

Chemical waste

THE TRUE COST OF
INEFFICIENT INVENTORY
MANAGEMENT



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A BROKEN SYSTEM

“We’re very serious about the chemicals we work with,” says Mark Findeis, the executive director of research biochemistry at Agenus, a Massachusetts-based biopharmaceutical company. “Chemical inventory management for us is more than just following regulations—it’s about being a good citizen in our community.”

For many companies, chemical inventory management is just this: a way to ensure a safe environment for employees and the neighboring community while never being short of a needed reagent. From dedicated chemical inventory management systems to electronic laboratory notebooks (ELNs) and even humble spreadsheets, chemists today have many options for managing their inventory and staying current with changing regulations. While these systems vary in functionality, usability, features, and cost, efficient inventory management allows everyone at a company—researchers, engineers, lab and stockroom managers, technicians, and receiving clerks—not only to locate the material in the amounts they need but to respond quickly to spills and accidents.

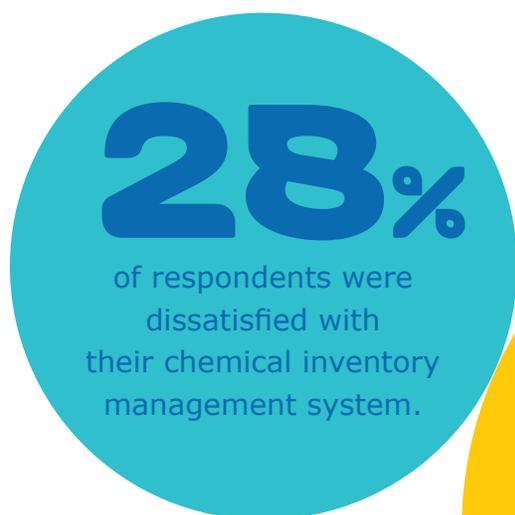
“Chemical inventory management for us is more than just following regulations—it’s about being a good citizen in our community.”

Mark Findeis

Chief Scientific Officer
Agenus

In August 2020, C&EN surveyed readers on behalf of MilliporeSigma to learn how professionals manage chemical inventory and comply with regulations. Nearly 1,000 people completed the online survey, and several of them were interviewed to gain further insights. The data included here have been aggregated from survey respondents who work in the for-profit and government sectors. The respondents represented a range of occupations and industries in those sectors. Most were based in North America (84%), and just under half worked in manufacturing. One-third worked at biotechnology firms, pharmaceutical companies, or contract research organizations. Forty-two percent were directly involved in research and discovery at their institutions.

This report identifies the challenges these respondents face in managing their chemical inventories. Although it focuses on the issues raised by respondents in the for-profit and government sectors, respondents working in academic research labs raised similar issues and trends. For example, a vast majority indicated that their biggest problem was the lack of real-time information and automatic updates on the status and location of chemicals they needed. This lack led to decreased productivity and increased waste. The respondents' concerns highlight the importance of CIMs that are accurate, robust, and easy to use.



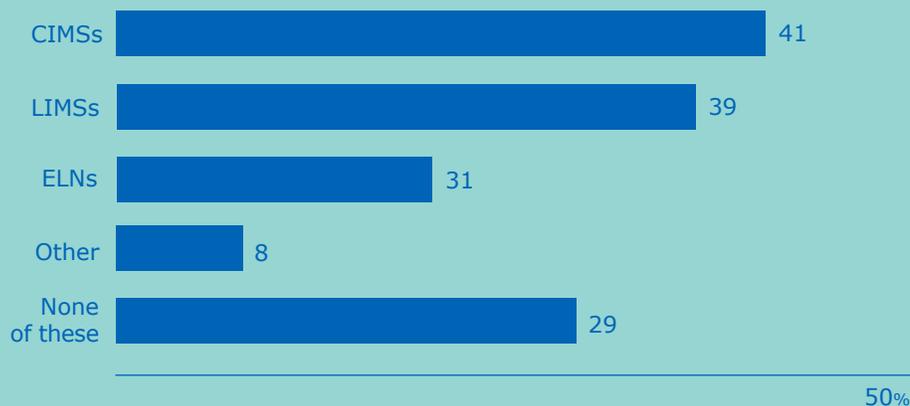
CURRENT PRACTICES

The respondents overwhelmingly used one or more forms of automated lab management tools at their workplaces. Such tools offer scientists functionalities that can include tracking chemicals as they are ordered, received, stored, consumed, and disposed of; detecting storage incompatibility; and providing safety information.

