitude and performance typically revert to previous levels. "Managers say, well, give them a raise," says Dr. Robert Hernandez of the Mayo Clinic in Scottsdale, Ariz. "But that's secondary. Give unhappy people a pay raise and you'll probably have highly paid unhappy people."

Employers strive to keep compensation packages competitive, but the majority of managers don't have the freedom to authorize bonuses or raises. (At Genentech, managers can cut a check—a "Genencheck"—right on the spot to award employees.) While money is the routine starting point in the war for talent, a compelling variability between competing offerings for lab talent is found in the satisfiers, atmospherics and management's approach to soft benefits—reward and recognition programs, flextime and work/

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life balance, career training and development, and assorted conveniences and services. Sometimes called total reward systems, this holistic approach attempts to go beyond money to more fully capture the employee value proposition, in HR-speak.

The use of nonmonetary techniques may increase transaction costs for managers. Cash is quick and easy; noncash motivators can be time-consuming, touchy-feely, and require direct managerial attention. Time spent managing talent is time lost managing lab operations, the measure traditionally used to evaluate and reward managers. Nor is top talent readily managed. "…if clever people have one defining characteristic, it is that they do not want to be led," says a *Harvard Business Review* white paper that draws on science-based operations. "This clearly creates problems for you as a leader." The clever "want a high degree of organizational protection and recognition that their ideas are important" and "the freedom to explore and fail," and they "expect leaders to occupy their intellectual plane, while not eclipsing their talent and skills."

Building on HR theory, anecdotal experience, best practices and incoming empirical data, more managers are honing skills to attract and retain staff without pay increases. Instead of a systematic or one-size-fits-all approach, managers need an array of arrows in their quivers when hunting for talent. Different workers respond to different motivators.

Many workers in medical labs feel undervalued and respond to recognition and appreciation, including from colleagues. McKinsey reports that praise and commendation from immediate managers was the most effective nonfinancial incentive across all industry sectors, followed by attention from leaders and the opportunity to lead projects or task forces.

Headhunter David G. Jensen, managing director, Kincannon & Reed Global Executive Search, recommends "The 7 Hidden Reasons Employees Leave" by Leigh Branham, which, Jensen says, convinced him that "this book was written with the biotechnology and pharma industries in mind." Branham, who says that compensation issues are responsible for just 12 percent of employee defections, lays out the following "hidden agendas" that recruiters exploit to poach talented malcontents:

- The job or workplace was not as expected
- A mismatch between the job and person
- Too little coaching and feedback—more managerial attention, or mentors, for new employees
- Too few opportunities for growth and advancement—overseas rotations are valued, but reentry and repatriation can be problematic
- Feeling devalued and unrecognized
- Stress from overwork and work/life imbalance—mothers want time for family
- Loss of trust and confidence in senior leadership

"Progressive labs pay attention to their retention," says Hernandez. "But if we push productivity too hard, we pay with increased turnover," he warns, recalling a driven colleague in a community hospital lab bemoaning his 90 percent turnover. Additionally, managers who don't address "staff who are not competent or safe can be very demoralizing to good workers," he adds.

New research throws light on related HR challenges. Henry Sauermann of Georgia Institute of Technology's College of Management studies whether science PhDs prefer careers in industry or academia, and "what makes them tick." To avoid mismatches, Sauermann says managers should take pains with potential employees to convey the company culture, since it's not readily discernable from the outside.

The intergenerational mix is another consideration. Many labs have four distinct generations working side by side: Millennials born after 1980; Gen Xers in their 30s and 40s; Baby Boomers in their 50s and 60s; and the Silent Generation in their mid-60s and beyond.

Generational theory proposes that each generation has distinct values and preferences that managers must recognize and reconcile. Whereas the Silent Generation and Boomers are respectful of authority, Gen Xers are more impressed with competence. Millennials and Gen Xers want work-life balance and personal freedom; Boomers, recognition.

"Internal equity is very important for many institutions," and limits flexibility in monetary rewards or paid time off, says Carmen Wiley, co-director of chemistry and immunology at Providence Sacred Heart Medical Center and PAML in Spokane, Wash. So Wiley advocates allowing for generational differences, perhaps permitting Millennials and Gen Xers to wear iPods at the bench, "or maybe make your Boomers more comfortable" by instituting basic dress codes for younger generations to adhere to.

A 2009 Deloitte Consulting LLP report on "life sciences R&D talent strategies" in emerging markets predicts management will be challenged to recruit and retain talent in R&D hotbeds like India and China, where Deloitte says a widening supply-and-demand gap and mismanagement have created turnover rates of 30 percent to 45 percent in CRO and pharma operations, and employee satisfaction numbers in the single digits. Companies "must avoid the pitfall of focusing only on paying more."

***F. Key Kidder** left journalism to pursue a career in government relations, politics and PR, but he still likes to keep one hand in writing. He can be reached at k2@keykidder.com or 410-828-6529.*

NOT THE MONEY by F. Key Kidder

A growing body of empirical research, supported by input from industry observers and placement firms, is taking the mystery out of how to attract and retain R&D talent and defying conventional wisdom about the allure of money.

Mismatches between employee expectations and the promises and true culture of the workplace—likely the primary reason scientists lose interest and change jobs, say researchers and headhunters—can be minimized by a thorough, two-way interview process on the front end.

After studying more than 5,000 scientists in industry and academe, Henry Sauerman of the Georgia Institute's College of Management confirmed the stereotype that academia attracts scientists with a greater "taste for science," but cautions that individual preferences for other job attributes differ widely and should be ferreted out during interviews.

Earlier studies on the reward preferences of scientists (Kochanski and Ledford; Chen, Ford and Farris) indicate the value of the total workplace offering to entice talent and the lesser appeal of money.

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IS YOUR TEAM READY FOR THE PLAYOFFS?

HOW TO BUILD WINNING INTO YOUR ORGANIZATION'S CULTURE

by Jan Ferri-Reed

December is a magical month for sports fans. The football and hockey seasons are heating up and the baseball season is just a memory. This can be a noisy month, too, if you have as many sports fans in your household as I do. But isn't it fun to see your favorite teams rising to the challenge and performing at their very best?

I think it's also fun to see successful business teams performing at the highest levels. But, there's more at stake to successful teamwork than just fun. Fred Smith, the founder of FedEx, the $36 billion transportation and logistics company, says "Leading a team is the single most important issue in running an organization today."

Why is teamwork such a critical issue? Perhaps it's because we see the results of poor teamwork every day: ineffective communication, misunderstood goals, mistakes, misunderstandings, personality conflicts, finger pointing and so on. What team in your organization hasn't suffered from similar problems, at one time or another? Even the greatest sports teams stumble occasionally on their way to a championship.

"Individual commitment to a group effort… that is what makes a team work, a company work, a society work, a civilization work." -- Vince Lombardi

What Makes a Team Successful?

Sports teams and business teams have much in common. In order to win, all members of a team have to understand the vision and recognize their role in accomplishing the team's goals. Teammates have to learn the playbook (strategies) and work together to execute the game plan (procedures) when it counts most.

Successful team members know the key roles that they play whether they are the star performers or the steady role-players who keep the team glued together. Team members also know what they need to do to backfill when teammates go down with injuries or setbacks. But these skills and behaviors don't always come naturally, so it's up to the team leader or coach to set the ground rules and expectations.

How Leaders Build and Sustain Strong Teams

Here are a few ways you can build your teams to the next level of play:

Keep the Vision Alive - Spend time reminding your team of the "big picture"—the dream and picture of success that you are trying to achieve.

Motivate and Coach - Make sure you set team and individual goals and constantly provide feedback on what is going well and what can be improved.

Reward and Celebrate – Great coaches and leaders celebrate the milestones that are achieved and acknowledge the individual and team efforts that contribute to success along the way.

The process of building a winning team starts in "training camp," but the foundations of success run much deeper. In any successful organization winning is built into the culture. Do you think it's an accident that certain teams win championships time and time again? Whether we're talking about the Pittsburgh Steelers, New York Yankees, Detroit Red Wings or any other long-term winning franchise, successful teamwork always starts at the top and runs throughout the organization.

Dr. Jan Ferri-Reed *is president of KEYGroup, a speaking, training and assessment firm that provides guidance to leaders who want a more engaged, productive and profitable workforce. As a consultant and speaker, Jan provides support to organizations including GlaxoSmithKline, U.S. Steel Corporation, Pitney Bowes and MTV Networks. She is also co-author of the best-selling book, "Keeping the Millennials: Why Companies Are Losing Billions in Turnover to This Generation and What to Do About It." To hire her, visit: www.KEYGroupConsulting.com or call 724-942-7900.*

LABCAST Join Dr. Jan Ferri-Reed on **Wednesday, December 1, 2010, 1:00–2:00 ET** for her Lab Manager Academy Labcast, "Attracting, Retaining and Motivating a High-Performance Team." For more details and to register, go to www.labmanager.com/academy.

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5 COMMON MISTAKES IN LAB LABELING

DONE RIGHT, LABELING IMPROVES ACCURACY AND ENABLES DATA AND RESOURCE SHARING by Nicole Nelson

Labeling may seem like a simple task. The specimen information goes on the label, the label is placed on the sample, and that's it ... right?

But when you think about it, your lab labels are an integral part of the success of your lab. They house critical data, and without them, your samples would be unreliable and simply irrelevant. Those labels are your source of identification, and—if implemented correctly—they are the foundation of your internal sample management process.

Are you making the most of them?

Whether you choose to implement large-scale identification automation, undertake continuous improvements or simply make a few small changes to improve your existing process, each outcome can advance results and optimize the efficiency of your labeling process.

Even if you've removed the high-occurrence error items, the tail end of the quality spectrum is all about squeezing out the errors throughout the process.

Here are five common mistakes related to item identification and labeling that are seen in today's laboratories.

#1: HANDWRITING LABELS

Although this seems obvious, there is still a large percentage of labs that handwrite. The benefit of handwriting is that anyone can pick up a pen or pencil and write … but that's about it. Handwritten labels are difficult to read and are unreliable. The ink can smear and the information can be easily misread—leading to repetitive errors.

▲ *In comparison to handwritten identification, printed labels offer significant improvements in legibility and data accuracy.*

Photo credit: Brady Worldwide, Inc.

Fortunately, it doesn't take much to start printing at a basic level. For example, you can start by purchasing a small user-friendly printer with a keypad, or you could implement a computer labeling system that takes a simple Excel sheet and merges it with a label file, then prints the data.

Printed labels (even if they are simply alphanumeric) offer significant benefits over handwriting. The quality of print is reliable; the text is clear and legible for everyone to quickly read—not just those who know the technician's handwriting. This reduces transcription errors and minimizes the time needed to manually interpret or rewrite the correct information, which often happens with handwritten samples.

#2: PURCHASING THE WRONG LABEL FOR YOUR APPLICATION

The technology of labels has become very sophisticated; there are many substrates or types of labels to choose from, which can make it difficult for labs to know which label is right for their specific applications. However, if you choose a label that is not sufficiently specific for your application, there could be a myriad of problems that result.

The chart below lists the six main label characteristics that you should consider when selecting your laboratory labels.

CHARACTERISTICS OF LABEL	DESCRIPTION	EXAMPLES IN A LAB ENVIRONMENT
Handling/dispensing	How the label is touched, removed from the liner and applied to the item being identified	You don't want the label to stick to the glove the technician is wearing.
Permanence	How long the label needs to last	For a clinical application, the label may only need to last a short time, while a biorepository needs it to last 20 years stored in LN2.
Appearance	The look or visual indicators of the label	Self-laminating vial and tube labels need to have a clear tail to wrap around the information area so that it is still readable.
Printability	The interdependency among the printer, substrate, and ribbon or ink needed to print	Using the wrong ribbon may result in a solvent washing off the print.
Durability	To what process, temperatures, chemicals, solvents and other conditions the label will be subjected	A slide label might need to withstand xylene and/or IHC protocols without turning purple or losing adherence.
Conformability	How the label matches the surface to which it needs to stick	Already frozen vials need a label that can adhere to the frozen surface. This same label may need to be concave to securely wrap around the vial, as well as be low profile, or extremely thin, to slide easily in and out of storage racks.

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To properly select a label for your application, examine the steps and environment of your lab—not only in your current process, but in any that you are planning to implement. Review this requirement with a trusted company representative and then request a sample from the manufacturer or your representative. Be sure to test it in your environment!

> "If implemented correctly, [labels] are the foundation of your internal sample management process."

Label manufacturers will also provide Technical Data Sheets that document the parameters and testing protocols that were completed for the label type. This will give you the ISO documentation for auditing, as well as the assurance that the material had quality controls in place from the manufacturer.

#3: CREATING "WASTE" IN THE LABELING PROCESS

Are your technicians walking around the lab with specimens in order to get them to the next step in your process? Are numerous specimens batch processed at one time, creating a backlog too large for the technician to handle?

As defined by lean practices, these are all examples of "waste"—any activity that does not add value to a given process. Traditionally, there are seven types of waste in a lab: transportation, inventory, motion, waiting, overproduction, over processing and defective product.

There can be numerous examples of waste in your labeling process as well. For example, large-scale labeling of a batch of carriers or tubes means that a technician must then marry the carrier or tube to the specimen later on. This results in several different types of waste: the carrier or tube can be matched with the wrong specimen, resulting in erroneous identification (type of waste: defective product); additionally, all the samples need to then wait until the entire batch is complete before they can be moved to the next step (type of waste: waiting).

Instead, you could implement an on-demand printing solution at a designated specimen printing "work cell." This would allow you to identify the carrier and then immediately match it to the appropriate specimen. It decreases the chances of placing the wrong label on the sample and greatly improves the integrity of the information. This also enables you to move smaller labeled quantities or

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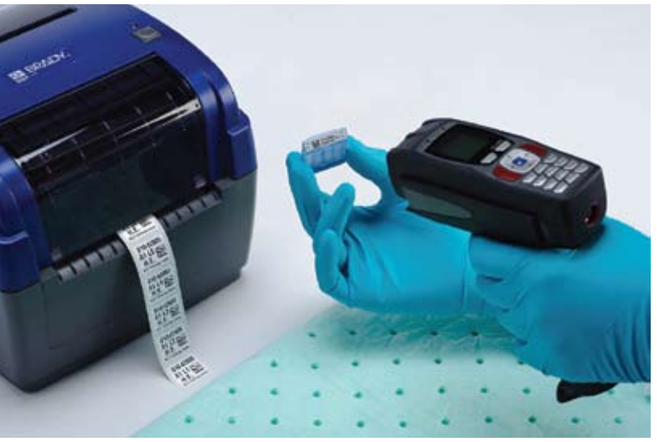
single specimens to the next step of your process as soon as they are identified, thus eliminating potential bottlenecks in the labeling step.

#4: FORGETTING THE BAR CODE ON YOUR LABEL

Even your bottled water has a bar code, so why doesn't that valuable specimen you hold in your hands have one?

Bar codes offer tremendous improvement opportunities for laboratory identification, particularly in reduction of errors and technician productivity levels. For example, it is estimated that an error is made once every 200 keystrokes. Previous methods of handwriting and tracking manually have an even higher error rate. Labs that implement bar coding, however, can significantly reduce the number of errors. In fact, it's commonly estimated that bar coding has only one error in 3 million serial bar code scans and one in 10 million two-dimensional bar code scans. A lab's specimen integrity is greatly improved by scanning a bar code and collecting the data electronically.



▲ *Standalone printing systems like the Brady BBP11 Scan and Print System can improve processing time and reduce errors.*
Photo credit: Brady Worldwide, Inc.

In addition to error reduction, bar-coded labels allow you to track, secure and manage your data in an automated process—alleviating much of the responsibility from your technicians. Bar codes allow for real-time information, keyless data entry, standardization, legibility and chain of custody tracking.

#5: LABELING ONLY FOR YOUR LAB

Every lab has its own way of identifying samples. You choose what information needs to appear on the label based on the current needs of your lab. However, it's easy to forget that these samples could potentially be used for cross studies and research and may have a life well beyond your individual lab. As the industry continues to move toward an environment of sharing and collaboration, it's important that your labels can be read and understood by those outside of your lab environment as well.

> "It's important that your labels can be read and understood by those outside of your lab environment."

A number of industry-wide best practices have been identified to give you guidance on the minimal labeling requirements for sample identification. These guidelines can be customized for your individual lab but provide a baseline for the type of information that should be included on your labels. By adhering to these best practices, labs can create a common platform for identification and data consistency throughout the scientific community.

Below is a list of biospecimen identification best practices as outlined by The National Cancer Institute.[1]

- Unique identifier or combination of identifiers
- Firmly affixed to the container
- Number or bar code
- HIPAA regulations for human subjects
- Information system tracks biospecimen from collection through processing, storage and distribution
- Data used for clinical and epidemiological
- Clear and legibly marked; able to endure storage conditions
- Shipping log tracks shipment
- Resources touching specimen

Additionally, it's important to note that in order to meet these guidelines, a complete informatics system is advisable. This includes software, hardware, written documents, support and training necessary to annotate, track and distribute the biospecimens.

Labels: A powerful tool for laboratory success

In the end, labeling is a bit more complex than it may seem. But those labels can be a powerful, effective tool that impacts the overall success of not only your lab, but labs around the world. Labels can increase efficiency; improve accuracy; reduce errors; and enable a scientific community to share data, resources and learnings.

As technology continues to progress and regulatory requirements continue to expand, there's no doubt that laboratories are going to see a number of advancements relating to labeling and identification in the future. Now is the time to implement a productive labeling system that accounts for the flow and processes of your lab—both for today and for tomorrow. The integrity of your data and the quality of your services depend on it.

References

1. National Cancer Institute Best Practices for Biospecimen Resources, Prepared by NCI, NIH, US Dept Health and Human Services, June 2007.

