

Keeping Tabs

Chemical management services open the door to greener industrial chemistry.

William Illsey Atkinson

In 1987, management at General Motors Corp. recognized that chemical use throughout the firm was fast becoming unmanageable. Not only did GM have too many vendors per chemical, further scrutiny turned up other problems. Paperwork had mounted with each new piece of environmental legislation, as thousands of chemicals were tracked—sometimes less than perfectly—from purchase through shipment, storage, use, and disposal. Different GM departments were independently ordering identical compounds, missing opportunities to make economies of scale. Plant safety was a costly concern, with constant demands for employee testing and training. An entire ad hoc company culture had grown up around chemicals. GM managers decided to move from a materials-acquisition mind-set to one of product life cycle. The concept of chemical management services (CMS) was born.

Managing Chemicals

Pioneered by GM over the past 16 years, CMS involves a shift in the thinking of users and suppliers from chemical-as-substance to chemical-as-service. It's a small, conceptual adjustment with big consequences. GM acted quickly to implement CMS across the board, systematically persuading its chemical suppliers to reengineer themselves as service divisions. "We need you to manage our chemicals," GM essentially told them. "You figure out how." Ultimately, GM paid its chemical suppliers a flat fee for each car out the door, reflecting the suppliers' contributions to the finished product.

The benefits to GM's operating divisions were immediate and far-reaching. To begin with, every GM facility implementing CMS reduced costs associated with chemicals by 30%. As if this wasn't good enough, other benefits started cropping up that had been largely unforeseen:

Total chemical use fell by nearly one-third, worker safety improved, and legal exposure dwindled. The new techniques lightened every component of the company's administration and environmental load for



chemical management, from purchase to disposal. Costs were reduced in at least three currencies: money, energy, and personnel time. CMS supported shareholder dividends, gave better conditions to workers, and demonstrated "green achievement" to the public, all from a relatively simple program to control chemicals more closely.

Some might wonder why something as beneficial as CMS wasn't put in place decades ago. CMS only became possible with the advent of powerful, low-cost cybernetics (see box, "An Integrated Approach"). But today's electronic support of CMS goes beyond an inventory database on a desktop in the purchasing department; it is based on universal bar codes, by which handheld machines let personnel track thousands of different compounds without cracking a single drum seal. In addition, global positioning services, pioneered by Federal Express, show both shippers and courier headquarters the exact location of chemicals in real time.

There was only one problem: the CMS program at GM was such a runaway success that the company decided to enjoy its competitive advantage in silence. Why should the firm share its hard-won gains with other companies?

Being Charitable

The answer came from an unlikely source: a nonprofit foundation for public policy. At the same time as GM was posting high gains in its internal CMS program, the Pew Charitable Trusts concluded that its customary approach to increase industry's environmental responsibility was proving less effective than it had hoped. New regulations designed to give the public the right to scrutinize toxic-release information, for example, went only so far in reducing overall chemical use. Something else was needed to persuade industry to put social and environmental payoffs on an equal footing with money—in foundation terms, to adopt a "triple bottom line".

CMS proved the perfect vehicle for a pro bono crusade. CMS use not only lowered dollar outlay for materials, as GM had hoped, it also fattened all three bottom lines. Senior personnel at Pew realized that the new approach was a perfect win-win, putting industries and environmentalists on the same side.

In 1996, Pew spun off a new nonprofit entity, the Chemical Strategies Partnership (CSP), whose mandate was to extend the "servicization" concept as far as possible. This was pro bono for the new century: practical yet idealistic, with mutually beneficial means and goals.

The CSP set up offices in Boston and San Francisco and began to explore a CMS rollout. The partnership was armed with

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An Integrated Approach

The key to CMS is the shared belief of suppliers, producers, and waste specialists that operational and production efficiency is maximized when the storage, use, and disposal of chemicals used in manufacturing are minimized. Peak efficiency can occur only when all parties work through a shared logistics infrastructure, usually Internet-based.

By using a streamlined inventory system, suppliers can send shipments to their clients on a just-in-time basis by constantly monitoring the use of raw materials by way of bar codes. With this system, the suppliers end up with a more satisfied customer who is not burdened with excess stock that might be rapidly approaching its expiration date. Similarly, within the company, engineers, scientists, and accounting staff have ready access to information such as MSDSs, specifications, chemical composition, and the results of quality control tests.

Throughout this process, purchasers, designers, and administrative staff can identify points of inefficiency that can be adjusted and thereby minimize the amount of waste produced, whether in human or material resources. And what waste is produced can be quickly transmitted to environmental health and safety or regulatory officials and waste disposal contractors.

expert advice, consulting services, and a small grant fund. As it worked, it discovered approaches like CMS in two other sectors: carpets and photocopiers. Those industries had also gone beyond material sales and were taking a life-cycle view of their products.

Jill Kauffman Johnson, executive director of the CSP, calls servicization a shift from tactics to strategy. "One approach that suppliers take is to determine what a customer is paying solely for chemicals," she says. "[The suppliers] then offer to supply both chemicals and chemical management services for the same fee." Whether it involves carpets, copiers, or chemicals, that's an offer few [client] companies can refuse. For their part, suppliers make money despite reduced product sales by charging a fee to manage chemicals. Helping this pitch is a persuasive statistic: Many customers considering whether to implement CMS are astounded to find their overall expense for chemical

management exceeds their purely material costs by up to an order of magnitude.