Software explicitly designed for chemical inventory management was most often cited as being used, although other laboratory automation tools, such as laboratory information management systems (LIMSs) and ELNs, were also used. Respondents working in biotechnology, pharmaceutical manufacturing, and drug development were more likely to use dedicated chemical inventory management systems than those at government organizations.

Agenus's Findeis says that the company uses a dedicated system, which allows researchers in different labs to query the database to see if a needed chemical is in another lab or on a general supply shelf.

Types of automated lab management tools used



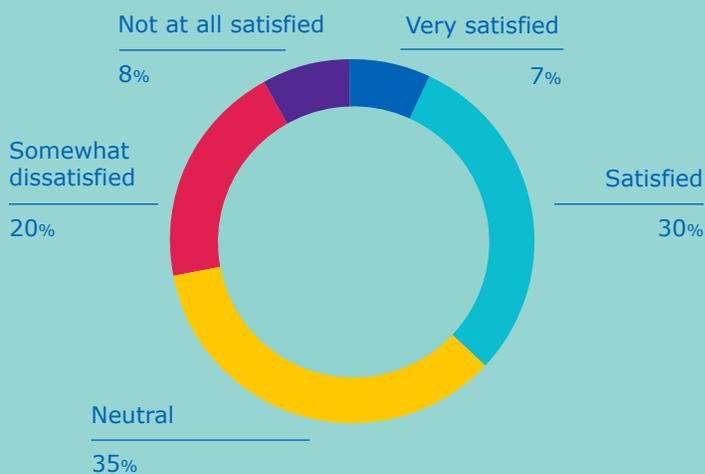
Note: Chemical inventory management systems (CIMs), laboratory information management systems (LIMSs), and electronic lab notebooks (ELNs) were most cited as management tools. Survey respondents were allowed to choose more than one response to this question, so these responses total more than 100%.

Respondents in the for-profit and government sectors used digital information systems to manage their chemical inventory, including dedicated chemical inventory management systems, more general LIMSs, and even ELNs, which are often used to document experiment results.

Over one-third (37%) of the respondents who used a dedicated chemical inventory management systems were satisfied or very satisfied with their system, whether it was commercial or designed in-house. A significant percentage (28%) of those who used a dedicated system were at least somewhat unhappy, however, and noted problems with ease of use as well as a lack of real-time information and auto-updating. In fact, even those who were relatively content with their system noted that it had room for improvement.

Azlan Hussain, a principal scientist at the Malaysian oil and gas giant Petronas, has had a common experience with chemical inventory management systems and call them a “mixed bag.” He says, “They are good in the sense that the organization can keep track of inventory as well as stay in compliance with the law. However, the most productivity-killing factor is time spent searching for chemicals.”

Satisfaction with current CIMs



Note: Current CIMs left over a quarter of survey respondents dissatisfied.

“The most productivity-killing factor is time spent searching for chemicals.”

Azlan Hussain
Principal Scientist
Petronas

In the COVID-19 pandemic, with nonessential employees largely having to work from home, the need for remote access to inventory management tools has moved to the forefront. Eleven percent of survey respondents said that the health crisis had influenced their views on CIMs. Many cited the need for real-time and remote access to chemical inventory information as crucial, as fewer staff members were working in the lab at the same time—some of whom did not know where key chemicals and reagents were located.

24%

of respondents were unable to conduct an experiment at least 10% of the time due to not having the necessary materials.