Nicole Nelson, *Laboratory and Healthcare Market Manager, Brady North America, can be reached at Nicole_nelson@brady-corp.com or by phone at 414-358-6744.*

BENEFITS OF BAR CODE TECHNOLOGY

- Many manual processes can be automated
- Lab efficiencies are improved
- The chance of error is greatly reduced
- Identification is clear and reliable
- Scanning of bar codes gives instant, error-free identification and traceability
- Data from bar codes can be sent automatically to correct place in software

MAXIMIZING THE VALUE OF SCIENTIFIC DATA

HOW ONE LC COLUMN MANUFACTURER USED A SCIENTIFIC DATA MANAGEMENT SYSTEM TO DECREASE OPERATIONAL COSTS AND ACCELERATE PRODUCT DELIVERY

by Steven F. Eaton and Chris Stumpf

Liquid chromatography (LC) is among the most common techniques found in analytical laboratories today. High-performance liquid chromatography (HPLC) and ultra-performance liquid chromatography (UPLC®) systems are routinely used for discovery, development, and quality-control applications in the chemical, pharmaceutical, and food and beverage industries, among others. For organizations operating in these market areas, delivering quality, consistent products is partially dependent upon the ability of their laboratories to generate quality, consistent LC data. Whether their concern is meeting regulatory standards, brand protection, or ensuring product efficacy and composition, companies must be certain that the chromatography technologies (hardware, software, and columns) employed are never a source of variability in sample characterization data. Should the manufacturers of these technologies fail to supply products with performance that is highly reproducible, their customers could face serious economic and legal ramifications.

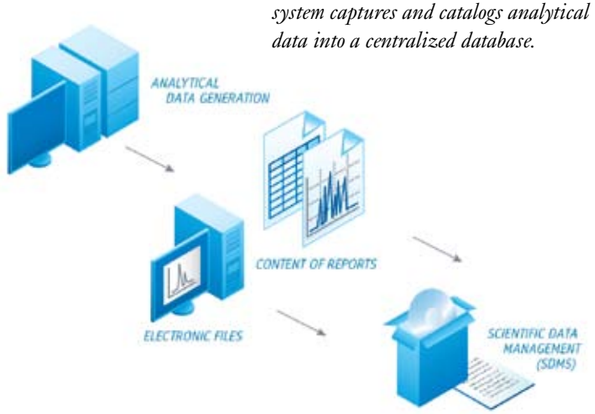
This article describes the use of a scientific data management system (SDMS) by an LC column manufacturer to produce consistently performing products for customers under intense regulatory and competitive pressures.

Total control for consistent performance

Waters Corporation, headquartered in Milford, MA, produces more than 30 different brands of chromatography columns. With each brand comprising a variety of particle sizes, degrees of porosity, and chemical modifications, the company supplies literally hundreds of product types to its customers. Two of Waters' sites—Taunton, MA and Wexford, Ireland—work collaboratively to produce the final product. The many varieties of chromatographic media are generated at the Taunton fine chemical plant, then sent to Wexford, where the columns are packed and shipped to customers around the world.

Critically important is Waters' ability to guarantee that a column delivered today performs identically to a column delivered last month, last year, or last decade. To achieve this, Waters tightly controls every step of the manufacturing process, including raw material modifications, in-process testing, and final product quality control, as well as supplying the actual column hardware (produced at the Milford facility). For Waters to exert this level of comprehensive control, the company must continuously acquire, process, interpret, and disseminate vast quantities of analytical data. If not addressed adequately, data management on this scale has the potential to create a bottleneck, negatively affecting production efficiency and customer satisfaction.

▼ *The scientific data management system captures and catalogs analytical data into a centralized database.*



To help maximize the value of scientific information, and to ensure that it is a fully leveraged asset rather than a liability, the Taunton and Wexford sites implemented a scientific data management system (SDMS) platform that is marketed by Waters' software business division (see Figure 1). The SDMS platform collects data from a wide variety of sources, including instruments (from

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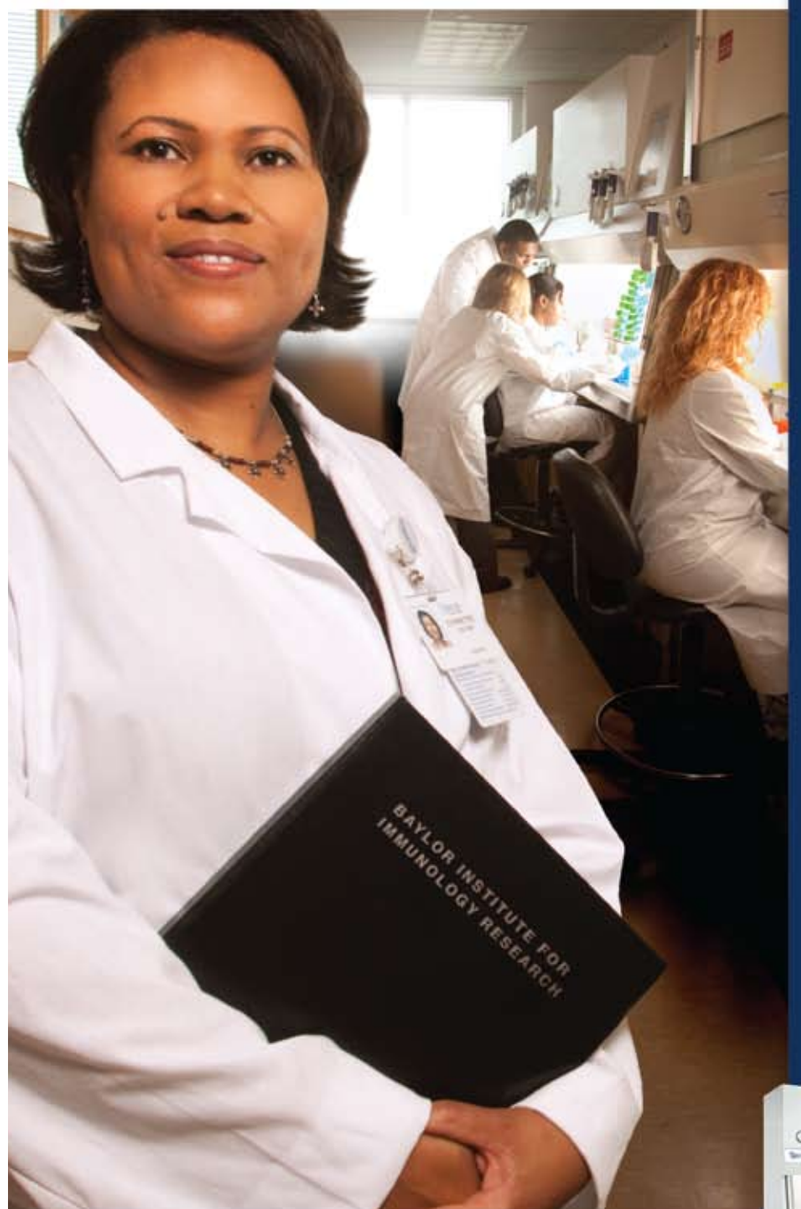

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different vendors and utilizing different technologies) and analysts. This information is automatically indexed and archived within a centralized data warehouse, where it can be searched and shared across departments or different geographic locations.

Critical manufacturing support from analytical laboratory

The synthesis of chromatographic media at the Taunton site is a multistep process that can take from four to six months. The raw silica, polymer, and hybrid particles are synthesized, then subjected to pore modification, sizing, and bonding steps. The facility produces about 150 batches each month, with 30 to 40 tests performed per batch by an in-house analytical laboratory. The lab utilizes 14 instrument types and operates dozens of systems in total; techniques include UPLC®, HPLC, GC, mass spectrometry, TGA, microscopy, and ICP, among others. All the data generated are collected by the SDMS (via its print-to-database functionality, which captures the actual content of instrument-generated reports) and used for in-process product characterization, for determination of final media quality, and in long-term trend analyses. The SDMS allows lab analysts not only to process and report these results more rapidly, but to access information more readily. There are numerous benefits to enhancing the laboratory's data management capabilities for manufacturing:

- More agile decision making
- Greater control of synthesis processes
- Lower risk of batch failures, which are costly and waste months of manufacturing time
- Superior batch-to-batch reproducibility
- Clearer understanding of existing processes, which allows for modifications that increase speed, lower costs, and improve overall product quality

"The automatic capture of column detail information with SDMS has reduced the data entry error rate to nearly zero."

Streamlining quality control and customer support

Once supplied with column hardware and media from the United States, the Waters Wexford site produces thousands of units per week. A critical step in the column manufacturing process is the review of outgoing customer orders prior to packaging and shipping. The reviewer's primary responsibility is to inspect product quality and associated paperwork. Reviewers are also required to manually

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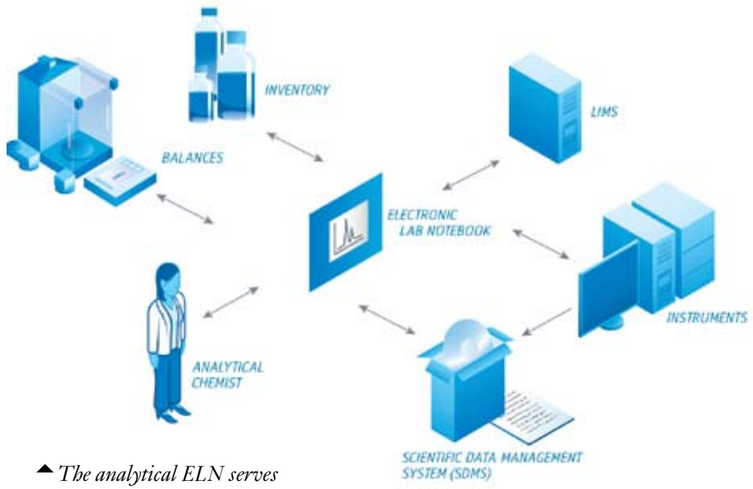
enter data for 14 categories of column detail information: efficiency, back pressure, retention time, batch number, part number, serial number, etc. In total, 56,000 manually transcribed entries are made per week—a laborious, time-consuming process. In addition, all column detail data are archived on DVDs. Accessing this information for customer inquiries regarding products in use may require up to two hours of the analyst's time, potentially reducing productivity and increasing response time.

In an effort to streamline their quality control and customer support activities, the Wexford facility implemented the SDMS platform. In the Wexford application, SDMS interacts with chromatography software via its print-to-database functionality—as reviewers print column test chromatograms, SDMS automatically catalogs the pertinent information and saves it to the database. Information on the column, including a hyperlink to the corresponding chromatogram, can be instantly retrieved at any time from multiple geographic locations.



▲ *The analytical ELN serves as a portal into data sources.*

Since implementation of the SDMS, the Wexford facility has noted several improvements in its order fulfillment workflow:

- The automatic capture of column detail information with SDMS has reduced the data entry error rate to nearly zero. During the print-to-database operation, a template ensures that all relevant indexing information is captured for each chromatogram, thus providing automated error-proofing.
- The time for a reviewer to input product data for one 96-piece customer order has been reduced by 50 percent.
- With less time required for data entry, reviewers are able to focus more time on quality improvements.
- Electronic storage of column performance records means that data can be easily shared between the Taunton and Wexford facilities on a 24/7 basis.
- By entering a particular serial number into the SDMS, an analyst has instant access to archived column quality control data. Customer inquiries on column performance can be addressed immediately, which helps minimize disruptions to the customer's workflow.

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The future: Improving workflow with an electronic laboratory notebook

To further streamline the analytical workflow in the Taunton facility, Waters is in the process of implementing the electronic laboratory notebook (ELN) capability of the SDMS platform (see Figure 2). The ELN serves as a portal into laboratory databases, allowing analysts to automatically import captured information from the SDMS repository as well as content managed by other software solutions.

For the Taunton application, automated quality control calculations to identify "out-of-guidelines" samples are being performed on imported testing data acquired during production. Although it's still in the preliminary stages, results of the ELN deployment are very encouraging. By migrating what have been historically manual activities to a fully electronic format, the laboratory is able to eliminate transcription errors, accelerate data review, improve decision making, and reduce paper usage. Additionally, the future business implications of the combined SDMS/ELN solution for the Taunton plant could be substantial, given the potential to decrease operational costs and accelerate product delivery.

> "The future business implications of the combined SDMS/ELN solution for the Taunton plant could be substantial."

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ENABLING CELL AND MICROBIOLOGICAL CULTURE FOR INDUSTRY, BASIC RESEARCH

by Angelo DePalma, Ph.D

Incubators are heated, controlled-climate chambers used mainly to grow cells or microorganisms. Together with the culture medium, conditions inside incubators are meant to mimic a cell's natural physiological conditions. Industries most likely to use incubators are pharmaceutical, biotechnology, and health care.

> "Conditions inside incubators are meant to mimic a cell's natural physiological conditions."

Although incubators operate at much lower temperatures than ovens, they resemble ovens in their requirements for temperature uniformity (ensuring even temperature throughout the unit) and precision (the ability to maintain a specific temperature). These values should be less than 1°C for high-quality incubators. Units achieve uniform heating either through fans or as a result of internal designs that promote circulation.

Two main categories

Cell culture incubators, also known as carbon dioxide (CO_2) incubators, are by far the largest group in terms of sales and application. CO_2 incubators support cell culture work in basic research and in the biotechnology industry. Diagnostics and pharmaceutical firms also use these incubators to grow test cells.

Most incubators have an internal CO_2 concentration of approximately 5 percent. Other gases, such as nitrogen, can be used to reduce oxygen levels for hypoxic cell cultures. CO_2 is used to control the pH of cell culture media and to provide a more lifelike environment in which cells can grow.

"Heat only" incubators, the other major product category, are used to grow bacteria and yeast. In some laboratories, these devices support the growth and propagation of microorganisms for research purposes; hospitals use them to culture environmental bacteria swipes for contamination control and patient samples for diagnosing infectious diseases.

CO_2 and heat-only incubators come in two basic sizes. Benchtop models tend to be small (6 to 7 cubic feet in volume) and stackable. Anywhere from one to half a dozen lab workers might use a single unit. Reach-in floor-model incubators are larger (up to about 30 cubic feet) and might hold samples from up to several dozen workers or an entire department. Floor models are popular in hospitals, which require high-volume incubators to meet demand for patient testing and sample segregation. Pharmaceutical and biotech companies also use large incubators to support cell line development, clone selection, and cell culture seeding for biomanufacturing, or to create cultures of test cells.

Benchtop incubators outsell reach-ins by about 20:1.

Contamination control

Contamination is the single most devastating occurrence in cultured cells. Contamination can delay critical diagnoses in hospitals, destroy tissues in fertility clinics, ruin basic research work on cells that may have taken months to develop, or delay a cell-based manufacturing project by months. Contamination arises from the lab environment, the researcher, or the medium being used.

Users employ several approaches to avoiding and resolving contamination, according to Scott Christensen, VP for North American Sales at NuAire (Plymouth, MN).

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duce bacterial growth; others employ HEPA filtration to prevent contaminants from entering. Incubators are usually kept free of contaminating bacteria through a combination of HEPA filtration and manual cleaning. Hand cleaning can disinfect and decontaminate an incubator, but it does not sterilize it. Sterilization is achieved by heating the unit to between 140ºC and 180ºC, which kills all pathogenic organisms present.

Which contamination control approach is most effective? "There has been a lot of discussion on that subject," Christensen tells *Lab Manager Magazine*. "Our approach is to prevent contamination in the first place." NuAire utilizes HEPA filtration in all models, resulting in an ISO Class 5 environment. Some units also use heat to periodically decontaminate the chamber, including the HEPA filter.

By contrast, BINDER's (Great River, NY) incubators do not incorporate HEPA filtration. According to Dave Craig, senior regional sales manager, filters can be expensive and require periodic maintenance or removal. "Plus, HEPA housings, fittings, and screws are perfect places for microorganisms to grow."

BINDER instead utilizes a heating cycle, which sterilizes incubators at 180ºC. Note that while heat will kill pathogenic agents lurking inside the incubator cabinet, it will not clean dirt and spills present on the inside surface.

"Cell culture incubators are by far the largest group in terms of sales and application."

Drying out is another serious issue that destroys cell cultures. Some units today employ steam generators to replenish humidity to close to 100 percent within the incubator. Steam pans—containers filled with water—are more common.

With so much of biomedical research now based on cells, one could argue that incubators have become an enabling technology for translational medicine. That's the view of Craig, who cites basic cancer research and in vitro fertilization as examples. "Human cell research is at the forefront of taking basic science from several sources and bridging it with other disciplines to optimize patient care."

***Angelo DePalma** holds a Ph.D. in organic chemistry and has worked in the pharmaceutical industry. You can reach him at angelo@adepalma.com.*

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SURVEY SAYS: YOU NEED AN INCUBATOR... NOW WHAT?

As part of our online Lab Products Survey series, *Lab Manager Magazine* has compiled the responses of 172 lab professionals regarding the use of incubators in their labs.

Laboratory incubators are used to grow and maintain cell cultures and are available in a variety of sizes and types. The incubator market is divided into two main categories: the gassed incubators which are the CO_2 incubators, and the non-gassed or microbiological incubators. CO_2 incubators are mainly used for cell culture and provide control over factors such as temperature, CO_2 for maintaining proper pH levels, and humidity, all of which affect cell growth. Microbiological incubators are essentially temperature-controlled ovens that work within the biological range of 5ºC to 70ºC and are mostly used for growing and storing bacterial cultures.

Many vendors are working toward addressing some of the common challenges associated with culturing cells, the most important of which is reducing aerial contamination. As a result, a number of incubators now offer a high-temperature decontamination cycle that works much like a self-cleaning oven.

The application and the lab professional's comfort level with the technology is what plays a big role in the selection of a new incubator. A majority of the respondents replied that the number one factor in selecting a new incubator is the performance and reliability of the unit in which to grow their cells.

For more information on incubators, please visit www.labmanager.com/incubators

If you would like to participate in our laboratory equipment purchasing surveys, please visit www.labmanager.com/surveys

Number of incubators being used in labs.

None	14%
1	14%
2	14%
3	12%
4	12%
5 or more	34%

Category of incubators being used.

CO2 incubators	53%
Microbiological incubators	44%
Other	3%

Types of incubators being used in the lab.

Benchtop	36%
Floor-standing	27%
Stackable	20%
Reach in (25 cu. ft.)	14%
Other	3%

Options for temperature control used in the lab.

Water jacketed	38%
Direct heat	33%
Air jacketed	24%
Other	5%

Related incubator components used in the lab.

Infrared CO2 control	28%
High-temperature disinfection	24%
Cooling options	19%
RH control	15%
O2 control	10%
Other	4%

Primary purpose for these incubators.

