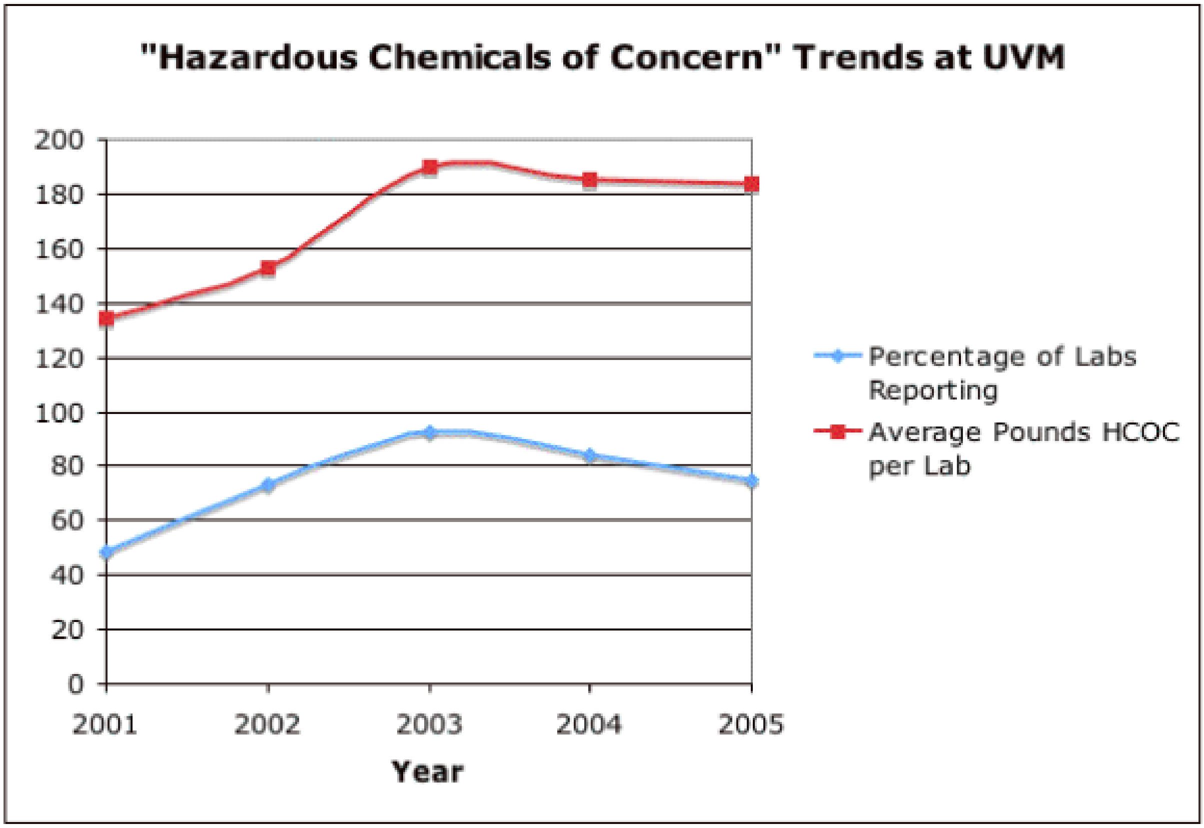
UVM Lab XL Annual Progress Report

August 15, 2005

UVM EPI Overview for 2004

EPI #1: Annual Surveys of Hazardous Chemicals of Concern

EPI #2: Verification of HCOC Surveys

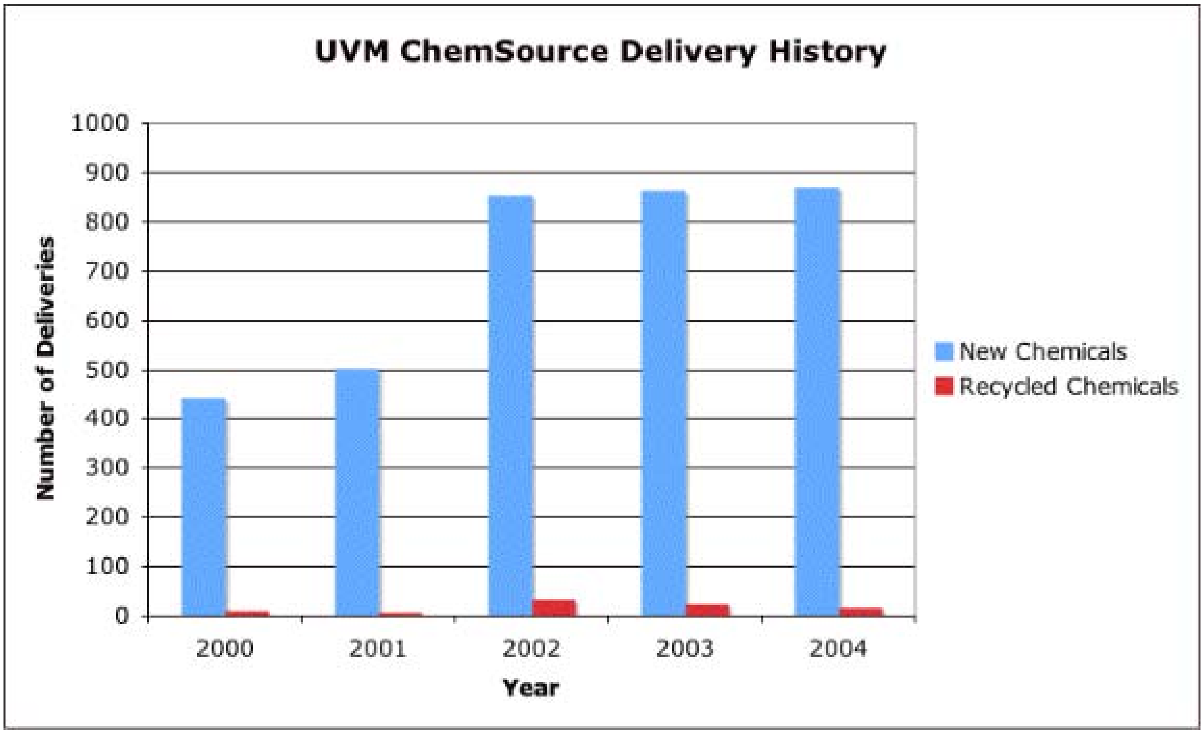


The first two EPI's are the results of the annual Hazardous Chemicals of Concern survey conducted of UVM laboratories. These surveys are used to prepare the SARA Title III report required for hazmat emergency planning purposes. As such, they do not provide precise assessments of the amount of hazardous chemical in the laboratories, but rather an estimate of this amount. The graphs above show the trends in laboratory participation in the HCOC survey and the amount of chemicals stored in the laboratories.

The challenges associated with gathering and interpreting this data has been extensively discussed in previous XL progress reports from UVM. However, the results indicate that the early improvements in participation rate have been maintained and the amount of HCOC stored in the labs have held steady.