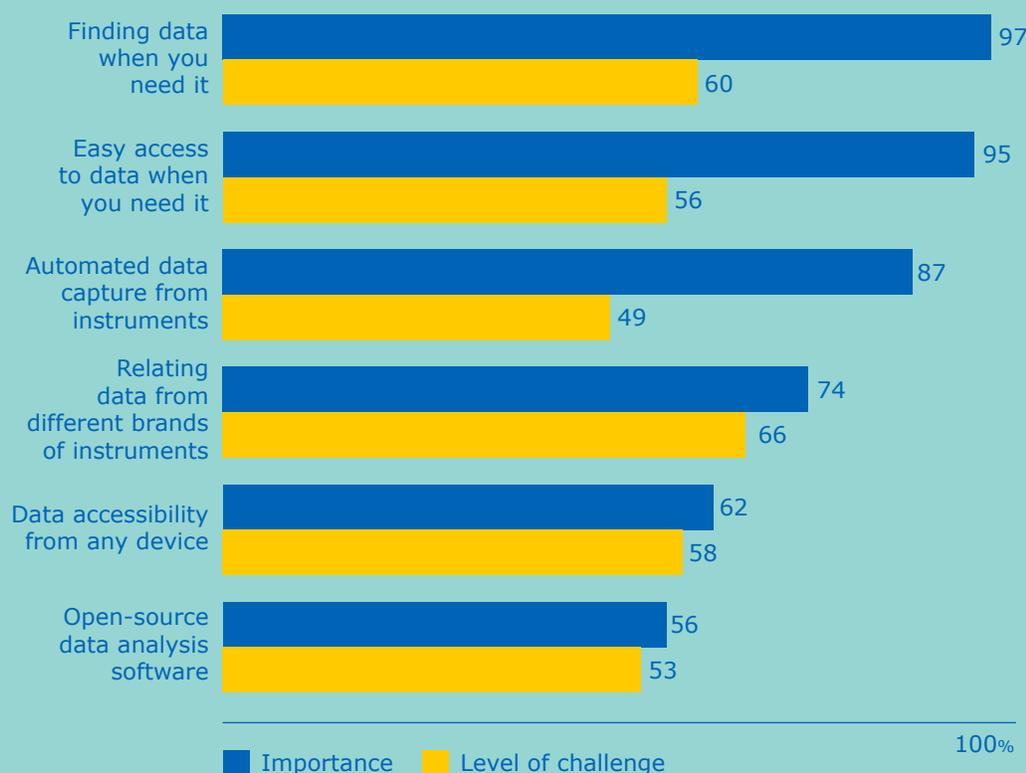


IMPORTANCE OF CHEMICAL INVENTORY MANAGEMENT

Efficient chemical inventory management—including meeting regulatory requirements, minimizing time spent recording information, and reducing errors—remains a high priority for all groups. In fact, Petronas’s Hussain feels that the systems for chemical inventory management are undervalued.

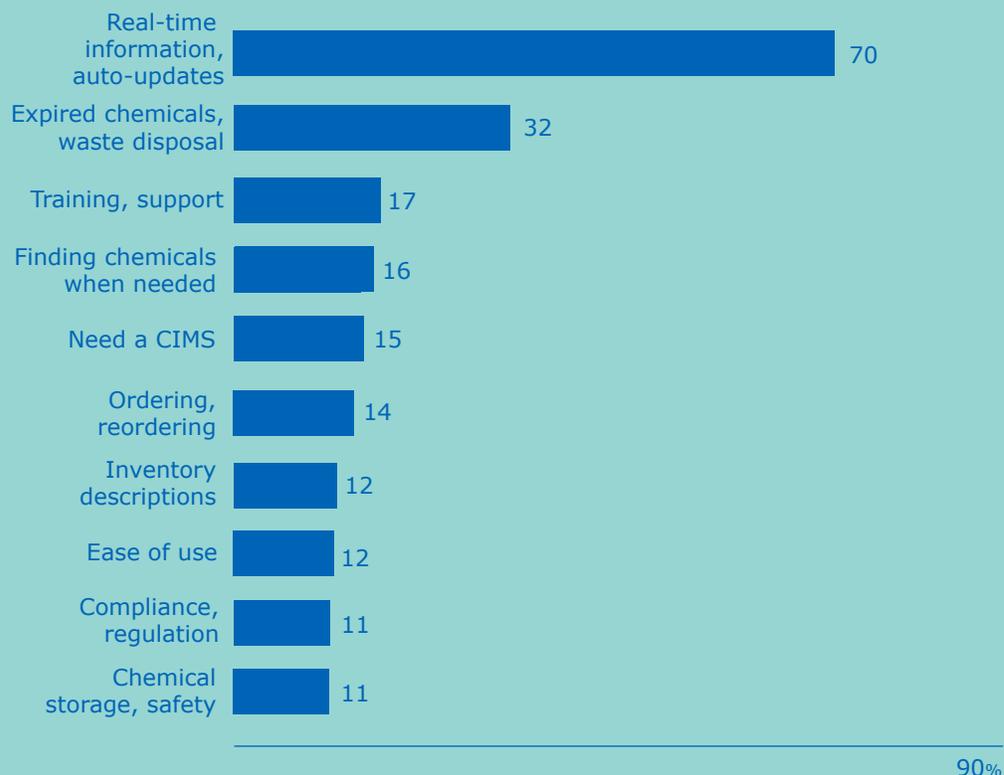
“The data generated from the software could help to plan ahead,” he says.