Research	51%
Quality control	18%
Clinical	16%
Manufacturing/Production	8%
In Vitro fertilization (IVF)	3%
Other	4%

Satisfaction with incubators being used.

Very Satisfied	56%
Satisfied	38%
Not Satisfied	5%
General comments on why a user is not satisfied:	
Equipment is aging, resulting in higher levels of contamination risk.	

Annual budget for related equipment, parts, maintenance, service and repairs.

$0 - $1,000	39%
$1,000 - $2,500	17%
$2,500 - $5,000	9%
$5,000+	13%
Don't know	22%

Purchasing plans for a new incubator

Starting the review process	8%
Plan to purchase in the next 1 to 6 months	15%
Plan to purchase in 6 to 12 months	10%
Plan to purchase in 12+ months	9%
No current purchasing plans	50%
Don't know	8%

Reasons for purchasing a new incubator.

Replacement of aging equipment	44%
Increase in capacity – addition to existing systems	31%
Setting up a new lab	23%
First time purchase of an incubator	0%
Other	2%

Factors/features that influence the decision-making process when buying an incubator.

Low maintenance/easy to clean	97%
Performance of product	96%
Ease of use	93%
Service and support	89%
Warranties	89%
Low operating costs	85%
Safety and health features	85%
Fast recovery times	84%
Audible and visible temperature alarms	83%
Vendor reputation	82%
Availability of supplies and accessories	77%
Minimal temperature control	77%
Past experience with product	69%
Benchtop and small footprint	59%
Stable CO2 control	55%
Currently using vendor's product	37%
Stackable up to 2 units	37%
Computer interfacing to log data	28%

Budget range for the purchase of a new incubator.

Less than $5,000	33%
$5,000 - $10,000	38%
$10,000 - $20,000	17%
$20,000 - $30,000	10%
$30,000+	2%

Respondents' fields of work.

Biotechnology	29%
Microbiology	19%
Pharmaceutical	12%
Hospital/Medical center	12%
Environment	9%
Chemical	5%
Quality control	4%
Food and beverages	3%
Other	9%

ESSENTIAL, BUT LITTLE UNDERSTOOD BY USERS

by Angelo DePalma, Ph.D

Vacuum pumps are used in dozens of laboratory applications, including filtration, evaporation, degassing, drying/freeze drying, metals/materials processing, coating, and distillation. Vacuum pumps have perhaps the widest dynamic range of any lab device, operating from just under atmospheric pressure, 760 Torr, to 10^{-17} Torr—a difference of almost 10^{-20}.

Most lab vacuum applications operate at pressures of between 1.5 Torr and 150 Torr, with the 75- to 150-Torr range typically served by house vacuum. Low-pressure applications run between 1.5 Torr and 10^{-3} Torr, while instrument-dedicated pumps can go as low as 10^{-8} Torr.

The two most common laboratory vacuum technologies are diaphragm pumps and rotary vane pumps. Diaphragm pumps are oil-free and suitable for applications above about 1 Torr, which covers the vast majority of filtrations and aspirations.

Rotary vane pumps use oil for sealing and lubrication and require substantially more maintenance than oil-free pumps. Higher pumping speeds and ultimate vacuums make them suitable for evacuating glove boxes and for drying/freeze drying.

A third technology, the scroll pump, is also an oil-less design. With ultimate vacuums of around 0.1 Torr, scroll pumps are suitable for applications requiring vacuums intermediate between diaphragm and rotary vane capabilities.

Welcome to OEM world

Historically, says Jack Abrams of Agilent (Santa Clara, CA), the lab vacuum marketplace is an "OEM world," where most users outside of physics or semiconductors (both requiring extremely high vacuum) have little familiarity with manufacturers. "It's not a user community that's deeply knowledgeable about products and options. Users might not even know, for example, that there's a turbo pump in your GC/MS. Lab workers care little about how a vacuum pump works," Mr. Abrams adds, "but they sure care when it stops working."

Matching pumps with applications

With vacuum, more is not necessarily better. "It's always best to match vacuum with the application," says Peter Coffey, VP of sales at Vacuubrand (Essex, CT).

For example, filtration requires modest vacuum (75–150 Torr). A pump pulling 10^{-3} Torr would evaporate the filter and cause channeling or rupture of the filter medium. More powerful pumps also contribute to noise pollution.

Because vacuum pumps last a long time, most laboratory workers have never purchased one. The most common practice is to replace an old pump with one just like it. According to Mr. Coffey, this practice leads to acquiring pumps that are inappropriate to applications; do not reflect current technology; and are larger, noisier, and more difficult to maintain than necessary. VACUUBRAND, like many pump manufacturers, offers extensive guidance to steer purchasers to the right pump.

Mr. Abrams cites one R&D customer whose freeze-drying chamber took several hours to achieve optimal vacuum. A more suitable pump could have reached the desired pressure in a few minutes.

Once the application is defined, the three essential characteristics of pumps are vacuum pressure capacity (also called ultimate vacuum), pumping speed, and electronic control. Control is important when the vacuum needs to be adjusted up or down, applied gradually, or maintained constant during a changing process (e.g., distillation).

Mr. Coffey rates control as the most significant recent development in pumps. "Productivity is a real issue in the labs with staffing levels as tight as they are, so a pump designed to manage an evaporation frees a lab worker from having to direct the process manually."

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The argument for oil-free pumps

Oil-free pumps are quieter, cleaner, and require much less maintenance than oil-sealed rotary vane pumps, and offer vacuum pressures that are appropriate for most lab applications.

"It's always best to match vacuum with the application."

The demand for oil-free vacuum pumps has been growing despite higher acquisition costs (about double for oil-free). It was initially believed that the cost of oil and oil disposal for twice-yearly oil changes was a significant driver, but that was not so. "It's labor costs related to maintenance and related logistics," says Abrams. An oil change takes only 20 to 30 minutes, but downtime for critical processes while the pump is being serviced is just as significant.

Pressed to provide one pearl of wisdom on new pump purchases, Mr. Coffey does not hesitate: "Never use an oil-sealed pump when an oil-free model will do the job."

Dan McDougall, senior manager for laboratory products at KNF Neuberger (Trenton, NJ), concurs. "Oil pumps are used when an application requires a deeper vacuum than can be provided by the diaphragm pump. But for the most common lab applications, such as rotary evaporation, gel drying, filtration, and vacuum ovens, oil-based pumps are overkill. An oil-free vacuum pump supplies adequate, reliable vacuum without the hassle and expense of pump oil."

What to look for

Mr. McDougall provides a thumbnail guide to pump selection:

- Match the pump to its intended use, considering materials of construction, desired flow rate, and ultimate vacuum.
- Make note of the solvents that the pump will encounter. Pumps using premium PTFE-wetted parts are recommended for pumping corrosive vapors, but other materials are suitable for less aggressive applications.
- Strive for low cost of ownership.
- Diaphragm pumps are oil-free; replacing a diaphragm is accomplished in minutes using simple tools. Oil-based pumps require oil changes and disposal, and repairs are complicated, expensive, and performed off-site.
- Consider the environment. Oil-free pumps eliminate the need to dispose contaminated pump oil and excessive water usage from an aspirator.

__Angelo DePalma__ holds a Ph.D. in organic chemistry and has worked in the pharmaceutical industry. You can reach him at angelo@adepalma.com.

www.vacuubrand.com

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SURVEY SAYS: YOU NEED A VACUUM PUMP... NOW WHAT?

As part of our online Lab Products Survey series, *Lab Manager Magazine* has compiled the responses of 194 lab professionals regarding the use of vacuum pumps in their labs.

The vacuum pump is an essential piece of equipment, used in a wide variety of applications in most laboratories. Innovation in vacuum technology is currently being driven by lab professionals who are demanding that manufacturers improve the reliability and efficiency of their vacuum pumps.

As a result, vacuum pumps of the future will offer greater reliability and be able to operate for longer periods of time before maintenance is required. Laboratory pumps are also expected to be smaller, more efficient, and generate less heat, noise and vibration. It is likely that they will also better resist corrosion and be easier to clean and repair.

Technological developments are likely to include higher shaft speeds and innovation in pumping mechanisms for improved performance. Vacuum pumps are also expected to incorporate novel materials and improved design to further improve performance and reduce operating costs.

For more information on vacuum pumps, please visit www.labmanager.com/vacuum-pumps

If you would like to participate in our laboratory equipment purchasing surveys, please visit www.labmanager.com/surveys

Number of vacuum pumps currently in place in the lab.

None	3%
1	14%
2	15%
3	18%
4	9%
5 or more	41%

Types of vacuum pumps in the lab.

Rotary vane pump	34%
Dry diaphragm pump	25%
Deep vacuum pump	18%
Water or air aspirator	11%
Filtration pump	7%
Other	5%

Applications that are currently in place.

Vacuum or pressure filtration	18%
Rotary evaporator	5%
Vacuum oven	16%
Degassing	27%
Freeze drying	15%
Gel dryer	10%
Other	9%

Primary purpose for these vacuum pumps.

Research	59%
Quality control	21%
Clinical	7%
Production	4%
Other	9%

Satisfaction with the vacuum pumps used in the lab.

Very Satisfied	41%
Satisfied	47%
Not Satisfied	12%

General comments on why a user is not satisfied:

Respondents who were not satisfied had older vacuum pumps and complained about the noise levels and the vacuum pump is starting to leak, resulting in frequent breakdown.

Annual vacuum pump budget for related equipment, parts, maintenance, service and repairs.

$0 - $1,000	42%
$1,000 - $2,500	22%
$2,500 - $5,000	10%
$5,000+	13%
Don't know	13%

Purchasing plans for a new vacuum pump.

Starting the review process	6%
Plan to purchase in the next 1 to 6 months	15%
Plan to purchase in 6 to 12 months	12%
Plan to purchase in 12+ months	7%
No current purchasing plans	56%
Don't know	4%

Reasons for purchasing a new vacuum pump.

Replacement of aging pump	44%
Addition to existing systems; increase capacity	31%
Setting up a new lab	18%
First time purchase of a vacuum pump	2%
Other	5%

Budget range for the purchase of a new vacuum pump.

Less than $500	5%
$500 - $1,500	20%
$1,500 - $3,000	17%
$3,000 - $6,000	10%
$6,000+	16%

Factors/features that influence the decision-making process when buying a vacuum pump.

Durability of product	100%
Leak tightness	94%
High suction	93%
Warranties	92%
Availability of supplies and accessories	91%
Service and support	89%
On-site maintenance and cleaning	87%
Cost of spare parts	87%
Noise level – quiet	87%
Oil-free/contamination-free pumping	86%
High pumping speed	84%
Small footprint	70%
Currently using vendor's product	68%
PTFE corrosion-resistant construction	66%
Wireless remote control	11%
Other	12%

Respondents' fields of work.

Environment	18%
Biochemistry and biology	17%
Chemical	17%
Quality control	11%
Food and beverages	8%
Pharmaceutical	7%
Hospital/Medical center	3%
Metal industry	3%
Plastics	3%
Forensic labs	2%
Fuels	2%
Other	9%

ADDING A SECOND DIMENSION TO GC

by Angelo DePalma, Ph.D

Gas chromatography-mass spectrometry (GC-MS) is the fastest-growing GC method. Mass detection, which can take a variety of forms based on the MS component, provides a dimension that conventional thermal conductivity or flame ionization detectors cannot, namely selectivity and absolute identification of both known and unknown compounds.

GC-MS is suited to every organic-chemical discipline where GC is found, including the chemical, pharmaceutical, environmental, and forensics industries, as well as basic research. But the limitations of GC-MS are the same as for GC alone: compounds must be volatilized and relatively nonpolar; molecular weights are therefore limited to about 800 Dalton.

GC-MS identifies compounds based on matching a mass spectrum from a run with entries in a database or spectral library generated with the same MS technique (hardware, ionization, detection).

Continuous improvement

Environmental Protection Agency and U.S. Pharmacopoeia GC methods are bedrock techniques used and referred to for environmental and pharmaceutical analysis, respectively. These methods have benefitted tremendously from the adoption of mass detection, notes Trisa Robarge, GC and GC-MS product manager at Thermo Fisher Scientific (Austin, TX). "As regulations for both industries evolve toward lower detection limits and higher specificity, analysts have benefitted particularly from triple-quad MS, which facilitates analysis of low-level compounds from complex samples."

"GC-MS is suited to every organic-chemical discipline where GC is found."

Whereas co-elution is common in GC, MS distinguishes closely related compounds, for example structural isomers, on the basis of their fragmentation patterns. And while MS cannot tell mirror-image enantiomers and most diastereomers apart, GC columns can—in the case of enantiomers with a chiral stationary phase. This is one reason why GC and MS are considered complementary techniques, and why their combination is so powerful.

Software and information technology supporting GC-MS have also greatly improved, Robarge says. Many systems today are supported by compound libraries and integrate with laboratory information management systems and/or electronic notebooks that allow archiving, managing, and sharing of analytical data.

A typical entry-level GC-MS system would likely incorporate a single-quadrupole ("quad") detector or a more sophisticated ion trap, which allows extensive analysis of fragments and fragments of fragments—"MS/MS" experiments. Also popular are time-of-flight (TOF) instruments.

These detectors suffice for most applications but their resolution is only about one atomic mass unit. To analyze isotope ratios one would turn to either a triple-quad or magnetic-sector MS detector. "But as selectivity goes up so does your investment," Robarge tells *Lab Manager Magazine.*

Not for every application

Despite the appeal of GC-MS and the broad range of cost and capability available, not every method demands its sensitivity and selectivity. Flame ionization is perfectly suited to quantifying blood-alcohol levels or analyzing low-molecular-weight hydrocarbons in the oil and gas industry, and electron capture is routinely used to screen pesticides in foods.

"While standard detectors serve many applications today, when selecting a detector, users should try to calculate the price of being wrong," cautions Robarge. "The bottom line is to get the detector you need to do the job."

connection and lack of instrument connectivity.

Thermo Fisher introduced its own Web-based product last year, targeting organizations that perform repetitive, routine testing. Shah says, "It's not a new product, but a new way of delivering it."

According to Shah, many customers don't want or need instrument connectivity. Some may simply wish to free workers from entering and looking up data manually; others may require the ability to share actionable data on the fly with colleagues on the next floor or around the world.

"Online systems create visual dashboards for decision making," he says.

Finally, there are pure "workflow" customers whose only need is a safe, secure place to store and access data.

Electronic laboratory notebooks

A recent survey indicated that most lab scientists can't tell the difference between LIMS and electronic laboratory notebooks (ELNs). No wonder, since the product literature is dense with computer and information technology jargon.

An ELN is, quite simply, a replacement for the bound paper notebooks lab workers used for most of history. ELNs hold specific experimental data that reflect minute-by-minute, documentable lab activities.

Together, ELNs and LIMS help lab workers design experiments, document and archive all data, share data with colleagues anywhere in the world, and provide a legal basis for generating intellectual property.

John McCarthy, VP of product management at Symyx (Santa Clara, CA), says that while LIMS are designed for structured information, ELNs need to be ready for almost anything. "LIMS help to orchestrate lab work, like moving samples from one experiment to another and capturing information. ELNs augment LIMS by providing the capturing of the plan of the experiment and pulling the data into the notebook," he says.

For example, process development in chemical or pharmaceutical labs may call for 100 experiments, each generating dozens or hundreds of data points. Once the process is optimized, the next group, scaleup, will need access to the top experimental candidates. "They'll want to see not just the reactions but the conditions, and why certain reactions didn't work," McCarthy explains. "That information is lost or buried in LIMS."

Symyx and Thermo Fisher have partnered to integrate the former's ELNs with the latter's LIMS. The two product categories are rapidly converging, in fact, but what the final package will look like is anyone's guess.

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EVOLUTION OF LAB REFRIGERATORS AND FREEZERS

BY JOHN BUIE

Most laboratories require some form of refrigeration to store samples, reagents and analytes. Dedicated laboratory refrigerators are normally required for this purpose, as domestic units tend not to provide the necessary stable and predictable temperatures and may not offer sufficient protection against accidents or explosions. Most laboratory refrigerators and freezers are equipped with alarms to warn against significant temperature deviation, as well as monitoring systems to record any alterations in temperature.

Laboratory refrigerators come in various sizes, from benchtop models for convenience, to upright models for storing larger quantities of reagents and freeze-dried products.

In the 11th century, the refrigerated coil, which was able to condense aromatic vapors, was invented by the Persian scientist Ibn Sina (Avicenna). He used refrigerated tubing to distill the essential oils.

In **1748**, artificial refrigeration was demonstrated for the first time by William Cullen of Glasgow University, UK.

In **1805**, the first refrigeration machine based on vapor rather than liquid was invented by Oliver Evans.

In **1820**, Michael Faraday, the renowned scientist and inventor, became the first to demonstrate that liquefaction of ammonia caused cooling.

In **1851**, the first ice-making machine was invented by John Gorrie.

In **1856**, James Harrison, an Australian, was commissioned by a brewery to build a machine that could cool beer. He successfully developed vapor-compression refrigeration, which was almost immediately taken up by the brewing industry and was also widely used by meat-packing factories.

In **1859**, Harrison's initial design was refined by Ferdinand Carré of France. Carré's device used rapidly expanding ammonia as the coolant in place of air.

In **1876**, a continuous process of liquefying large volumes of gas was invented by the German engineer Carl von Linde. This paved the way for the development of the modern refrigeration industry. In 1878, Carl von Linde went on to found the company Lindes Eismaschinen AG (Society for Lindes Ice Machines), which now operates as Linde Group.

In **1881**, Arnold Gross and Edmund Copeland founded the Leonard Refrigerator Company (later known as the Electro-Automatic Refrigerating Company).

In **1895**, Carl von Linde was granted a patent for the liquefaction of air following his continued interest in the development of lower temperature systems.

In **1901**, a patent was issued for the "Refridgeator" (ice box), as invented by Henry Trost.

In **1914**, the first alternative to the ice box, the DOMELRE (DOMestic ELectric REfrigerator), was launched. This was a single-compartment unit housing an internal freezer sub-compartment.