EPI #3: Pollution Prevention Opportunity Assessments

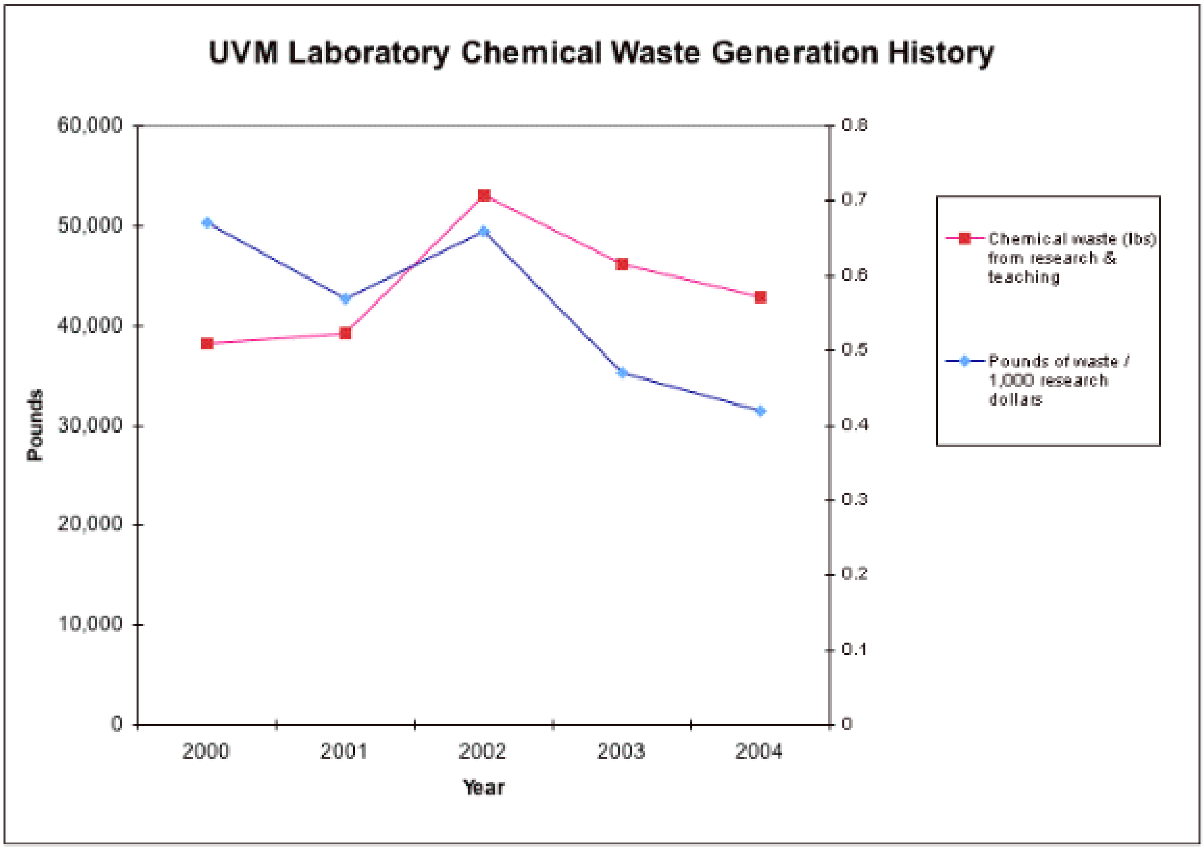
EPI #4: Hazardous Materials Reuse and Redistribution



As has been discussed over the history of the Lab XL progress reports, the most important hazardous waste minimization opportunities for UVM laboratories are found in improving laboratory housekeeping. This opportunity is significantly enhanced by central support services, such as the UVM ChemSource program. The ongoing success of the ChemSource program with regard to new chemicals is demonstrated by the graph above. We have been able to maintain and slightly increase the use of this program by ongoing education of the UVM lab population about its value, both to their labs and the environment.

Less successful as been the attempt to encourage laboratories to reuse excess chemicals from other laboratories. Despite similar support as for new chemicals, no significant increase in this reuse has been found at UVM. Around 2% of our “waste” chemicals have found reuse opportunities in laboratories. This number is similar to that found by peer institutions around the country. Interestingly, it is also similar to the amount of reuse generated by the Chittenden County Household Hazardous Waste program, which offers excess usable household chemicals to homeowners at no cost. We believe that this similarity reflects a reasonable cultural bias about the potential consequences of using chemicals of uncertain quality. We believe that this bias limits the value of strategies aimed at increasing the management of chemicals for reuse.