Importance versus level of challenge for selected factors



Note: Survey respondents agreed on the importance of nearly all aspects of managing chemical inventory, from meeting regulatory-compliance requirements to accessing real-time information on the location and amounts of chemicals.

Biggest pain points with managing chemical inventory



Note: The majority of survey respondents said they lacked real-time, updated information about chemicals.

Seventy percent of respondents indicated that their biggest problem was that they lacked real-time information and automatic updates on the status and location of the chemicals they needed. For specifically tracking and managing chemical and reagent inventory, a majority of respondents (59%) noted that they used general office software like Excel or Access—not a dedicated CIMS—and 22% said they still used handwritten papers and journals.

Jose Camacho Gutierrez, a synthetic organic chemist at one of the world’s largest manufacturers of paints and coatings, says it can be difficult to access accurate information on the location of chemicals at his site in Ohio. “Nearly 40% of our employees interact with our chemical management system,” he notes. “That can lead to materials being moved around without being updated in the system.”

Survey respondents reflected Camacho’s frustration. Fifty-seven percent said they checked inventory at least weekly. Over one-third (35%) spent at least 10% of their time each month searching for samples or reagents; 26% said they spent that amount of time checking stock levels and ordering chemicals. This added up

to nearly a day's lost productivity each week. 17% of survey respondents lost 10% or more of their inventory each month to spoilage and expiry.

One-third of respondents cited concerns with tracking expired chemicals and the proper disposal of waste materials. Nearly half of respondents (44%) said they were interested in a system that used radio-frequency identification (RFID) labels and digital data capture to track and manage chemical inventory in real time.

The average monthly cost of expired inventory and hazardous waste disposal exceeded \$7,000 for for-profit and government organizations.