In **1915**, the company Guardian Frigerato was founded by Alfred Mellowes and began to build standalone refrigerators for domestic use. The company was later purchased by General Motors and renamed Frigidaire.

In **1922**, Swedish students Baltzar von Platen and Carl Munters invented the absorption refrigerator, submitting the design as part of their degree studies. The heat source that initiated the process could be fuelled by electricity, gas or kerosene, making the system extremely flexible. The commercial potential of the absorption refrigerator was recognized by Electrolux, who commercialized the invention and enjoyed its worldwide success.

In **1923**, the Frigidaire Company released a self-contained refrigerator which, for the first time, allowed all components of the device (including condenser, motor and compressor) to be contained in one unit.

In **1925**, Electrolux launched its first refrigerator, the D-model. This had a volume of 91 liters, with a cooling unit and electrical fittings built into a "hump."

In **1927**, General Electric (GE) introduced the "Monitor-Top" refrigerator, the most successful refrigerator of its time and the first to be widely used. Over 1,000,000 units were produced, and many functioning examples still exist today. A great deal of heat was emitted from the compressor assembly of this model, which was positioned above the cooling cabinet. These refrigerators used hazardous chemicals (methyl formate of sulfur dioxide) as the refrigerating medium.

In **1930**, the first built-in refrigerator, the model "M3," was introduced by Electrolux. Previous models had all been freestanding. In the same year, Frigidaire released the Hydrator with an adjustable slot to regulate the amount of air allowed in.

In **1931**, the first air-cooled refrigerator, the model "L1," was produced by Electrolux. This was considered a technological breakthrough. Unlike the previous model D refrigerator, which required both a power source and running water to function, the L1 used air to cool the ammonia, making it independent of a water source. This permitted the refrigerator for the first time to become a 'standalone' unit, allowing for much greater flexibility in its use.

Also in **1931**, DuPont began to produce commercial quantities of the chlorofluorocarbon coolant, Freon, as an alternative to hazardous agents, such as sulfur dioxide, that had been used previously. This advance allowed the refrigerator market to expand even faster.

1750 1800 1850 1900 1950 2000

In **1933**, the first refrigerator incorporating shelves on the inside of the door was launched by Crosley.

In **1938**, GE introduced a refrigerator with a dedicated heat control, allowing users to adjust the internal temperature of the refrigerator. However, as this electrical device was not grounded, many customers reported receiving unpleasant electric shocks.

During the **1940s**, separate freezers began to be marketed, although they were not mass produced for domestic use until after the Second World War. Prior to this time, freezers were only available as the ice-cube compartment within the refrigerator unit. The war years saw a halt in developments in refrigerators and freezers as many companies were diverted into manufacturing machinery for the war effort.

In **1947**, GE introduced the first combined refrigerator-freezer unit with separate external doors for both compartments.

During the **1950s** and **1960s**, many cosmetic advances were made to refrigerators used in the home, including the development of drink and ice dispensers, revolving shelves and coordinated colors. However, few advances were made to the fundamental technology, and the laboratory refrigerator was largely unchanged during this time.

In **1958**, Frigidaire launched the first frost-less fridge, removing for the first time the need for frequent defrosting.

In **1968**, ScienTemp began manufacturing laboratory freezers.

Early in the **1970s**, NuAire was awarded a contract to design and manufacture the first modern biological safety cabinet to meet U.S. National Institutes of Health Specifications. This unit was known as the "Laminar Flow Biological Safety Cabinet".

In **1976**, responding to environmental concerns and the ongoing energy crisis, Sears launched the Coldspot Power Miser, which claimed to use 40 percent less electricity than its competitors.

In **1987**, SANYO developed their first ultra-low temperature (ULT) freezer, the MDF-2135, capable of achieving temperatures of -135 °C.

In **1991**, SANYO developed the world's lowest temperature freezer, the MDF-1155, reaching temperatures of -152 °C.

In **1993**, in response to growing concern about the environmental impact of CFCs, the use of Freon was discontinued in refrigerators. Freon was replaced by the non-ozone-depleting gas, tetrafluoroethane.

In **1997**, SANYO introduced the world's first vacuum-insulated freezer, the ULT freezer MDF-U70V, which operated at -86 °C. The vacuum panels offered greater internal storage without impacting external dimensions.

In **2007**, LABREPCO launched the "Futura" media storage refrigerator for the storage of cell cultures that required 45 percent less energy than standard laboratory refrigerators.

In **2001**, New Brunswick Scientific (NBS), introduced the space-saving Innova® Model U101, the world's first personal-sized, upright ULT freezer that fits on or under the bench, enabling scientists the security and convenience of being able to keep their samples directly in their lab. The U101 featured use of vacuum insulation panel technology to maximize internal storage without impacting external dimensions.

In **2007**, NBS was among the first to offer an eco-friendly and cost-saving "Green Freezer" line in which detrimental HFC refrigerants were replaced with hydrocarbon-based refrigerants. The new design significantly lowered energy consumption and operating costs. These freezers are not available in the U.S., where use of hydrocarbon refrigerators is prohibited.

In **2010**, NBS launched a new line of high-efficiency freezers (HEF™) that offered a number of innovations. The combination of vacuum insulation panel technology, new and improved circulation and compressor systems, and in 50 Hz models the use of hydrocarbon-based refrigerants, allowed these freezers to consume up to 65 percent less electricity than competitive units.

Also in **2010**, SANYO launched the world's safest ULT freezer with -86 Dual°Cool™ technology. This freezer avoided conventional cascade refrigeration technology by using two completely independent one-compressor, autocascade cooling systems, each capable of maintaining ultra-low temperatures.

In **2008**, Marvel Scientific introduced a new series of general purpose lab refrigerators featuring enhanced microprocessor technology and its exclusive MicroSentry™ scientific refrigeration monitor for superior temperature accuracy, control and monitoring of critical contents.

FUTURE OF LABORATORY FRIDGES AND FREEZERS

Future innovations in freezer technology are likely to center on the development of alternative safe and effective refrigerants. Refrigerants are currently required to have an Ozone Depleting Potential (ODP) of zero, to be effective in conventional refrigeration machinery, to be non-toxic, non-flammable, and to have low global warming potential (GWP). It is very difficult to meet all these requirements. Hydrocarbon refrigerants, which meet many of these criteria and are widely used in Europe, are currently banned in the U.S. due to concerns over flammability.

An alternative refrigerant that may be used in the future is carbon dioxide, which was used in the early days of refrigeration, but fell out of use during the 1950s with the introduction of efficient halocarbon refrigerants. Experts predict that carbon dioxide will be increasingly used in a variety of ways, including in high-pressure carbon dioxide compressors for refrigeration and as a volatile secondary coolant.

WHAT'S THAT SMELL?

INDOOR ENVIRONMENTAL QUALITY DURING CONSTRUCTION AND RENOVATION

by Vince McLeod

If you have worked as a lab manager long enough, you have probably lived through at least one construction or renovation project. Maybe it went smoothly and you can barely remember the details. Most likely, however, a number of things went wrong and there are memories that you want to forget, perhaps even a nightmare or two. In this month's column, we intend to help you avoid replaying those bad scenes and enlighten you about how to proactively eliminate the most common errors.

"Most EH&S programs will have an IEQ policy that will make your job much easier."

In order to maintain employee and occupant health, comfort and productivity, it is essential to manage indoor environmental quality (IEQ) effectively. Below, we provide a few guidelines to assist you in reducing and minimizing any negative impacts from renovation projects or adjacent new construction on occupied spaces, and hopefully preserve acceptable indoor environmental conditions both during and after your renovation project.

The first step is to involve your Environmental Health and Safety (EH&S) office as early as possible. Most EH&S programs will have an IEQ policy that will make your job much easier. If the EH&S office is given the opportunity to review and comment on architectural or engineering submittals, many of the pitfalls can be avoided altogether. If any of the recommendations given here are at variance with traditional/consensus guidelines or local codes, try to apply the more stringent of the two. Make sure any exceptions or variations are reviewed and approved by the EH&S office.

The most common IEQ concerns stemming from construction and renovation projects are transient smells, nuisance odors, noise and dust. Building occupants can experience mucous membrane irritation and headaches, as well as aggravated allergies or asthma symptoms, even with low-level exposures to contaminants. In addition, excessive noise has a definite effect on focus, concentration and productivity. If these conditions are repeatedly introduced into the occupied areas, the workers are going to let you know about it, and rightfully so. However, most of these conditions that affect IEQ, and thus employee comfort, productivity and health, are preventable. After years of dealing with IEQ complaints resulting from construction and renovation adjacent to occupied spaces, we recommend the following tips to keep your project moving toward completion and your employees happy, healthy and productive.

- Prior to beginning your construction or renovation project, ensure that the ventilation systems supporting the adjacent, occupied spaces are generally consistent with all appropriate recommendations of the latest version of the American Society of Heating, Refrigeration and Air Conditioning Engineers Standard 62, *Ventilation for Acceptable Indoor Air Quality.*[1] This might be a good time to perform a test and balance of the ventilation system, unless one has been done in the past twelve months.
- Separate construction/renovation project areas from adjacent, occupied areas with full-height hard wall barriers. These type of barriers will effectively block any transmission of dust, odors or other contaminants and attenuates noise, thus isolating the construction zone from the adjoining work areas.

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- Maintain the construction/renovation areas with a slight negative air pressure, relative to the adjacent, occupied spaces. Should positive pressurization occur, then contaminants, dust and odors could push into nearby offices and labs. Set up and maintain negative pressurization during the test and balance by adjusting the HVAC system or installing additional exhaust ventilation to support the construction/renovation work. If local exhaust ventilation is used, for example, specialized hoods or snorkel systems, it should follow the recommendations of the American Conference of Governmental Industrial Hygienists' *Industrial Ventilation, a Manual of Recommended Practice.*[2]
- For the construction/renovation work, try to segregate all areas utilized for containment. Move any odor-or contaminant-generating activities away from the return air system and ensure that adequate exhaust air is provided. Alternatively, you could block the return air vent temporarily in the construction/renovation area.
- Make sure regular, daily housekeeping is performed to prevent construction workers from tracking dust and debris outside the work area and into occupied spaces. If possible, set up decontamination zones or antechambers so that workers can wipe down and clean off before leaving the construction area. The use of sticky mats greatly reduces the dust and debris carried by worker footwear. Your facility housekeeping staff will also appreciate their use.

"The use of sticky mats greatly reduces the dust and debris carried by worker footwear."

- Ask the facility maintenance personnel to perform a routine checking and replacing of HVAC system air filters throughout the project. Use more efficient filters if dust loading in adjacent occupied areas becomes excessive. We recommend pleated, extended surface area filters with a minimum dust spot efficiency of 60 percent (MERV 11).
- Many construction and renovation projects necessitate the use of equipment that produces odors or contaminants, and this equipment is often set up outside. Examples include roofing tar pots, spray equipment, pressure washers, portable gas- or diesel-powered engines or generators, and portable showers/lavatories. Any such equipment set up outside must be carefully located well away from any ventilation system air intakes and building entrances to prevent the re-entering of contaminants.
- Make sure that Material Safety Data Sheets are maintained on-site for all chemical products used during the construction/renovation process. When the inevitable calls start coming in, you will need to know what the contaminants are so that the appropriate actions can be taken.

Construction and renovation projects are always fraught with unknowns and the unexpected. Even if you are extremely diligent, chances are something will upset the delicate balance and cause unacceptable indoor environmental quality conditions in unintended places. There may be times when controls are just not possible. When these cases arise, your only alternative may be to have your contractors schedule a continuation of the work after regular work hours or on weekends. It is not often that you run into these situations, but it is a good idea to consider adding contingencies to the project budget, just in case. Good luck with your next construction or renovation project, and remember—Safety First!

References

1. *Ventilation for Acceptable Indoor Air Quality.* American Society of Heating, Refrigeration and Air Conditioning Engineers Standard 62-2009. Atlanta, Ga.
2. *Industrial Ventilation, a Manual of Recommended Practice.* American Conference of Governmental Industrial Hygienists. 27th Edition, 2010. Cincinnati, Ohio.

Vince McLeod *is an American Board of Industrial Hygiene–certified industrial hygienist 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.*

SAFETY TIP

CONDUCT PERIODIC, UNANNOUNCED LABORATORY INSPECTIONS

By James A. Kaufman

Inspections are an integral part of a good safety program. This is your time to step back a little from your day to day involvement and look for problems and opportunities for improvement as well as things that are well done. Don't hesitate to praise good work, safe practice, improvements, and good ideas.

People need to feel that the inspections are being done to make the working and learning environment safer and healthier for all. They are not to blame or to get someone. At the same time, it may be necessary to note some unsafe practices.

You need to be sure that the emergency equipment is in place, unobstructed, properly designated with signs, and properly functioning. Check electrical receptacles for correct wiring with a ground monitor. Check the hoods for proper air flow. Check the stockroom for security and overcrowding. See that benches and aisles are kept clear and free of materials that should have been put away. And so on. . . .

As you conduct your inspection, make a written list of those opportunities that you identify for improving lab safety. When you're done, prioritize the list to identify the more serious issues. Give copies of the list to department members, the maintenance department, and the management and administrators. Now you need to work diligently at trying to make those improvements that are within your ability and resources. Seek assistance for the rest.

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

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« EXPERT: Murat Kantarcioglu, Ph.D.

ASK THE EXPERT

HOW TO SET UP LAB AND DATA SECURITY

by Tanuja Koppal, Ph.D.

Murat Kantarcioglu, Ph.D., is an assistant professor in the Department of Computer Science and the director of the Data Security and Privacy Laboratory at the University of Texas at Dallas. His research focuses on creating technologies that can efficiently extract useful information from any data without sacrificing privacy or security. Recently, he has been working on security and privacy issues raised by data mining, privacy issues in social networks, privacy issues in health care, and risk and incentive issues in assured information sharing. His lab has created open source tools, such as the "Anonymization Tool Box," that people can download and use to sanitize data and share it in a secure fashion. The tool box has compiled the best tools made available by various sources and put them together in one convenient location for public use. Kantarcioglu obtained his master's degree and Ph.D. in computer science from Purdue University.

Murat Kantarcioglu, Ph.D., assistant professor in the Department of Computer Science and director of the Data Security and Privacy Laboratory at the University of Texas at Dallas, talks to Tanuja Koppal, Ph.D., contributing editor at* Lab Manager Magazine, *about the new technologies he is creating for mining and sharing various types of data without compromising the security or privacy of the information. He offers much-needed advice on how lab managers should go about setting up some basic protocols and appropriate levels of security for protecting the data in their labs.

Q: What needs to be done to set up adequate data security in a lab? Where do you begin?

A: There are many tools out there to help secure digital data in a laboratory. The first line of defense is setting up some firewalls to limit remote access to machines and servers that have the data. The second line of defense is to have fine-grained access control of various types of data to determine who has access to what. If people need access to all the data that is available, then you can have accountability in place by creating a secure log-in mechanism to keep track of who accesses what, and if there is a misuse or abuse you can use the system logs to sort out any issues; this is the third line of defense. The fourth is the physical security of the systems, to avoid any thefts or loss of hardware. This involves having a card-access to the server locations and to the labs. What I am seeing is that old access continues even after people have left a lab. Physical security certainly should not be overlooked. To implement these measures, your machines should be uploaded with the latest security patches. You realize the need for security once you have lost it. It's like air. You realize its importance once you start suffocating.

> "You realize the need for security once you have lost it. It's like air. You realize its importance once you start suffocating."

Q: How do you deal with securing really critical data?

A: For data that is very critical, we have to do some basic risk management. For instance, perform some 'thought experiments' to figure out what will happen if the data is leaked to the outside world. If the result is severe, then you should be more cautious and look into putting more controls in place, such as denying access to the Internet, disabling all USB ports, and minimizing unnecessary programs and operating system functionalities. For some kinds of data, I think the best solution is to limit its exposure. The more software programs you have on your machine, the more vulnerable it is to bugs [malicious codes]. These are the basic steps that you need to follow to protect and secure your data.

Q: Are there any resources that can help lab managers budget for some of these security initiatives?

A: Usually, the people in the information technology (IT) and security departments in most companies and organizations are well-informed; asking them for help could be a good starting point. Also the tools for setting up firewalls and database encryption may already be available in the IT department and you may have the license to use the tools you need. It's important to always start as early as possible with data security in mind, as it gets harder to put things in place later. At the same time, it's never too late to start thinking about security. There are always things you can do to reduce the risks.

Q: How do you rate the commercially available tools, and can they be customized for your needs?

A: The main problem with commercially available tools is that there are many limitations with security when it comes to sharing data. The other issue is that some of the systems out there are too big and have many software bugs. Hence, as a last line of defense, we store our data in an encrypted data format and are developing tools to protect ourselves from some of those vulnerabilities. There is no absolute protection. It's about reducing the risk to an acceptable level to manage a good research environment. Many start-ups and research groups are also putting out new tools. Over time there will be many more tools available to users and many of them will be open source.

Q: Is there any sharing of ideas across various fields when it comes to data security?

A: The tools that we are working on in my lab are supported by the work of and grants from the U.S. Air Force. The defense industry leads the way in this field, and we are trying to apply some of those same tools to the health care domain. However, there are some key differences. For instance, securely sharing data with coalition partners on different missions is critical in defense, but sometimes individual privacy is not an issue. However, in health care, individual privacy is a big issue. So there are differences, but there is a possibility for inspiration.

Q: What is your goal as the director of the Data Security and Privacy Lab?

A: Our mission is to install, share, mine, and learn from any kind of data without worrying about security and privacy issues. We are looking at this from an interdisciplinary perspective by integrating ideas from computer science with those from data mining, database and risk management, and also from economics. Our research is supported by grants from diverse sources, such as the National Science Foundation, Air Force Office of Scientific Research, Office of Naval Research, National Security Agency, and National Institutes of Health, and we are looking to come up with software tools to disseminate our research to the public. There are many labs across the country working on computer security, but what we are focusing on is the security of the data itself.

PERSPECTIVE ON: A MUNICIPAL WATER LAB

SAFEGUARDING OUR DRINKING WATER

by Sara Goudarzi

Monitoring the Adirondack mountain watershed.