EPI #5: Laboratory Waste Generation Rates

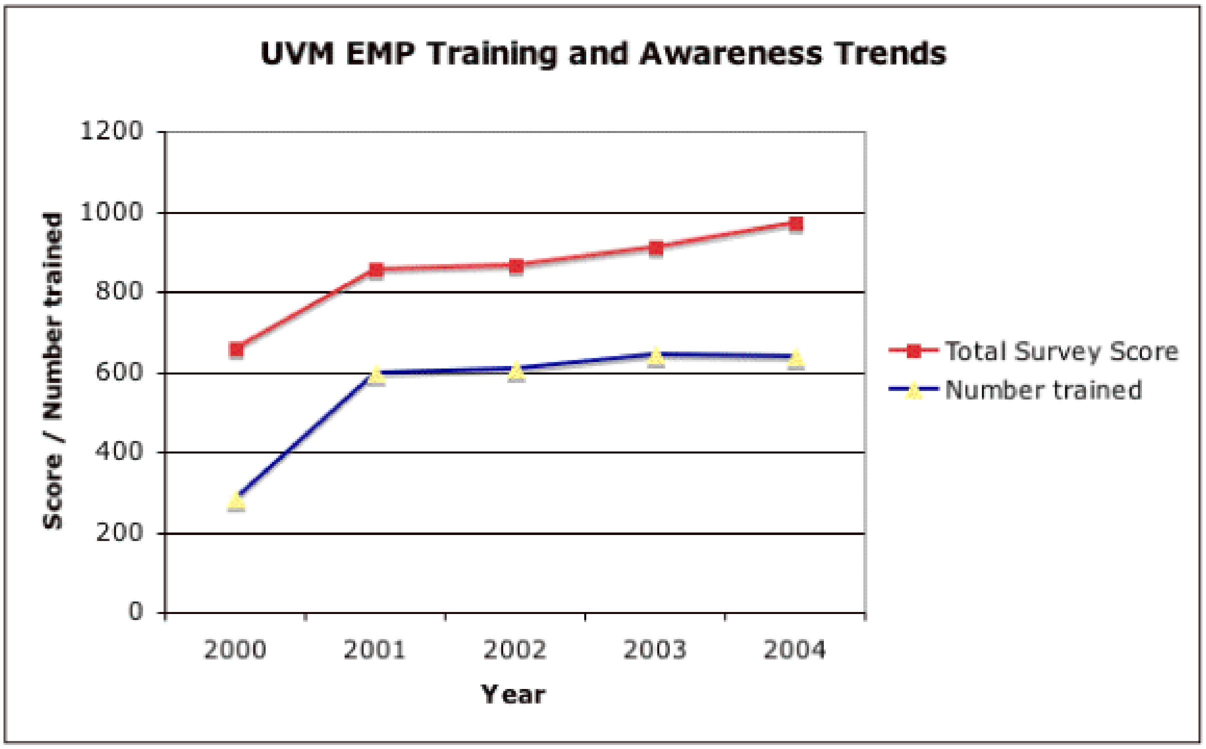


As demonstrated by the graphs above, the amount of laboratory waste generated at UVM does not have a clear trend associated with it. We attribute the spike seen in 2002 to laboratory cleanouts associated with the movement of laboratories into a new laboratory building and laboratory clean-outs associated with implementation of the XL project. However, the long term trend seen over the life of the XL project seems to indicate that the amount of laboratory waste generated has decreased relative to the level of research activity in UVM labs.

We believe that this decrease can be attributed to the implementation of the EMP as well as the changing nature of research. Increased awareness of the challenges associated with managing hazardous chemicals, which has arisen from the EMP have supported better housekeeping in the laboratories and the production of less waste during their chemical use processes.

EPI #6: Environmental Awareness Survey

EPI #7: Environmental Awareness Training



The graph above shows the environmental awareness and training trends at UVM. The effects of the initial outreach efforts of the XL project are clear in the significant increases in both of these measures. The number of lab workers trained each year has settled in the range of somewhat more than 600 people per year.

The 2005 Hazardous Chemicals of Concern inventory also collected information about the number of lab workers in each lab and found that there are about 1000 laboratory supervisors, chemical hygiene officers and lab workers at UVM. Given that the awareness surveys have consistently indicated that there is about 40% annual turnover in laboratory workers, we believe that an annual training rate of 60% of the population is adequate to maintain the heightened awareness levels achieved by the XL project.