"Information technology is the backbone of successful CMS programs," agrees Kauffman Johnson. "Generally, customers purchase their chemicals either on a Web-based system or [by] a direct link to the supplier. Then, chemical use is tracked through the facility until it becomes waste. This information is key to identifying process-efficiency opportunities, compiling accurate data for regulatory reporting, and tracking progress in improving chemical management." Kauffman Johnson's CSP adds another interesting cybernetic tool: an online financial tool for corporate self-assessment (www.chemicalstrategies.org/cost_accounting_tool.htm), designed to ease a user firm's transition to CMS.

Just as the CSP began its work, the concept of chemical management percolated from the automotive sector into aerospace. The conduit for this was Hughes Missile Systems Co. (now Raytheon Corp.), a subsidiary of GM. While ultimately so successful that, in Kauffman Johnson's words, "All Raytheon's competitors started scrambling to emulate it," this early intra-GM rollout had a rocky start.

"They tried twice and failed twice," Kauffman Johnson remembers. "The third time, we [the CSP] came in with some grant money and a little advice, and everything clicked." Similar failures still occur, she admits, when a company retains a supplier who doesn't have sufficient experience in converting to a chemical-service approach. "It's important whom you hire as a chemical provider," she says, "because contracts are often three to five years, and once you're into CMS, the program is relatively entrenched. Of course, by then, you're going to see all the advantages, and you're unlikely to want to get rid of those. Most customers save 5 to 10% in year one, and a minimum of 5% per year thereafter, measured against each previous year. After 5 years, their costs are 25–30% below the baseline year."

Just Regulatory Folks

Have the CSP's successful nonprofit partnerships made

the organization think about entering the accreditation business? "We've wrestled with that one, yes. But we concluded it would be very time-consuming and expensive," Kauffman Johnson says. CSP prefers to spend resources in getting the word out to more companies and occasionally helping them defray their start-up costs. "The market will sort things out," she says. "Firms that implement CMS properly will prosper and grow. Their public image will improve, and in many cases, so will the quality of their products." Such faith in capitalism is remarkable in a pro bono sector that has traditionally relied on pressuring governments to implement more regulation.

What's in the immediate future for CMS? Priscilla Halloran, on detail to the Office of Pollution Prevention and Toxics at the EPA, says that the agency has its eye on the educational sector "because they offer an interesting challenge for chemical servicization . . . [with] thousands of chemicals, small quantities, and hundreds of users." The EPA also sees a "transferability potential" because knowledge from educational servicization could be put to use in the rest of America's research labs. Overall, Halloran writes, her organization's interest in CMS "is . . . [to] help institutions reduce the amount and toxicity of chemicals used, and achieve better environmental regulatory compliance."

The Stanford Linear Accelerator Center in California is already about to choose a

Table 1. A Partial List of Chemical Management Systems Developers

Company	Website
Air Products	www.airproducts.com
AV Chem	www.avchem.com
Chemico Systems	www.chemicosystems.com
Dow Corning Corp.	www.dowcorning.com
General Motors Corp.	www.gm.com
Haas TCM	www.haascorp.com
Henkel Chemical Management	www.chemicalmanagement.com
Illinois Waste Management and Research Center	www.wmrc.uiuc.edu
Interface LLC Chemical Management	www.interface-llc.com
Quaker Chemical Corp.	www.quakerchem.com/solutions/services.htm
Seagate Technologies	www.seagate.com
Shell Services	www.shell.com/services

For a more complete list, see www.cmsforum.org/members_about.html.

chemical service provider under a pilot project, funded by the EPA in 2000, that has been administered by the CSP.

Conversion to a chemical-management viewpoint, says Kauffman Johnson, is never easy: More than anything else, it demands mental flexibility. "You really have to change your thinking," she says. "Also, each company is unique. The closer chemicals are to a user firm's core competency, the more reluctant that firm is to surrender chemical management to an outside firm, even if servicization would save them money." Other resistance may come from misplaced pride. "Some people believe they are already doing the best that's possible, and that no other person or system could possibly do things better than they can," Kauffman Johnson says. But even here, the news is mostly good. While a company's purchasing personnel may start off skeptical of CMS, they often experience a sudden conversion when they look beyond their catalogs and containers to the wider issue of product life cycle.

CMS puts a company in solid control of its chemicals. Specific advantages include optimal tracking of chemicals, clear demonstration of legislative compliance, reduced consumption and spoilage, increased transparency and accountability, better worker safety, and major administrative cost savings. But the single most important benefit may be in waste disposal, traditionally the 800-pound gorilla of chemical use. In a CMS program, every cc of chemical is accounted for, from initial production through use and breakdown. And CMS encourages users and vendors to recycle, further cutting energy and material use.

Tomorrow's Chemicals

Just as GM was persuaded to share its knowledge of CMS for the public good, so the CSP has begun to disseminate its expertise abroad. The system is already being implemented in Canada, one of the United States' largest trading partners. An extensive web knits the two countries, not only in trade (~\$100 million per day in chemicals alone), but also in govern-

ment, academia, corporate subsidiaries, and interagency communication. The CSP has also been approached by Korea, Singapore, and the European Union for advice and assistance in implementing CMS programs. Chemical management seems an idea whose time has truly come.

Yet for all its practical benefits and despite its association with the tongue-twisting new word "servicization", the greatest benefit of CMS may be immaterial. CMS might be the long-sought charm that shows a cynical public and skeptical legislators that chemistry can produce wealth as cleanly as banking. Substances the public has learned to dread as long-lasting poisons and virulent carcinogens may soon be seen as under firm control—as invisible, safe, and hard-working as the coolant in a refrigerator. The public has long awaited a feel-good story of that magnitude. What better news for chemistry in the new millennium?

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