The Mohawk Valley is a region of New York State that surrounds the Mohawk River, the largest tributary of the Hudson River. North of the Mohawk and Hudson rivers lies the Adirondack Park, the largest park and National Historic Landmark in the contiguous United States.

The source water for Mohawk Valley Water Authority (MVWA)—a utility company in Utica, NY, that treats and delivers potable water to the surrounding area—originates in the Adirondacks. This water gathers in the streams and creeks of a 373-square-mile Adirondack mountain watershed and drains into the West Canada Creek, which carries the water to the New York State-owned Hinckley Reservoir.

"Our watershed team monitors these streams and the reservoir," says Connie Schreppel, director of water quality at MVWA. "Their testing includes but is not limited to routine water chemistries, plankton and algae analysis, and monitoring for waterborne protozoa such as *Giardia* and *Cryptosporidium*."

In addition to keeping an eye on the water source, Schreppel and her team monitor and test the water as it travels through a water treatment plant and more than 600 miles of water mains in the distribution system, which provides potable water to customers' homes and businesses.

"The main function of the MVWA water quality laboratory is to ensure that our 129,000 customers are provided with safe potable drinking water that meets or exceeds all drinking water standards and regulations," says Schreppel.

Organizational structure

Schreppel oversees a 2,100-square-foot water quality lab and the 300-square-foot laboratory located in the treatment plant. She also oversees the operations of a less-than-typical lab, what she refers to as the Adirondack watershed lab.

To run the three divisions, she manages a staff of 15 that ranges from lab technicians to field specialists and scientists to water treatment plant operators.

"Most of the staff in the water quality laboratory is specialized in biology with minors in chemistry," she says. "The treatment plant staff is licensed by the State of New York and is required to complete a laboratory skills course as part of their training. They are also required to take 30 hours of continuing education training, including a laboratory refresher course, every three years."

"Most of the staff is specialized in biology with minors in chemistry."

Schreppel herself has an undergraduate degree in laboratory technology and is a registered medical technologist through the American Society of Clinical Pathologists. After working five years in a clinical microbiology lab, she decided to work in water quality and pursued her graduate studies in environmental science. She also holds a New York State Grade 1A Water Treatment Plant Operators license—a certificate required for those who operate or supervise a drinking water facility.

"The MVWA water treatment plant operators are trained in laboratory operations and are motivated to produce the best-quality drinking water," Schreppel says. "Recent advances in water treatment plant instrumentation and laboratory equipment have allowed our staff to use their ingenuity to further optimize water treatment. They have worked diligently to enhance the traditional processes and continue to ask how a process could be improved with the use of new tools. They are not encumbered by 'that is the way it has always been done.'"

Processes

In order to service their clients—residential areas, hospitals, nursing homes, four colleges, state prisons and manufacturing facilities—with water that is free of pathogens and vectors, officials at MVWA carefully planned suitable treatment processes.

MVWA's filtration plant began operations in 1992 and chose direct filtration as the main treatment

process. This process adds a chemical coagulant—in this case, alum and a non-ionic polymer—to the source water that is then passed through filters for removal. Chemical coagulants help particles aggregate and form larger masses that are more easily removed in the filtration process.

▲ *MVWA's pilot filter lab.*

Filtered water is then disinfected using free chlorine. Later, lime and soda ash are added for corrosion control, followed by fluoride for its dental benefits.

"The treatment plant laboratory has gone beyond performing basic analyses such as alkalinity, hardness, color, turbidity, pH and the traditional jar test [and] has incorporated the use of streaming current monitors, coagulant charge analyzers, particle counters, UV_{254} analyzers and gas chromatographs into the routine to better understand the true picture of the treatment process and look for improved approaches to water treatment," Schreppel explains.

The team at MVWA has created Supervisory Control and Data Acquisition (SCADA) monitoring screens to illustrate the data generated as the water travels throughout the process and into the distribution system. This real-time information, which is also saved, creates a database that's available for water quality assessment.

"By utilizing these laboratory tools, staff are better equipped to look at a more complete picture of the water's true quality and quickly determine if the chemical dosing adjustments are being made in the right direction," Schreppel says.

She adds that increased exposure to such instrumentation and data has served to broaden the staff's knowledge and has empowered them to make decisions that improve overall plant operations.

Once the water is ready for consumption, it goes through the distribution system—a network of pipes buried underground that is continually monitored.

Each morning, trained laboratory staff travel throughout the areas served by the water system and monitor the levels of chlorine disinfectant throughout the piping network.

They also collect samples for bacterial and chemical analyses and visit meter stations and pump houses throughout the distribution system to gather these water quality monitoring samples.

▼ *Testing samples for bacteria.*

Inventory, maintenance, hiring

MVWA's workload varies. The team performs a variety of experiments from 1,000 microbiological tests to about 30 tests for *Giardia* and *Cryptosporidium sp.* to 1,000 routine wet chemistries each month.

"The laboratory is also engaged in method development research involving flow cytometry, PCR and toxicity testing."

"The treatment plant laboratory performs a wet chemistry battery of tests twice each day as well as jar tests and other diagnostic tests for process control," Schreppel says. "The water quality laboratory is also engaged in method development research involving flow cytometry, PCR and toxicity testing."

With such a wide range of tests, the lab team must ensure that all the processes are running smoothly and the materials needed to run the tests are available.

Schreppel's staff handles the inventory for all the materials required to run the water quality lab, the treatment plant and the distribution system.

"Our clerk processes the requests for the purchase of supplies," Schreppel says. "I have final review and approval. Since we are a government agency, we must utilize competitive bidding for many purchases."

Schreppel and her staff routinely use instruments such as pH meters, spectrophotometers, turbidimeters, total organic carbon analyzers, discrete and continuous flow analyzers for wet chemistries, and microscopes equipped with fluorescent filters and differential contrast microscopy.

In order to maintain this equipment, twice a year a private instrument maintenance company performs calibrations and maintenance checks on the instruments. For routine maintenance, Schreppel relies on the water quality staff who are assigned to specific equipment based on their areas of expertise.

"[They] are expected to perform routine maintenance on equipment and maintain quality control records," Schreppel says. "This function is supervised and reviewed by the QA officer and myself."

For their hiring needs, Schreppel counts on MVWA's human resources director, who helps her find a qualified individual and process the necessary paperwork.

"Because we are a government entity and are covered by New York State civil service regulations, new job candidates must meet job criteria and are appointed provisionally until they pass a competitive civil service exam," she says.

Challenges

According to Schreppel, the biggest challenges include making sure

PERSPECTIVE ON: A MUNICIPAL WATER LAB

that each day the treatment plant provides the best possible water to customers and that the water meets all regulatory requirements.

This is especially tricky because of the aging distribution infrastructure.

> "We must utilize competitive bidding for many purchases."

Many of the water mains are more than 100 years old and require diligent monitoring and analysis. But her staff, who are motivated and well-trained, know how to work with the older system to ensure that water quality is not compromised.

Additionally, like most public water systems, MVWA has practiced chlorination since the turn of the 20th century, when it was recognized that waterborne diseases could be eliminated or greatly reduced by disinfection.

Ironically, Schreppel explains, chlorination caused a problem of another nature. Like many other surface water sources, MVWA's water supply is rich with natural organic matter (NOM). Growing research in the 1970s demonstrated that when chlorine is added to waters with a high concentration of NOM, the formation of potentially harmful and cancer-causing disinfection by-products (DBPs), such as trihalomethanes (THMs), increases.

New regulations, which will take effect in 2012, require significant reductions in DBPs.

"The staff must ensure that the maximum amount of organic matter is removed by our treatment process," she says.

"The laboratory and treatment plant staff has been engaged in research for the past eight to 10 years and will be altering the treatment process with the addition of granular activated carbon into the treatment train next year. This will ensure maximum removal of the natural organic matter that can contribute to the disinfection by-products."

This is just one example of how the science of water treatment has changed in the 34 years that Schreppel has been in the water quality laboratory field.

"The water industry is now detecting chemical compounds in the parts per trillion and we must now deal with the implications of detecting endocrine-disrupting compounds and personal-care products in the drinking water," she says.

"Another area of concern that has evolved since 9/11 is the security of the water system and the development of ways to quickly detect a contamination event, whether it is intentional or accidental."

But it's the challenges and ever-changing nature of this field that intrigues Schreppel.

There is rarely a routine day, she explains. "Every day presents a new challenge that must be incorporated into the scheduled testing procedures. My staff also makes the job enjoyable; we have a relaxed and friendly atmosphere and strive for a team approach," Schreppel adds.

She also believes that keeping up with new science and technologies in the field is the way to stay on top of unforeseen complexities.

"You have to stay well-informed concerning water issues and regulations. Participation in organizations such as the American Water Works Association (AWWA) and the Water Research Foundation (WRF) keeps you current, and these organizations offer educational and networking opportunities as well as showcase the latest in technologies available to the water quality laboratory," she says.

For Schreppel, the challenges and the extra effort she puts in are worth the rewards of the job.

▲ *Testing for contamination.*

"It is staggering to realize that well over a billion people in the world lack safe water, over 6,000 children die every day and over 10 million children die before their first birthday due to waterborne disease," she says.

"We must embrace the fact that only 3 percent of the earth's water is freshwater, and we must diligently safeguard that natural resource because, in contrast to oil, it truly is the most important liquid resource needed for our survival."

Sara Goudarzi *is a freelance writer based in New York City. Her Web site is www.saragoudarzi.com.*

"Thank you Rice Lake!

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INSTRUMENT LIFE-CYCLE MANAGEMENT

STRATEGIES FOR OPTIMIZING CAPITAL EQUIPMENT ACQUISITION, REDEPLOYMENT AND DISPOSAL INVESTMENTS

by Michael Pope

A key factor in maximizing return-on-investment in the lab is the ability to align the right scientific instruments, i.e., fixed lab assets, with science initiatives. Maintaining the right scientific instruments can help companies increase biological screening efficiency, shorten the drug development process, and meet milestone objectives.

Historically, pharmaceutical, biotechnology, and chemical companies have approached laboratory equipment acquisition and instrument utilization from a consumables perspective. They purchase the latest scientific instruments, utilize them productively while they depreciate, and then continue using them until age or disrepair renders them useless.

This "buy and hold" strategy creates considerable technology, productivity, and economic risk where time-to-market, patent protection, and other productivity factors may constrain earnings growth. The consumables mind-set often results in an aging installed base of scientific assets that are susceptible to underutilization, higher incidence of repair, and frequent downtime. To meet laboratory turnaround times, quality reviews, and sample throughput, companies are forced to buy new equipment, leaving the old equipment to either occupy valuable laboratory space or to incur significant warehousing costs.

In this environment of flat and contracting budgets, laboratory managers and procurement specialists are looking for novel ways to generate value by optimizing their laboratory equipment inventories and laboratory budgets.

To mitigate the risks of an aging installed base, forward-looking managers are turning to laboratory equipment life-cycle management (LCM) strategies to keep pace with laboratory throughput, sensitivity, and compliance demands.

LCM provides a structured process for holistically managing the installed base of laboratory equipment. From capital equipment acquisition through asset disposition, Figure 1 shows the steps involved in optimizing the technical, scientific, and economic resources along the "technology life cycle continuum."

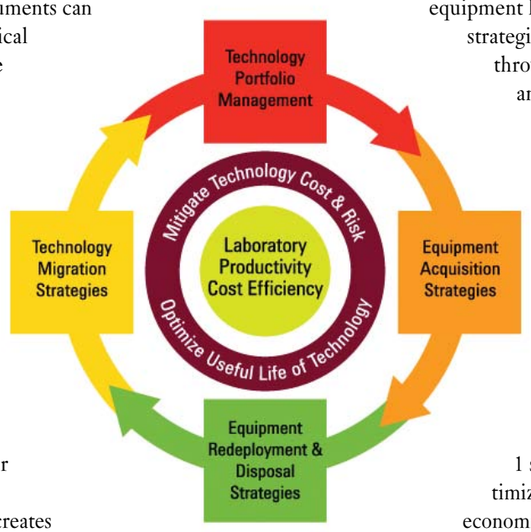

Figure 1. A holistic approach to managing capital equipment acquisition and the installed base of laboratory equipment.

This article examines the steps for designing and implementing an effective LCM program and how such a program addresses the common scientific instrument challenges facing scientists and laboratory managers today.

STEP 1

ADOPT LAB EQUIPMENT PORTFOLIO MANAGEMENT TECHNIQUES

Making certain that the right scientific instrument is in place to support key business objectives is the first step in LCM, and often the most difficult. Rapid technological change has made it increasingly challenging for companies

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to identify the most efficient, cost-effective scientific equipment for laboratory projects. As a consequence, many companies harbor an aging population of equipment that cannot interface with other equipment, threatening data throughput and other measures of project productivity.

For example, over the past 18 months, the major scientific instrument manufacturers introduced a new standard in chromatography instruments and columns. Ultra-high pressure liquid chromatography systems (UHPLC) improve the speed, resolution, and sensitivity of chromatographic separations up to ten times over traditional HPLC methods.

This presents a challenge along with an opportunity for laboratory executives and sourcing managers: How do analytical laboratories acquire and incorporate this leading-edge technology into their laboratories? Projects need to be justified and budgets allocated. For early discovery projects and leading-edge research, economics can be a barrier to entry. For quality analytical labs and regulated process development groups, the technology transfer and capital acquisition costs become the major hurdles. If a company followed an LCM strategy prior to UHPLC introduction, they would have planned the UHPLC acquisition strategy for leading-edge applications while anticipating cascading the existing HPLC technology to more routine applications in other areas of the laboratory organization.

> The consumables mind-set often results in an aging installed base of scientific assets."

LCM begins with portfolio management, a process that provides the framework to plan, align, and invest in technologies to drive maximum laboratory productivity, cost savings, and risk mitigation. To begin the process, a company inventories the current installed base by scientific instrument types, quantities, financial value, age, application criticality, and equipment utilization.

The current installed base can to be mapped against future project and scientific instrument forecasts. Once this is completed, the company can conduct an analysis of original equipment manufacturers' (OEM) product improvements, project starts/terminations, and other factors that may technologically and/or financially impact the lab equipment portfolio.

The result of this portfolio analysis is useful life versus mechanical life technology profiles. The useful life technology profiles become the basis for developing a company's technology migration strategy. They also become the basis for employing flexible asset disposition strategies to accommodate technology refresh—the systematic disposal or migration of existing equipment with new or improved scientific instruments. By reviewing the portfolio on a periodic basis, a company can validate or dismiss previous assumptions and adjust equipment and management plans accordingly.

STEP2

DEVELOP CAPITAL ACQUISITION STRATEGIES

Building and maintaining a competitive equipment portfolio require a flexible acquisition strategy. Scientific instrument product life cycles are shortening as OEMs respond to researchers' requirements for faster and greater throughput and higher sensitivity levels. The product life cycle for mass spectrometers, DNA sequencers, laboratory automation platforms, and other complex scientific instruments used to

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be five to 10 years. Now, that statistic is three to seven years and often shorter. After an OEM product introduction, their instruments frequently remain leading-edge for only 12 to 24 months.

Because capital budgets do not always keep pace with technological change, the "buy and hold" strategy employed by most laboratory managers poses a serious problem in the face of shorter equipment life cycles and long depreciation schedules. Witness the recent pace of genomic analysis technology advances.

For example, a lab employing a five-year-old workflow for genomics experiments would be woefully behind in the race to discover biomarkers for cancer or autism, even though the tools are still performing as designed. These missed scientific opportunities also put the lab behind in the race for funding, thus jeopardizing future work.

The second step in the LCM approach is to develop an acquisition plan that allows companies to maintain the levels of instrumentation needed for various functions while setting the stage for a smooth technology migration when appropriate. Complementing the yearly budgeting cycle, an effective LCM program provides laboratory managers with additional ways to acquire lab equipment.

The operating lease option, where technology risk is transferred to the lessor, enables a company to use instrumentation for only as long as it suits R&D needs. This can save an organization on average 10 to 20 percent off the original equipment cost while freeing up capital. There are other benefits as well in relation to productivity. For example, a major pharmaceutical company that originally planned to purchase four MS units for a short-term project opted to finance 12 systems instead. The result: By having access to more technology, the company reduced the project timeframe from four to two years and was able to return the equipment it no longer required upon completion.

STEP3

ADOPT EQUIPMENT REDEPLOYMENT AND DISPOSAL STRATEGIES THAT REDUCE COSTS

Although many companies would like to quickly migrate to the latest scientific instruments, they have no effective way of disposing of their current scientific instruments or recouping their value. Tracking, redeploying, and disposing of assets based on useful life profiles help companies better manage both the effectiveness of scientific instruments in supporting organizational goals and instrument cost. In fact, the Investment Recovery Association (Kansas City, MO) states that individual companies may save as much as $150 million per year through effective asset management recovery services.

Solid LCM programs include an asset management recovery component. The program should gauge equipment acquisition and disposal timing based on utilization, functionality, new equipment introductions, used equipment values, and environmental factors. An understanding of these factors provides guidelines for redeployment and proactive timeframes for disposal to eliminate the unnecessary costs of underutilized or abandoned assets.

There are some instances, however, when holding on to older assets can be effective, but this requires a sound redeployment strategy. For example, an instrument no longer suitable for R&D applications demanding ultra high-sensitivity technology may be ideally suited for use in an organization's QA/QC department. The key to the redeployment strategy is having a sound understanding of the organization's scientific instrument assets and being able to align them with business goals.

STEP4

TECHNOLOGY REFRESH—ENSURE THAT THE EQUIPMENT PORTFOLIO HAS THE FLEXIBILITY TO MIGRATE WITHIN AND ACROSS TECHNOLOGIES

Research requirements can change from day to day, depending on project longevity. Scientists and laboratory managers are in a continuous struggle to align existing scientific instruments to new projects. Companies that do not have the capability to migrate to other technologies during and after the useful life of their technologies are finding themselves at a competitive disadvantage.

Consider two different generic pharmaceutical companies: Company A standardized on analytical instrumentation for small molecule production and Abbreviated New Drug Application (ANDA) submissions. They own and use lab equipment over its entire mechanical life.