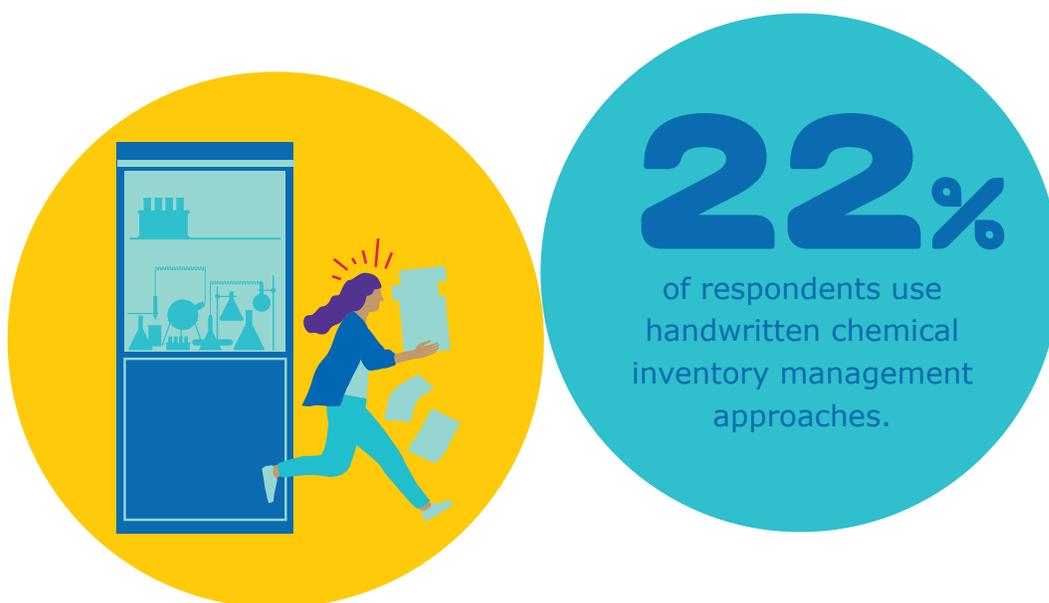


59%

of respondents use
general office
software for
chemical inventory
management.

Hussain says he wishes his system could automatically track the locations of chemicals, register incoming compounds, and trigger the procurement process should the volume of certain chemicals dip below a predetermined amount.

The consequences of this lost and expired inventory were staggering: about one-quarter (24%) of respondents were unable to conduct an experiment at least 10% of the time because they did not have the necessary materials, and over half (58%) lost at least 3 days of work per month. The average monthly cost of expired inventory and hazardous waste disposal exceeded \$7,000 for for-profit and government organizations.



LAB SAFETY AND REGULATORY COMPLIANCE

Lab safety and regulatory compliance were listed by survey respondents as being among the most important aspects of managing chemical inventory. Eighty-one percent followed one or more types of regulation, with the most common being international standards (44%), good laboratory practice, and good manufacturing practice, which is often used in production of consumables. Barely half of respondents said they felt prepared for an unannounced chemical audit, with many saying they would be largely unprepared, raising concerns about lab and community safety.

Respondents reported three equally challenging pain points with regulatory compliance, including documentation and reporting, keeping current on changing regulations, and disposing of expired chemicals and chemical waste. Agenus's Findeis points out that with the volume of reagents his company consumes, it could easily exceed permitted quantities of hazardous materials without careful oversight. "New chemicals and accumulated waste add up quickly," he says.

While most respondents had some formal system in place to provide chemical hazard information, it's unclear the extent to which participants accessed these potentially cumbersome systems to ensure lab safety.

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INEFFICIENCIES ABOUND

This survey revealed the importance of CIMSs to the productivity and safety of all organizations that work with, store, and dispose of chemicals and reagents. Survey respondents in the for-profit and government sectors represented a broad cross-section of professionals. They valued systems that allowed a diverse group of users to interact with and query the databases. The biggest pain points for respondents were the lack of real-time information on the location and amount of chemicals in their inventories and the tracking of expired chemicals and proper disposal of waste materials. Far from being mere annoyances, these long-standing challenges take a substantial toll in wasted time, lost productivity, and squandered resources—as well as considerable and avoidable expenses.

70%

of respondents felt their biggest problem was a lack of real-time information and automatic updates on the status and location of needed chemicals.



TAKE ACTION

The potential has never been higher for laboratories to re-think their workflows, to re-evaluate their productivity potential, and to re-imagine their quality solutions. The LANEXO™ Lab Inventory, Safety and Compliance Management System is specifically designed to create efficiencies, improve safety and facilitate compliance within highly regulated analytical and research laboratories.

Through simple digital data capture of RFID tags placed on consumables, the easy-to-use LANEXO™ mobile application lets users rapidly, effortlessly and accurately register and archive reagent data — whether restocking shelves or recording experimental workflows. The availability of real-time consumables data impacts functions across an organization, improves lab productivity and sustainability, and supports traceability, regulatory compliance, and audit-readiness.

- **Reduce time spent** on inventory management by tracking stock levels and monitoring expiration dates.
- **Reduce compliance & safety risks** by automating traceability of reagent documentation and storage compliance check.
- **Reduce errors** with easy specification and identity checks along experimental workflows.

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