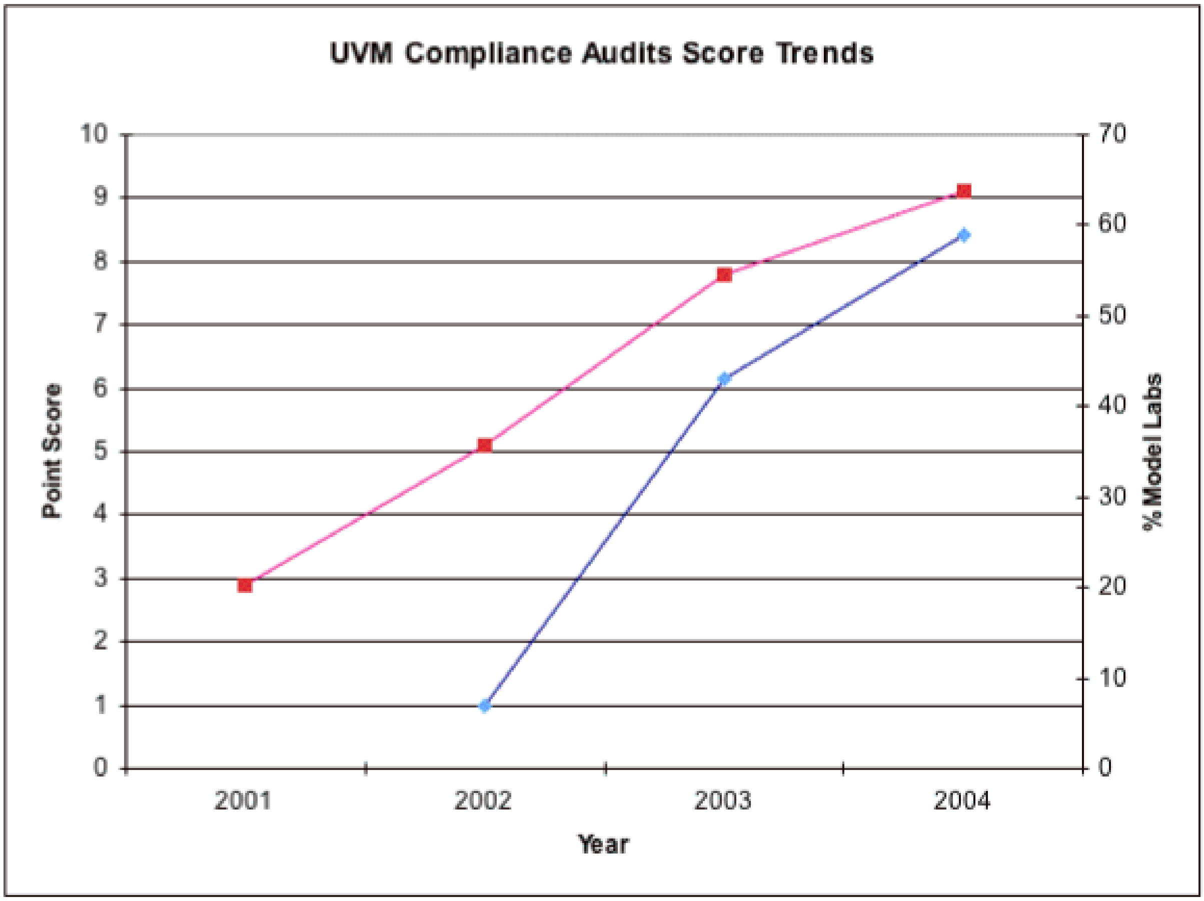
EPI #8: Environmental Management Program Effectiveness

As described in Section 2, the development of this EPI has proven to be the most problematic for UVM, as well as the other pilot schools. Using the balanced scorecard model to identify the key XL EPIs for UVM laboratories, it is satisfying to report that all four of these EPIs are continuing to show improvement, either quantatively or qualitatively.

For example, the normalized lab waste and audit scores indicators are showing numerical improvement trends. The quality improvements in the training program are found in its diversification to include a wider range of environmental health and safety topics to support the ongoing improvement of laboratory performance. The level amount of ChemSource deliveries indicates that the program is viewed as a reliable source of laboratory materials by campus, thereby lessening the amount of HCOC required to be kept in laboratory storage.

The next step in the development of the Balanced Scorecard approach for these indicators will be to set new targets for the key EPIs on a more frequent basis than that of the XL project, where the same set of targets have been in place in the signing of the Final Project Agreement in 1999. Such targets will be developed during the planning process for the 2006 Environmental Management Plan.