Two years earlier, Company B executives anticipated the changing market conditions for biologic generics, e.g., off-patent opportunities and the debate in Congress. They developed an LCM program, which included a technology refresh strategy. Recently, Company B acquired time-of-flight (TOF) mass spectrometers to develop analytical methods for generic biologic approval. They traded in or sold single quadrupole LC mass spectrometers to the OEM, reducing the purchase price of the TOF acquisition.

Organizations like Company A that attempt to conduct today's business on yesterday's scientific instruments quickly find themselves losing their competitive edge. Through equipment acquisition and disposal strategies, LCM helps companies regain this edge by enabling them to migrate to scientific instruments needed for new R&D requirements and emerging projects instead of force-fitting existing scientific instruments.

CONCLUSION

The rapid rate of scientific instrument advancement will continue for the foreseeable future, and companies will continue to be challenged to meet or exceed laboratory productivity levels while managing their scientific instrument costs. Taking these first steps toward implementing an LCM program will enable pharmaceutical, biotechnology, and chemical companies to optimize scientific instrument investments and performance, while at the same time increasing productivity and maintaining flexibility in supporting scientific projects.

Michael Pope *is a senior laboratory services consultant with Agilent Technologies, Inc. He can be reached at michael_pope@agilent.com or by phone at 847-944-6022.*

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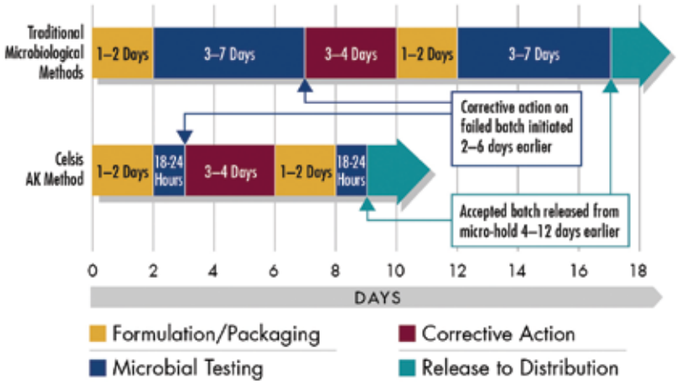
THE ECONOMICS OF RAPID MICROBIAL TESTING

A NEW BEST PRACTICE FOR MANUFACTURERS WHOSE PROFITABILITY DEPENDS ON CYCLE SPEED AND SUPPLY CHAIN EFFICIENCY

by Cindy Lieberman

For years now, we've all been seeing the world of work through cost-cutting lenses, trimming departmental expenditures no matter how incremental. This has created an automatic reflex against anything that costs money: We "just say no." But what if it were possible to increase your budget and increase your value to the company *at the same time*?

If you have any influence in or over a microbial testing lab, you may have an opportunity to help your company become more profitable by effectively streamlining the manufacturing process. But there's a catch: Your department will need to spend a little more in order to do so. However, engaging management in a conversation about the financial benefits of rapid microbial methods (RMMs) might make getting the support and funding you need easier.



Contamination Recovery. Faster results from testing also improve recovery time. When there is a contamination event, the benefits of using a rapid method are doubled.

About RMMs

Briefly, RMMs provide a faster alternative to the traditional and time-consuming method of culturing samples to see if microorganisms are present. It generally takes from three to five days, using specific agar-based media, for organisms to grow to levels that may be detected as colony-forming units visible to the naked eye. During this time, the individual agar plates must be examined regularly by an experienced lab worker, making the results both subjective and prone to human error. Meanwhile, manufacturing is pressuring the Quality department to release products from their microbial testing hold.

Instead, products can be incubated, tested and released in as few as 24 hours using rapid methods. RMMs can provide fast, objective results with instruments that automatically read results, drastically reducing subjectivity and the risk of human error. They often make microbial testing labs more efficient, and can require less time, materials and expertise to operate. Unlike the routine agar plate examinations of traditional methods, RMM systems usually include some automation. They can be user-friendly, and some can be operated by the least-experienced lab technician. Plus, these systems use fewer testing materials and generate less waste, so they support company sustainability initiatives.

RMMs represent a new best practice for manufacturers whose profitability can turn on cycle time speed and supply chain efficiency. For example, by identifying a contamination event earlier and releasing replacement lots faster, manufacturers can reduce the volume of goods that must be scrapped or, worse yet, recalled, and can recover faster—both operationally and financially.

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Starting the conversation

While as a lab manager you approach RMMs from a scientific standpoint, your finance and operations managers approach them from an economic point of view. So the more information you can present in financial terms, the more receptive they will be to the conversation—because it's all about the value.

Here are three examples of effective conversation starters:

"I may have a way to cut several days out of our product release time. Would you be interested in learning more?"

"Who can I work with to quantify the value of reducing our inventories and shortening the production cycle?"

"What did our last contamination event cost us overall? I know a way we can significantly reduce those expenses the next time it happens."

Rapid detection reduces cycle times by several or more days, which reduces the amount of working capital the company has tied up in finished goods inventory and safety stock. RMMs free up warehouse space, shorten lead times and reduce the cost (and time) of recovery from contamination events. So while your department will pay more per test to use a rapid system, your company will save far more with each rapid screening your lab runs. The overall result is a more streamlined, cost-effective and responsive manufacturing facility.

> "RMMs can provide fast, objective results with instruments that automatically read results."

Choose the RMM with ROI

The four key criteria in selecting the right RMM share a common trait: a strong correlation to financial results. Without a strong value proposition, you simply won't get the support of your finance and operations management.

The first consideration is selecting a system that gives you actionable information. In a typical controlled manufacturing facility, products pass the final microbial limits (MLTs) or sterility tests more than 99 percent of the time. A rapid test that provides a positive or negative result quickly is therefore ideal for the vast majority of your production. The less than one percent of product that tests positive in an initial screen can undergo further evaluation against your release criteria. By managing the exceptions, 99 percent of your production run is being released two to four days faster for MLTs—and even more for sterility testing—safely and cost-effectively. The second criterion is to choose a rapid method that is compatible with all products that your lab currently tests. The full economic benefits of RMMs cannot be realized if the rapid method cannot be applied to the vast majority of products. Look at the method's sample preparation, for example. One that does not require filtration means the application will not be limited to your filterable products only.

Flexible sample preparation also allows for the effective neutralization of preservative systems or buffering of pH levels. You should not lose the flexibility that you have with traditional methods to make standard product accommodations. Further, the detection system itself should not be subject to interference by particulate matter or product pigmentation. A good choice is a system that will allow you to assay the majority, if not all, of

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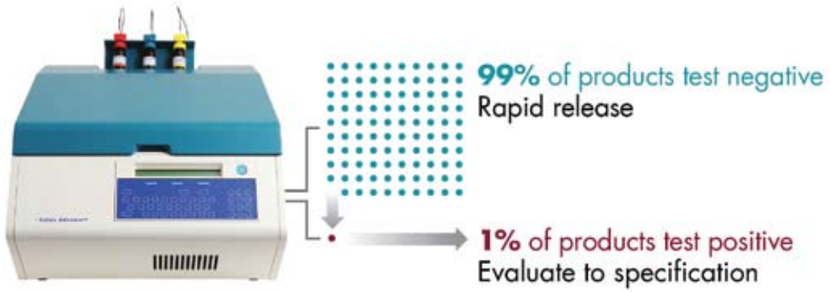


▲ *Actionable Information. For products that are expected to be clean, an absence/presence test provides actionable information to get your products out the door faster.]*

your products. You will benefit from testing standardization and training, as well as from maximizing the financial benefits to your company through a broader application of RMMs.

Third, consider the resource efficiency of the RMM. This applies to both the system throughput—how efficient it is at screening samples—and how much staff time is freed up for other activities. Some RMMs may require multiple extra steps to prepare samples, additional labor to deal with system complexity, or multiple systems and additional lab space to handle throughput requirements. The economic benefits of "rapid" may be negated if it takes an unreasonable amount of your resources just to process the majority of samples with a rapid method. Look for a method that's easy to use with familiar sample preparation, and a system that will minimize the potential for operator error or subjective readings. Systems that can be used by any trained employee, as opposed to only those with advanced degrees, are available and will offer more staffing flexibility.

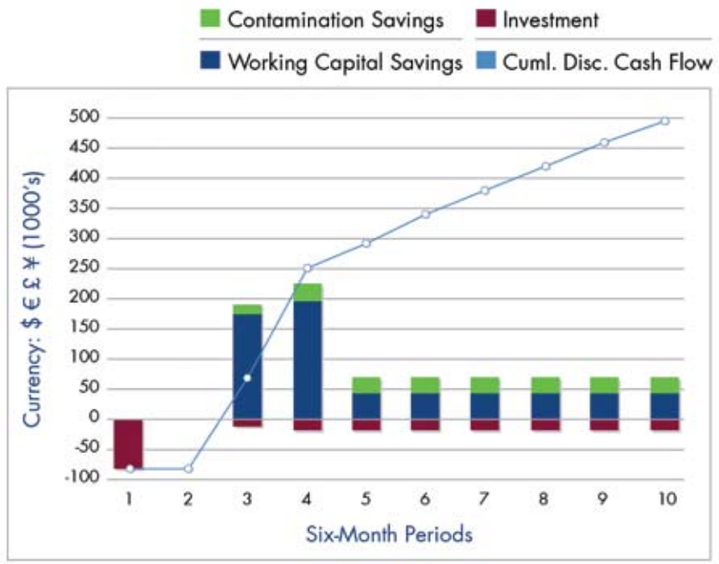
Laboratory space is another major cost to consider. Some rapid methods, including the instrument itself and additional sample prep needed, require quite a bit of lab space, and some may require additional modules to accommodate your testing volume. So look for a system with a small footprint that can easily integrate into your existing bench space and can readily handle your throughout requirements. A plus for the environment is a system that can also reduce the amount of waste generated by the lab.

> "Rapid screening systems will offer strong ROI with a payback period averaging six to nine months."

Finally, when choosing an RMM, it's important to look beyond the instrument to the entire system, including service and support. Choosing the right RMM also means selecting a supplier with appropriate scientific, technical and regulatory support. Without this, it is difficult to obtain maximum value from your investment, because you won't have the benefit of the accumulated experience from getting hundreds of systems up and running and many thousands of products validated. Ask what teams are available to you and where they are located. Will you have quick access to experts? You don't want to incur costs for international flights to have someone look at your system. Finding a good team to work with will ensure a smooth implementation and a streamlined product release cycle that enables you to realize the benefits of the rapid detection technology. Some companies include a three-day on-site installation and operations qualification, and will get your team started with the validation work as part of the training. This ensures that you'll be able to see a fast return on investment (ROI).

Get the financials for finance

Ask RMM providers about their resources to help your company project the ROI for your facility. A financial model that incorporates company-specific information will give you an accurate look at the economic value of the solution. Rapid screening systems, because they allow you to release the bulk of your products quickly, will offer strong ROI with a payback period averaging six to nine months. These systems typically free up working capital in amounts greater than $500,000 in net present value. And even if you're not quite sure what that means, your finance department will know—and they'll like it!



▲ *Return on Investment. Financial models can be used to accurately project the business value to your company of implementing rapid methods.*

Rapid methods are also available as an outsourced service from an analytical services laboratory. Contract labs experienced in rapid methods can provide cGMP validation services and full turnkey testing. Although you will have to build in extra time to get the samples to the lab, you may still find it economically beneficial to outsource your testing to an accredited lab offering RMMs.

The key is to remember that this is not about asking for a budget increase for the microbial testing lab: It is about helping your company find new ways to save. This time, however, instead of cutting costs, you're adding value to the bottom line. And that will let management see you, and the lab, in a different light.

Cindy Lieberman, *vice president, Celsis, can be reached by email at clieberman@celsis.com or by phone at 312-476-1200.*

About Celsis

Celsis Rapid Detection provides rapid microbial systems for detecting contamination in consumer-bound pharmaceuticals, home and personal care products, and beverages. For more information, visit www.celsis.com.

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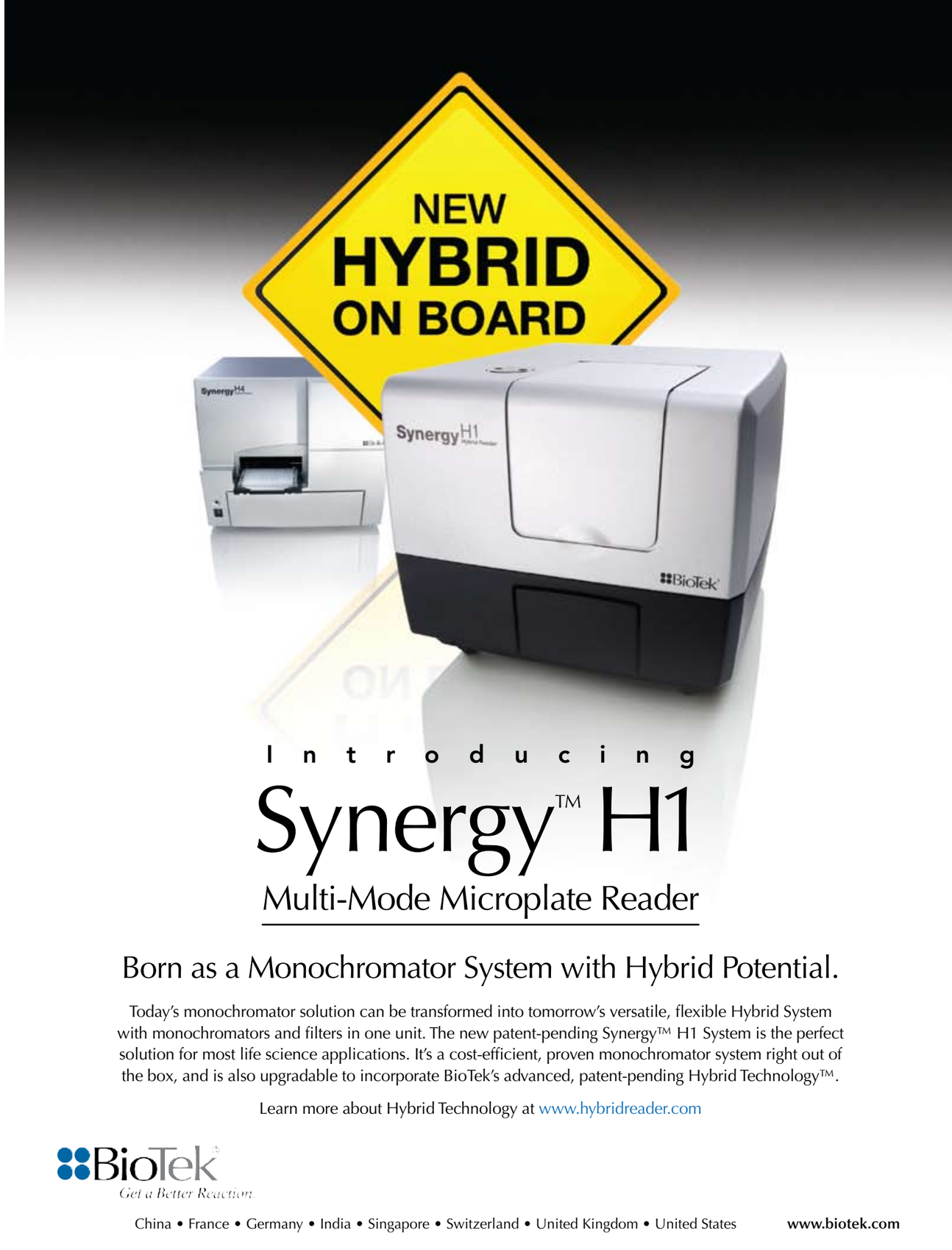

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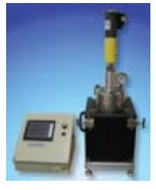

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- Features an integrated chemical reference library in conjunction with an application validation system

AirClean Systems www.aircleansystems.com

Energy-Saving Ductless Fume Hood

Purair ECO™

- Minimizes stress on HVAC systems without compromising protection for personnel and the environment
- Available with a choice of controllers including a touchpad control with color display interface
- Optional BACnet network interface connects all cabinet control, monitoring and alarm functions to an open-source facility monitoring system

AirScience www.airscience.com

Manometer

Traceable®

- Displays gauge and differential pressure/vacuum in eleven different units
- Simple hose fittings permit using hose/tubing with inside diameters from 1/16 to 3/16 inches
- Features a count-up timer that displays up to 99 hours, 59 minutes, 59 seconds
- Includes a data hold key to freeze the display and capture readings

Control Company
www.control3.com

Pressure/Flow Rate Sensors

Mitos

- Designed to minimize interference with the liquid flow
- Range includes 5 flow rate sensors and 1 pressure sensor (-0.5 – 30 bar)
- Devices are fully interchangeable and can run stand-alone or integrated with a Mitos P-Pump for the efficient logging of flow rate output

Dolomite www.dolomite-microfluidics.com

Sample Preparation System

ElectroPrep

- Supports a broad range of membranes with MWCO of 100, 500, 1K, 2K, 5K, 10K, 25K, 50K, 100K and 300K Daltons
- Ideal for the rapid purification of proteins, nucleic acids, carbohydrates and other biomolecules
- Features reusable sample chambers made of PTFE for high sample recovery
- Features a run time of 3 to 10 minutes

Harvard Apparatus www.harvardapparatus.com

Fume Hoods

UniFlow SE Air Stream

- Feature unitized flame retardant composite resin construction for total chemical and corrosion resistance
- Feature an angled sash opening and aerodynamic air foil for uniform air flow entry into fume chamber
- Available in constant volume CAV and variable air flow VAV models in 48", 60", 72" and 96" widths

HEMCO www.hemcocorp.com

Karl Fischer Volumetric Titrator

AQUACOUNTER® AQV-2200S

- Small volume titration cell requires only 20mL of titration solvent for accurate measurements
- Combining one additional KF station with either a volumetric or coulometric module enables two different measurements to be performed at the same time
- Measures moisture over the entire range from 1ppm to 100% water content

JM Science
www.jmscience.com

Evidence Drying Cabinet

Protector™

- Provides a secure ventilated area to dry evidence such as clothing and bedding
- Leak-tight stainless steel interior withstands degradation by surface disinfectants
- HEPA- and carbon-filtered exhaust protects personnel from exposure to biohazards while eliminating odors
- Key-activated UV light provides secondary disinfection of the interior between cases to prevent cross contamination

Labconco www.labconco.com

Oven Sample Changer

885 Compact

- Used for thermal sample preparation in Karl Fischer titration
- Can be used in combination with a Coulometer or a volumetric titrator
- Samples can be heated up to 250 °C
- Screw cap vials can be opened, cleaned and then reused

Metrohm USA
www.metrohmusa.com

Compact Dry Bath

MyBlock™ Mini

- Accommodates test tube sample sizes from 0.2ml to 50ml and accurate temperature control (+/- 0.1°C) up to 80°C
- Six exchangeable blocks are available for applications requiring different tube sizes
- Features a block lifter for removing blocks from the unit, eliminating delays due to cool-down time

MIDSCI www.midsci.com

Enclosed Freezer/Mill

6970 EFM

- Features a totally enclosed liquid nitrogen (LN) auto-fill system with external loading of sample vials
- Includes a pre-cooling chamber, allowing additional samples to be cooled while the grinding chamber is in operation
- Controlled by a color touch screen interface that can store up to 10 programs for rapid process replication and consistency

SPEX SamplePrep www.spexsampleprep.com

Laboratory Freezer

Bio-Cool

- Provides low temperature cooling to either -40ºC or -80ºC
- Does not require expendable liquid nitrogen and the associated pumping, re-filling, and storage challenges posed by a cryogenic liquid
- Immerses samples into a well-circulated, cold liquid bath

SP Scientific www.spscientific.com

Wireless 4-Channel Logger

RTR-574

- Monitors illuminance, ultra-violet, temperature and humidity
- Large data capacity can store up to 8,000 readings times 4 channels for a total of 32,000 readings in One-Time or Endless recording mode
- Luminosity range covers 0 to 130k lx and Low Light Resolution to 0.01 lx

T&D Corporation www.tandd.com

Chilling/Heating Dry Baths

EchoTherm™ IC22

- Chill, heat or freeze two separate sets of samples at two separate temperatures with individual control from -20°C to 110°C
- Chilling/heating surfaces are each 2.875" (7.3 cm) x 4.375" (11.1 cm) flat aluminum plates for optimal contact with the sample blocks
- Plates will heat to 37°C in under a minute

Torrey Pines Scientific www.torreypinesscientific.com

PRODUCT SPOTLIGHT

FIRE DETECTION AND SUPPRESSION SYSTEM

DETECT AND SUPPRESS FIRE DIRECTLY AT THE SOURCE

The FIRETRACE® stand-alone fire detection and suppression system from Firetrace International provides round-the-clock fire protection for various types of fume hoods and enclosures.

In traditional fume hood in-cabinet sprinkler detection and dispersal systems, the design of the airflow can result in heat and flames not reaching the top-mounted detection device in time to prevent severe damage or destruction.

FIRETRACE overcomes this issue with Firetrace Detection Tubing, a leak-resistant polymer tubing linked to an extinguishing agent cylinder. This proprietary tubing is a linear pneumatic heat and flame detector that ruptures anywhere along its length immediately upon fire detection, and automatically releases the suppression agent. In addition, detection is positioned in the path that heat and flames will follow—behind the baffles and across the duct openings.

"Sprinklers will go off until the fire department arrives, causing damage," said Scott Starr, Director of Marketing for Firetrace International. "[FIRETRACE] can stop the fire where it starts, to prevent potential damage."

Suppressant options include CO_2 AFFF foam, dry powder and the latest clean agents, such as 3M™ Novec™ 1230 Fire Suppression Fluid and DuPont™ FM-200®.

FIRETRACE can also be used to protect hazardous material storage cabinets. The Firetrace Detection Tubing is flexible so it can be routed throughout the cabinet, ensuring detection is at the point of a potential fire.

For more information, visit www.firetrace.com.

LIFE SCIENCE

Cold Blood Storage

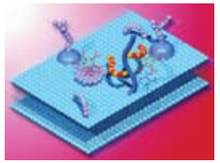
COLDSTASH

- MaxedRack made from 9% nickel steel; holds 25ml cassettes
- Cassettes are designed to accommodate the guidelines of AABB for bag storage
- Cassettes are fabricated from lightweight aluminum alloy 5083-0
- Allows for reduced liquid nitrogen consumption

Coldstash
www.coldstash.com

Reagents for Glycobiology and Glycoanalysis

Sulfated GAG Quantitation Kit



- Allows easy quantification of sulfated GAGs in tissues such as cartilage, cultured chondrocytes, and chondrocyte culture solution
- Based on a colorimetric determination method, using 1,9-dimethylmethylene blue (DMMB)
- Capable of measuring amounts in the 2.5-80 μg/ mL range within a wide standard curve
- Provided in a standard 96-well plate format that can be stored for up to 1 year

AMSBIO www.amsbio.com

BL21 Host Strain

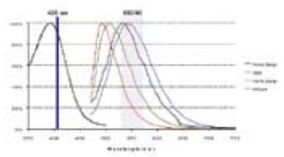
Solu BL21™ Competent E. coli

- Overcomes a major obstacle to effective protein expression in E. coli for many mammalian proteins
- Helps enable scientists to make progress in a wide range of applications quicker and far less expensively than in the past
- Use of the Solu BL21™ Competent E. coli follows a simple and straightforward protocol, the product is compatible with all T7 promoter-based expression vectors

AMSBIO www.amsbio.com

Organic Dye

Krome Orange



- Violet-excited organic dye expands the range of available choices and dye sensitivity limits for violet lasers
- Features excitation and emission maxima of 398 nm and 528 nm respectively
- Initial release of Krome Orange includes conjugates to human CD45 and CD4, with the range of human and mouse targets to expand going forward

Beckman Coulter www.beckmancoulter.com

BRUKER
50 years of innovation

• ALPHA FT-IR Spectrometer
with QuickSnap™ Accessory Modules

ALPHA is a compact FT-IR spectrometer that will play a big part in your daily routine. Plug & play set-up, easy-to-use software, combined with a wide variety of QuickSnap™ accessory modules assure powerful and reliable FT-IR analysis you expect from Bruker.

www.bruker.com/ftir

think forward

FT-IR

qPCR Reagent

SsoFast™ EvaGreen® Supermix with Low ROX

- Optimized for users of PCR systems employing ROX as a passive reference for normalization
- Can help reduce time-to-results from 90 minutes or more for standard cycling to between 35 and 45 minutes
- Patented Sso7d-fusion polymerase utilizes dsDNA-binding protein Sso7d to enable fast cycling without affecting PCR performance

Bio-Rad
www.bio-rad.com

Compound Libraries

PPI01 and FFG01

- Protein-Protein Interaction Library (PPI01) is designed around a novel scaffold that mimics a "beta-sheet type" hydrogen bonding pattern
- FieldFocus GPCR Library (FFG01) is designed using field- and shape-based overlays of known ligands; targets the allosteric site of metabotropic glutamate receptors

BioFocus www.biofocus.com

Microplate Dispenser

Multi-Flo™

- Dispenses up to four independent, parallel reagents in volumes from 1 µL to 3 mL, and microplates from 6- to 1,536-well, including low-profile, standard height, deep well and even microtubes
- Two integrated peristaltic pumps provide low prime volumes, full reagent recovery and high chemical compatibility

BioTek Instruments www.biotek.com

PRODUCT SPOTLIGHT

DISINFECTION UNIT

DISINFECT AN ENTIRE ROOM AND ALL ITS CONTENTS

ID Tech Bio's new Ultra-D Room Fogger offers a practical room cleaning technique, suitable for all types of rooms and contents, including beds, chairs, ventilators, IV pumps and computers. Once an ID badge is swiped, a 15-minute "dry-misting" process will begin, disinfecting the entire room, leaving all surfaces undamaged.

Featuring Magnetic Resolution Activation (MRA™) technology, the unit releases an activated dry mist Reactive Oxygen Species (ROS) fog that kills all potentially harmful microorganisms, including MRSA, VRE, Acinetobacter and C-Diff spores to >6 log. ROS target only surface microorganisms, killing them on contact and then transforming them into H_2O and O_2 and evaporating. No residue is left behind and no damage is done, so even sensitive electronics can be disinfected.

The disinfectant includes a food-grade, 5- to 7-percent hydrogen peroxide concentration. "Hydrogen peroxide is the second most effective killing mechanism behind fluorene, which is highly toxic," said John Barton, President, ID Tech Bio. "[Hydrogen peroxide] provides a very environmentally friendly disinfection, and kills harmful bacteria, spores and viruses."

The compact unit sits on wheels so that it can be moved from room to room, and operates silently. If re-entry into the room is required immediately after the disinfection process, air scrubbing is required.

For more information, visit www.idtechbio.com.

Reusable Bio-Chip

FR48.48 Dynamic Array™ IFC

- Lowers costs and enables the use of SNP genotyping in a wide range of applications
- Each chip can be used up to five times and is able to produce results for 48 samples across 48 assays for a total of up to 11,520 genotypes over the five uses
- Provides 99 percent or greater call rates, and 99.75 percent or higher accuracy

Fluidigm Corporation www.fluidigm.com

Liquid Handling Workstation

VERSA™ LLE

- Validated for the organic solvent extraction of 25(OH)D from blood serum using liquid-liquid extraction (partition chromatography)
- Automated process takes 60 minutes for a set of 96 samples with no detectable cross contamination
- Each VERSA workstation remains customizable to accommodate unique needs

Aurora Biomed www.aurorabiomed.com

Multiplexing Instrument

MAGPIX

- Features magnetic bead-based technology
- Simultaneously measures up to 50 analytes in as little as 25 µL of sample
- Offers more than 20 MILLIPLEX MAG Panels (magnetic bead immunoassay panels) for metabolic disease, inflammation, toxicity, neuroscience, and cell signaling research

Millipore www.millipore.com

ISCA UPD 4 x 180k Array

CytoSure™

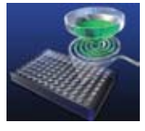
- Offers ability to simultaneously detect DNA copy number variation (CNV) along with whole chromosome uniparental disomy (UPD) using SNP probes, on a single array
- Uses a proprietary 60-mer probe design and multiple rounds of optimization
- Developed to ensure near identical labelling and hybridization conditions to standard aCGH

Oxford Gene Technology www.ogt.co.uk

Microplate

Optimiser™

- Features a microfluidic channel as the reaction chamber (instead of the well), reducing assay times and sample/reagent consumption
- Compared to traditional microplate wells, Optmiser microchannels have a 10x higher binding efficiency
- Fully compatible with all existing readers



Siloam Biosciences www.siloambio.com

Microplate Evaporator

UltraVap™

- Designed to quickly and safely remove solvents from 96- or 384-well plates
- Open-access design, combined with full RS232 control of every parameter, enables integration with laboratory robotics
- Side panels ensure that exhaust gas carrying solvent fumes can be easily extracted to the front or rear of the unit
- An optional adaptor allows direct connection of a 4" diameter fume duct to the evaporator

Porvair Sciences www.porvair-sciences.com

HIV Seroconversion Panels

PRB Series

- Each panel consists of a set of undiluted plasma samples from a single plasma donor during a period of HIV seroconversion, and is ready to use in vials of 1.0 mL per patient sample
- Data sheets for each panel list results from twenty U.S. and International test methods for markers of HIV infection, including HIV RNA, 1st to 4th generation screening tests for HIV, confirmatory tests and a rapid discriminatory method

SeraCare Life Sciences
www.seracare.com

96-Well Plate for Phospholipid Removal

Ostro™

- Provides a novel solution for the cleanup of phospholipids in plasma and serum
- Requires no method development for fast implementation
- Uses in-well protein precipitation with a single pass-through method, providing a quick, reliable, and reproducible solution

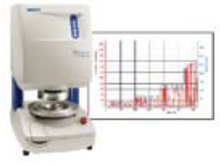
Waters www.waters.com/ostro

LIMS & SOFTWARE

Powder Flow Tester Software

Powder Flow Pro V1.1

- Available via download free of charge to customers who have purchased a Brookfield Powder Flow Tester
- Features improved graphing capabilities, for additional ways to use and manipulate data
- Calculates and displays data in a variety of formats at the end of each test
- Able to overlay up to eight separate powder sample tests on a single graph



Brookfield Engineering www.brookfieldengineering.com

NIR Software

Vision 3.50 Service Pack 5

- XDS Liquid Adapter can now be used with either the XDS Rapid Content Analyzer (RCA), or the XDS Rapid Solids Analyzer (RSM)
- Compatible with Windows 7
- Compliant with 21 CFR Part 11
- Features secure data archiving, report generation and database and spreadsheet compatibitlity

FOSS NIRSystems www.foss-nirsystems.com

Image Acquisition and Analysis Software

DIGICOM NC 2.0

- Images are saved in JPG or TIF formats
- Features ability to stitch images and adjust density profiles
- Includes interactive magnifiers with ability to enhance contrast or invert while image is being magnified
- All menu options are available via mouse click or touch screen

KUBTEC www.kubtec.com

Titration Software

tiamo® 2.2

- One same sample changer may be shared by two or more different working stations
- One sample can be titrated while the next one is already being prepared and another measurement performed
- Just a few mouse clicks allows existing methods to be customized for particular users' needs

Metrohm USA www.metrohmusa.com

Software for Simplified Bioanalytical Workflows

TSQ Module™ for Watson™ LIMS

- Enables direct LC/MS data acquisition and data from the entire bioanalytical workflow can reside in a single database
- Eliminates time-consuming file transfers and manual verification of data
- Designed to provide a single audit trail for QA and FDA requirements, for improved workflow efficiencies as well as time and cost savings

Thermo Fisher Scientific www.thermofisher.com

Software to Enhance Proteomics Workflows

ProteinCenter™

- Provides faster, more confident integration, interpretation and sharing of proteomics data
- Links peptide-centric information derived from Proteome Discoverer software with protein-centric content of popular biological data repositories such as the UniProt and NCBI databases
- Contains over 13 million unique protein sequences

Thermo Fisher Scientific www.thermofisher.com

SUPPLIES & CONSUMABLES

Light-Shielding Volumetric Flasks

VITLAB®

- Made of polymethyl pentene (PMP) plastic that provides excellent absorption of light
- Provides a sunlight protection factor of nearly 20
- Flasks are lightweight and break-resistant, providing a cost-effective alternative to glass
- Available in sizes from 10 mL to 1,000 mL

BrandTech Scientific www.brandtech.com

Cryogenic Storage Labels

CIL91000TN

- Feature a clear wrap-around tail to permanently protect computer-printed variable data
- Withstand multiple freeze-thaw cycles, water-baths, solvents, abrasion and long-term storage in liquid nitrogen and ultra-low temperature freezers, even down to -196°C, without detaching, cracking or fading

CILS International www.cils-international.com

Crucibles

Ceramic and Glass

- Standard sizes range from 0.03 ml to multi-liter capacity
- Materials include alumina (dense or porous), boron nitride, magnesia, quartz, silicon carbide, titanium diboride, vitreous carbon and zirconia
- Depending on size and material, crucibles can be made by slip casting, injection moulding or chemical vapor deposition

Goodfellow www.goodfellow.com

Cerebrospinal Fluid

Artificial

- Commonly used as a sterile diluent or flushing fluid for delivery of molecules into the brain
- Perfect for use as a general infusate or perfusate, when it is essential for fluid to be identical in composition to native CSF
- Prepared with highest purity water and analytical grade chemicals
- Supplied in convenient, sterile 25 ml aliquots

Harvard Apparatus www.harvardapparatus.com

Plastic-Coated Glassware

KimCote®

- KimCote is an ultra-clear coating applied to the exterior of laboratory glassware to resist breakage contain leakage, and protect against injury from shattered glass
- Durable coating provides a non-slip surface texture, improving the ability to grip KimCote glassware whether wet or dry
- Withstands steam autoclave temperatures up to 120°C (250°F) and freezing temperature to -20°C (-4°F)

Kimble Chase www.kimble-chase.com

Microplate Sealing Film

MicroBurst™

- Adhesive is encapsulated in millions of tiny spheroids, preventing film from sticking to gloves
- When film is in the desired position, only pressing down hard will burst and activate adhesive microcapsules
- Can be pierced by pipette tips or robot liquid handlers and is temperature stable

Porvair Sciences www.porvair-sciences.com

Cleanroom Crimping Tools

La-Pha-Pack

- Available in a range of sizes, from 11 to 20 mm
- Made entirely from stainless steel for maximum durability; easily withstands dry heat sterilization or autoclaving
- Stainless-steel construction removes the need for any protective coating on handle or crimp head
- Mechanism is both corrosion- and heat-resistant

Thermo Fisher Scientific www.thermofisher.com

Vials for Cryopreservation

Nunc™ Cryobank Vials

- Incorporate 2D barcode tracking for effective sample storage, tracking and retrieval
- Cryobank cap is fully compatible with automated de-cappers
- Sterile, non-pyrogenic tubes are CE-marked and IATA-certified
- Can be used with standard freezer racks and cryoboxes

Thermo Fisher Scientific
www.thermofisher.com

Tubing for HPLC/UHPLC Applications

Nickel-Clad

- Available with fused silica (FS) tubing, PEEK® tubing, and polyimide-coated fused silica tubing
- Nickel-clad FS allows the use of metal ferrules for improved leak-tight connections
- Fused-silica tubing has a thick nickel coating applied to achieve a higher pressure rating; A thin nickel coating may also be used for resistive heating for PEEK tubing

Valco Instruments www.vici.com

96% Energy savings - No atmospheric pollution - Reduced infrastructure costs*

greenfumehood®
TECHNOLOGIES by erlab
Filtration - Detection - Communication

GFH Technologies equipped fume hoods in operation and saving money for our customers every day.
Top left: Hamilton "Infinity" Hoods; Top Right: ALC "Green G3" Hoods; Bottom Center: AMS "Solution" Fume Hoods

Our green partners

Green G3 Fume Hood

Infinity fume hood

Air Master Systems Solution Fume Hood

2008 The fume hood revolution begins with the introduction of the GreenFumeHood.

2009 The GFH Technology becomes available on all our partner's fume hoods.

2010 Clients across America are starting to save energy and reduce costs.

2011 Your lab can save thousands in the new year*. Call us today to find out how.

*Customers have been saving up to $6,500 per year. Calculation is based per 6 ft. fume hood at $7 per CFM.