EPI #9: Environmental Management Plan Conformance



The chart above demonstrates the ongoing improvement in compliance with the requirements of the UVM Environmental Management Plan over time. Both the average campus audit scores and percentage of laboratories which achieve "model laboratory" status have shown improved without sign of leveling off.

The established base of model labs within the UVM laboratory population has enabled us to begin planning a audit and training program for laboratories that are interested in going "beyond compliance" by participating in campus program that help improve their safety and environmental performance beyond model lab status.

Participation in activities such as pollution prevention brainstorming, active participation in emergency response planning, and improved chemical management practices will enable laboratories to achieve the "beyond compliance" designations and act as role models for other laboratories on campus. We believe that over the long term, this will enable UVM to maintain the continuous improvement efforts for laboratory environmental performance sparked by the XL project.

Appendix 1:
Laboratory Waste Minimization: Reflections
Peter C. Ashbrook and Todd A. Houts

Since this will be our last column, at least for awhile, we are taking this opportunity to present some thoughts based on 11 years of writing on laboratory waste minimization.

First, in our opinion, the single most effective laboratory waste minimization strategy is good housekeeping. For many, this is a tough option to pursue because it is a constant need and entropy is a powerful reality. Nor is it easy to demonstrate that good housekeeping has caused a reduction in waste production or costs. Nonetheless we are convinced that continuing attention to good housekeeping is the foundation of laboratory waste minimization. Closely related to good housekeeping is the practice of planning activities before action. Waste minimization is most effective when addressed before activities begin rather than after an activity has already started.

Second, everyone likes checklists—just tell us what to do and we'll be glad to do it. Similarly, our columns on audits generated quite a bit of interest. Our feeling is that general purpose checklists, and to a less degree – audits, have limited value in laboratories because there are so many differences between settings that such tools are likely to be either much too general or much too specific to be useful. As a result, we encourage laboratory workers to periodically take time to develop their own checklists with an eye toward how their chemicals can be used most efficiently with the generation of the least amount of waste. Audits should be designed so that conceptual goals are evaluated, rather than specific ones. With few exceptions, people don't need training in laboratory waste minimization; instead, they merely need to incorporate the concepts into their thinking. The Chemical Hygiene Plan is an excellent place to incorporate waste minimization.

Third, the biggest successes come from the cumulative results of many little successes. Opportunities for cutting solvent usage in half or eliminating mercury use do not come around very often. However, maybe you can reduce chemical use in a standard analytical procedure by a few milliliters, and over time this reduction can become significant. Celebrate and share these small successes, because they are the basis for big successes. The biggest challenge to continuing waste minimization successes is to keep at it after you have had a success. Don't fall into the trap of neglecting waste minimization because you had a big success story. Use your successes, however small, to generate even more success stories.

And finally, acknowledging the fluidity of personnel over time (and in a nod to our own decision to step back from this column), is the need for each person that contributes to waste minimization to leave a behind a legacy. Instill in each new person the knowledge you've gained and the changes you've seen. Encourage them to make waste minimization an integral part of their thought process so they won't even know a time existed when it wasn't the norm. If you can accomplish this, it may one day eclipse all your greatest individual successes.

We want to give the editors of *Chemical Health and Safety* our special thanks for encouraging and supporting this column. Warren Kingsley, the Founding Editor, was especially supportive when the concept of this column was put before him. Carl Gotschall and now Harry Elston have likewise been extremely supportive of our efforts with this column. We also take this opportunity to recognize Cindy Klein-Banai, who was a coauthor on this column in its early years.

While there does seem to be more interest in laboratory waste minimization now, it would be fraudulent to say we have observed a radical shift in thinking over these past 11 years. Perhaps the biggest change has been the number of places that have made serious attempts to reduce mercury usage, something we first wrote about over ten years ago. While other concerns—particularly those related to security and biological hazards—have become the issues of the day, writing these columns has certainly helped us develop our own waste minimization programs. Hopefully, they have helped our readers as well.

Waste Minimization Recommendation #87: Establish a culture and legacy of waste minimization in your laboratory. Special initiatives can reduce wastes on a temporary basis; however, constant attention to waste minimization is necessary for continuing success.

Published in ***Chemical Health and Safety*** Volume 11, Issue 6 , November-December 2004, Page 25

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