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(800) 964-4434 - gfhsales@erlab.com

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A Personal Microarray System

Problem: Many life scientists who need a whole-genome view of complex biological questions are limited by budget or inhibited by the complexity of microarray systems and data analysis. As a result, they are forced to outsource their experiments or use less powerful technologies with a limited view of the genome like qPCR. Microarray processing on existing platforms can be time consuming, error prone, and complicated. Additionally, turning raw data into answers can be a difficult road for biologists to travel.

Solution: The GeneAtlas™ System is the first personal microarray solution that makes the power of microarrays accessible to life scientists in their own labs. The system comes with everything needed to get biologically relevant results, all in an easy-to-use package. The GeneAtlas system provides a simple microarray workflow for gene-level expression and integrated analysis software for a whole-genome view. The system's stations for fluidics, imaging, hybridization and analysis are all integrated into one seamless workflow.

Target preparation: Processing microarrays begins after isolated RNA has been prepared through either the Affymetrix 3' IVT labeling assay or the whole-transcript (WT) expression assay. These assays start with as little as 50ng total RNA input, and enable researchers to obtain higher signal-to-noise ratios for detecting more rare transcripts. The assay uses magnetic bead-based purification which enhances recovery.

Hybridization: Once the target is prepared, scientists hybridize their samples to the array by simply pipetting the samples into each microwell of the hybridization tray and aligning the array strip, which takes less than five minutes of hands-on time. Then the assembly is incubated overnight in the GeneAtlas hybridization station.

Wash and stain: This is an automated process that only requires the scientist to perform simple pipetting steps. The researcher aligns the consumables on the quick reference card and pipettes the reagents using the easy-to-follow color codes and instructions. The reagent filled microtiter plate and the hybridized array strip assembly are then transferred to the fluidics station deck. The fluidics station's robotic arm, powered by intuitive software, does the wash and stain processing automatically without any further user intervention.

Imaging: After washing and staining, the scientist simply moves the strip assembly from the fluidics station to the imaging station's drawer to start the imaging process, which is also automated through the intuitive software user interface. The imaging station can process four samples in as little as 30 minutes—requiring only one user intervention.

Analysis: The GeneAtlas System makes it easy for scientists to turn raw data into biologically relevant results with wizard-driven workflows and interfaces specifically designed for biologists—not statisticians. This powerful and intuitive software suite takes raw data to biological pathways in just nine clicks.

Array strips for the GeneAtlas System are available in 3' IVT or whole-transcript (WT) expression designs and include human, mouse, and rat arrays as well as 17 other model organisms. Affymetrix will launch additional applications in the near future. The GeneAtlas is a winner of the Instrument Business Outlook (IBO) 2010 Analytical Instrument Industrial Design Award for its user friendliness and accessibility.

For more information, visit www.affymetrix.com/GeneAtlas

▾The GeneAtlas™ System provides a simple microarray workflow for gene-level expression for life science researchers who want to take control of precious samples, reduce the cost of experiments, and decrease time to results and publication.

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International Year of CHEMISTRY 2011

PITTCON CONFERENCE & EXPO 2011

Advancing Spectrophotometric Flexibility

Problem: With uses in DNA, RNA and protein analysis protocols, microplate spectrophotometers are an integral component to numerous research applications. Providing a quantitative measure of light absorbance through a sample, these instruments need to be able to recognize a broad spectrum of light wavelengths. However, different assays require the use of various light wavelengths, commonly ranging from ultraviolet (UV) to near infrared (IR), to provide optimal results. The process of determining an ideal wavelength and the switching of filters between each assay can prove both problematic and time-consuming. This lack of flexibility can limit throughput and make simple protocols increasingly complex and lengthy. In addition, most researchers have a preference with regards to using microplates or cuvettes with specific sample types, and this choice can be limited by restrictions of the instrumentation.

With many laboratories focusing on increasing efficiency and consequently experimental throughput, complicated set-up and analysis steps can also be extremely time-consuming. Furthermore, with multiple users often sharing a single instrument, researchers for who English is not their first language may experience issues with understanding highly technical instructions.

Solution: In order to circumvent these issues, laboratories need to be supplied with a highly flexible spectrophotometer, which is easily adaptable to a number of different applications. In order to meet this need, Thermo Fisher Scientific has developed the Thermo Scientific Multiskan GO UV-Vis spectrophotometer which offers free wavelength selection for both 96- and 384-well plates and various types of cuvettes. Any measurement wavelength between 200 and 1000 nm can be selected at any time with the advanced monochromator-based system. Using the spectral scanning feature, the whole spectrum of a sample can be scanned in 1 nm increments in a few seconds to identify the optimal measurement wavelength for a new assay. This not only saves valuable time, but also ensures that the most accurate results are obtained from each assay performed. The Multiskan® GO uses <2.5 nm measurement bandwidth which ensures excellent spectral resolution.

The Thermo Scientific Multiskan GO UV-Vis spectrophotometer.

Both the microplate chamber and cuvette holder of the Multiskan GO are equipped with temperature control up to 45 °C to ensure that sample integrity is maintained during temperature critical applications such as enzyme kinetic studies or cellular assays. Shaking speed can also be selected to ensure that samples within the microplate remain homogenous.

As an energy efficient system, the Multiskan GO encompasses an advanced power save function, reducing energy consumption by over 70%. In addition, this spectrophotometer conforms to the Restriction of Hazardous Substances (RoHS) directive, which guarantees that the reader is free from harmful materials, such as heavy metals, making it extremely environmentally friendly.

The Multiskan GO provides a further level of operator flexibility with the option to be controlled as a stand-alone instrument, or via the Thermo Scientific SkanIt software. Its internal software and large color display make it convenient for quick and simple measurements. Preprogrammed settings enable the fast and convenient implementation of commonly used protocols. Alternatively, even the most complex and demanding applications can be easily set-up using the intuitive SkanIt® software for PC control. Taking into consideration that not all users will be fluent in English, both the internal and PC software are available in multiple language versions, including English, French, German, Spanish, Portuguese, Russian, Chinese and Japanese.

For further information, please visit www.thermoscientific.com/multiskanGO.

March 27-31, 2011

Gaylord Palms Resort and Convention Center Orlando, Florida

SBS 17TH ANNUAL CONFERENCE & EXHIBITION 2011

Advancing the Science of Drug Discovery

SBS 2011 Registration Now Open!

Innovative New Programs and Awards Debut at SBS 17th Annual Conference & Exhibition

Start Planning for SBS 2011!

More than 2,000 scientists, innovators, researchers and industry analysts from around the globe will gather in Orlando to learn about the latest trends and basic and applied research that are transforming the way new pharmaceuticals are developed.

Register Today!

SLAS.org/events/sbs11

Registration is now open for the SBS 2011 Conference & Exhibition in Orlando, March 27-31. Confirm your participation today and be part of this leading drug discovery event highlighted by an outstanding scientific program, cutting-edge innovation, and numerous opportunities for networking and collaboration.

"Take Off With Us" and Take $200 Off Your Flight to SBS 2011

New this year! Learn about the "Take-Off With Us" flight discount program and discover how you can save $200 on your flight to Orlando for SBS 2011.

New Academic Travel Award Program Supports Future Leaders

To support future leaders in drug discovery, a new Academic Travel Award Program has been created for SBS 2011. Qualifying students, graduate students, post-doctoral associates, and junior faculty can author and submit an abstract for consideration. Awards include fully paid airfare (or mileage reimbursement), full conference registration, and shared hotel accommodations.

New Product Award (NPA) Designations at SBS 2011 to Recognize Best New Products on Exhibit Floor

In the spirit of innovative excellence, each year dozens of new products launch on the SBS exhibit floor. This year, to celebrate these momentous breakthroughs and acknowledge the best of what's new, the SLAS New Product Designation has been introduced. At SBS 2011 in Orlando, a team of experts will select up to three of the most promising new products launched on the exhibit floor for official SLAS New Product Award (NPA) Designation.

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Present your poster and share data either never before presented or work that has already been published in a peer-reviewed journal. The deadline for poster abstract submissions is **February 18, 2011**. *Submit your poster today!*

Learn More and Register

To access conference details, learn more about these new programs and awards, and to register for SBS 2011, visit **SLAS.org/events/sbs11**.

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An International Community Advancing Scientific Research and Discovery Through Laboratory Technology

The Society for Laboratory Automation and Screening (SLAS) is a new non-profit scientific organization uniting the Society for Biomolecular Sciences (SBS) and the Association for Laboratory Automation (ALA). The SLAS mission is to be the preeminent global organization providing forums for education and information exchange to encourage the study of, and improve the science and practice of, laboratory automation and screening.

Society for Biomolecular Sciences SBS ALA Association for Laboratory Automation

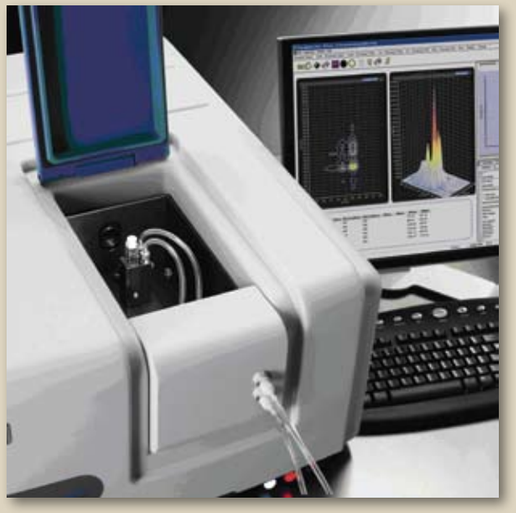
Increasing Fluorescence Spectroscopy Sensitivity Requirements

Problem: As it is commonly available in most laboratories and does not require tedious sample preparation, most instrument manufacturers use the Raman emission spectrum from ultra-pure water to determine the sensitivity of their spectrofluorometer. To eliminate variations created by differing instrument parameters, the signal-to-noise ratio (SNR) of the intensity of the Raman peak compared to the noise present in a signal-free region is often used as a metric for reporting sensitivity, and thus instrument performance. However, there are different methods and techniques used to evaluate the SNR of an instrument.

Theoretically, the SNR can be calculated exclusively from the Raman peak signal fluctuations using the variation in the peak intensity over time or a time scan analysis. However, the dark noise is not the major cause of signal variation, therefore making this method unreliable for determining SNR in low signal measurements.

Solution: The most accurate method of measuring SNR is to ratio the peak Raman intensity to the average intensity of a signal free "baseline" region. The value of the intensity of the signal can be evaluated either by a single intensity data point extracted from scanning data or by averaging the peak intensity using a time scan.

There are also two methods for measuring the noise value of the SNR. The first method is based on measuring the fluctuations in a spectral region known to be free from signal. These random variations in the intensity values form the basis for calculating either the peak-to-peak noise (max-min) or the root mean square (RMS) noise (standard deviation) of the spectral response over a defined wavelength region. It is important with either measurement to have a statistically significant number of points to ensure a representative noise value. One problem with this measurement is the uncertainty about whether residual signal remains in the region that is assumed to be signal free. A baseline correction is frequently applied to remove any residual signal originating from broadband fluorescence or scattering.



The Thermo Scientific Lumina fluorescence spectrometer

Alternatively, the noise value can be determined from a time scan analysis. In this method, the noise is measured as a function of time at a single wavelength. As discussed above, either the peak-to-peak variation or the RMS variation is calculated using a large number of points from the resulting time scan.

While much of the sensitivity of a fluorescence spectrometer is directly related to the molar absorptivity and quantum yields of the molecules being analyzed, instrument performance is also critical to detecting low concentrations of fluorophores or small changes in larger signals. For measuring the SNR ratio, the Thermo Scientific Lumina fluorescence spectrometer, for example, uses a hybrid method where the value of the signal is determined by a scan of the Raman line. A time scan is used to evaluate the noise floor and to determine the noise value. The SNR is then determined from these two measurements.

For more information, visit www.thermoscientific.com.

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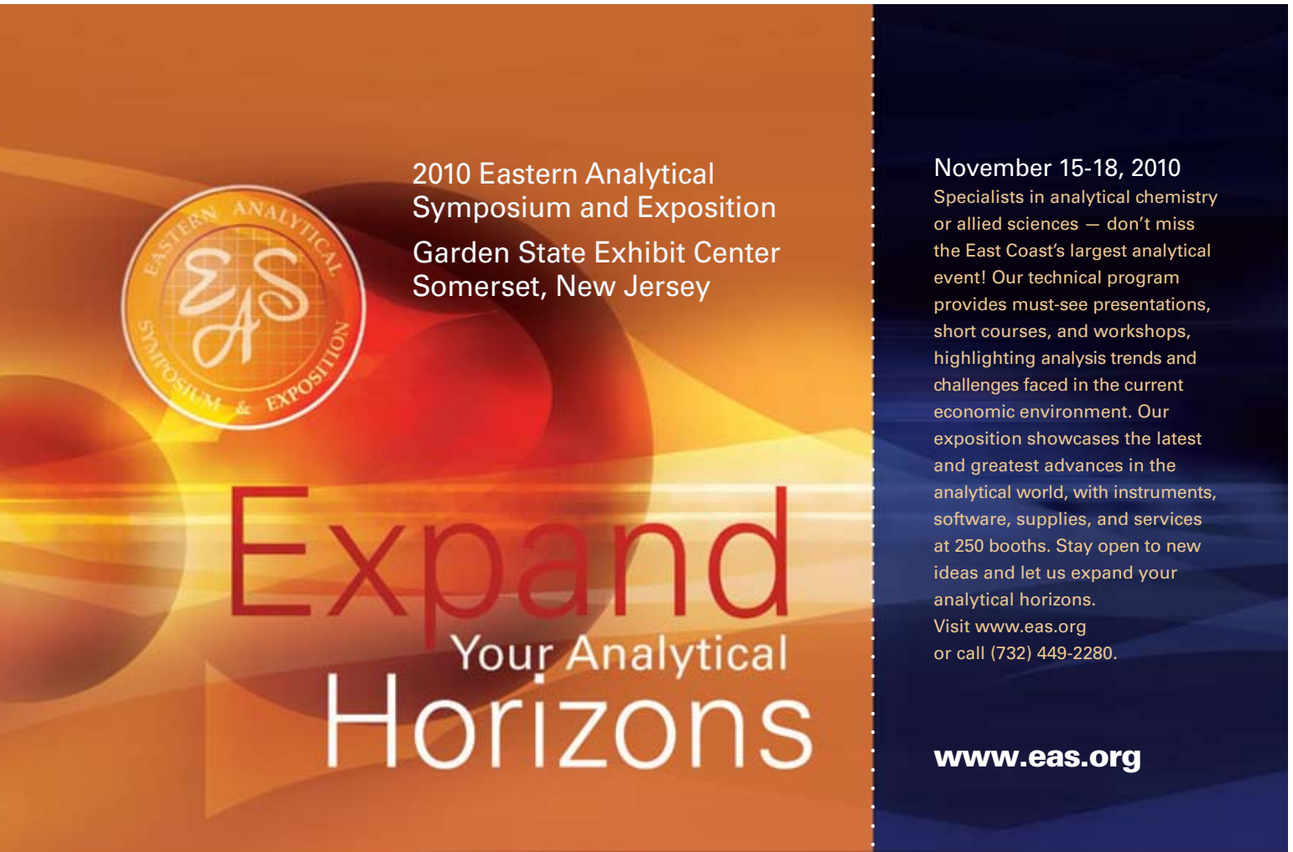

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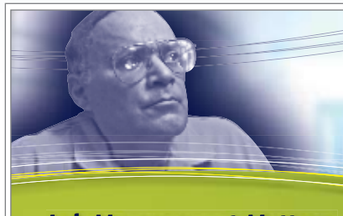

Lab Management Matters
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www.labmanager.com/blogs/Lab-Management-Matters

discussing current issues and topics in lab management.

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PARTING POINTS

Takeaways from this month's issue:

HIDDEN TREASURE

Driven by the need for greater cost effectiveness and the desire to extract the most value from pricey assets, laboratory managers are eager to convert their unused, excess and replaced equipment into cash. There are various ways of doing so.

- Some companies will buy old, non-functioning equipment, then refurbish and re-sell it
- Asset disposition companies will work with organizations to sell excess equipment for fair prices
- These same companies might also host monthly auctions, which bring in several buyers, enabling organizations to sell various equipment all at once

10

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SCIENTIFIC TALENT WARS

Vexed by acute personnel shortages, medical labs are lobbying to attract and retain talent. Also acting to generate an interest in science careers, the U.S. National Science Foundation launched a study to ramp up the supply of scientific and engineering talent called "Rising Above the Gathering Storm."

- Remuneration isn't the only way to keep employees happy; they also desire flexibility, work/life balance, and career training and development
- However, different workers respond to different motivators; praise and commendation from managers can be seen as the most effective nonfinancial incentive

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FIVE COMMON MISTAKES IN LAB LABELING

Labels house critical data, and without them, samples would be unreliable and irrelevant. If implemented correctly, they are the foundation of internal sample management processes. Here are five common mistakes related to item identification and labeling:

- Handwritten labels: Unreliable and difficult to read
- Purchasing the wrong label for an application
- Creating "waste": Implement an on-demand printing solution
- Forgetting the bar code on the label
- Labeling only for your lab: Ensure the labels can be understood by those outside your lab as well

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MAXIMIZING THE VALUE OF SCIENTIFIC DATA

An LC column manufacturer used a scientific data management system (SDMS) to produce consistently performing products for customers under intense regulatory and competitive pressures. Some of the benefits of implementing such a system are as follows:

- More agile decision making and greater control of synthesis processes
- Superior batch-to-batch reproducibility
- Lower risk of costly and time-consuming batch failures

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THE ECONOMICS OF RAPID MICROBIAL TESTING

Rapid microbial methods (RMMs) provide a faster alternative to the traditional method of culturing samples to see if microorganisms are present. Consider four key criteria when selecting the right RMM, to ensure the support of your finance and operations management.

- Select a system that gives you actionable information
- Choose a rapid method that is compatible with all products your lab currently tests
- Consider the resource efficiency of the RMM
- Look beyond the instrument to the entire system, including service and support

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