SPF00032 FINAL REPORT: CHEMICAL INVENTORY REDUCTION CAMPAIGN

By Christian Bouchard

Manager, Hazardous Waste Management

Table of Contents

1. EXECUTIVE SUMMARY

The Hazardous Product Act (HPA) and the regulations referring to it stipulates that an individual who possesses controlled products (regulated under WHMIS) needs to have a complete inventory of all the bottles in his possession, as well as the Material Safety Data Sheet (MSDS) attached to each chemical. At McGill, not all researchers comply with the regulations, whether it is by lack of knowledge or simply refusing to do it for various reasons. In order to help the research community, the Environmental Health and Safety (EHS) department purchased software, the Environmental Health and Safety Assistant (renamed "myLab" by McGill), to digitalize and centralize the entire chemical inventories, as well as maintaining an MSDS database for everyone who requires access to it.

To facilitate the transition to myLab, the Hazardous Waste Management (HWM) department, who is responsible for collection of all hazardous wastes on both campuses, organized several hazardous waste collection days, where all researchers were allowed to dispose of their obsolete chemicals. This "inventory reduction" project had several goals:

- Reduce the number of unwanted hazardous chemicals on our campuses
- Ensure proper and safe disposal of those chemicals
- Provide a safer environment to the McGill community
- Free valuable laboratory space in our buildings
- Fast-track implementation of myLab by reducing the amount of bottles to be inventoried

From June 2011 to September 2012, we collected chemicals from all across the downtown and Macdonald campuses. We then consolidated all the data to determine statistics on volumes of waste disposed of with this project. Overall, we collected 3 380L of flammable and toxic waste, 28,5 kg of highly reactive materials (pyrophoric, water reactive, etc.) and 4,7 kg of inorganic cyanides (Potassium cyanide, sodium cyanide, etc.). These numbers represent hundreds of bottles which were removed from the laboratory shelves. Our communication plan with the research community worked well, but there is room for improvement if we are to perform such a task in the future. We feel that we could have removed more chemicals if our plan would have been a little more aggressive and structured. However, we were successful in achieving all goals mentioned above, with no incidents to report.

2. INTRODUCTION

2.1 Our department: The McGill Hazardous Waste Management (HWM) department is responsible for the safe disposal of all hazardous material generated on both MacDonald and Downtown campuses. Our main focus is on research waste such as chemical, biomedical and radioactive. In addition, we also collect and dispose of various scrap metals as well as old electronic equipment, which contains highly toxic materials like lead, nickel, cadmium and many other heavy metals. This report will focus on the chemical waste generated by McGill University.

2.2 The University: At McGill, we have over 800 laboratories working with hazardous materials. These laboratories have a chemical inventory which varies between a few dozen to several hundred bottles. According to the most recent statistics, we have over 100 000 different chemical items stored in our laboratories, confirming McGill as being a research intensive institute.

2.3 The regulations: As a province of Canada, Quebec must abide to Federal and provincial regulations. In our case, we will refer to the "Hazardous Product Act[1]" (HPA, federal) as well as the "Regulation Respecting Information on Controlled Products[2]" (RRICP, provincial), which refers to the HPA. The HPA and its regulations are administered by Health Canada, who uses a communication standard called the Workplace Hazardous Materials Information System, or WHMIS. In short, the Act and its regulations stipulate that whoever is in possession of controlled products is responsible to keep an inventory as well as a collection of Material Safety Data Sheets (MSDS).

- **Controlled products:** a material which is flammable, combustible, oxidizing , poisonous, infectious, corrosive, dangerously reactive and compressed gas

- **MSDS:** It is a document which contains information on the potential hazards (health, fire, reactivity and environmental) and how to work safely with the chemical product. It is an essential starting point for the development of a complete health and safety program. It also contains information on the use, storage, handling and emergency procedures all related to the hazards of the material[3].

- **WHMIS:** The Workplace Hazardous Materials Information System (WHMIS) is Canada's **national** hazard communication standard. The key elements of the system

[1] http://laws-lois.justice.gc.ca/eng/acts/H-3/
[2] http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=3&file=/S_2_1/S2_1R8_A.HTM
[3] http://www.ccohs.ca/oshanswers/legisl/msdss.html

are cautionary labelling of containers of WHMIS "controlled products", the provision of material safety data sheets (MSDSs) and worker education and training programs[4].

3. PROBLEMATIC

3.1 Current situation: McGill University, just like any other institution which possesses controlled products under WHMIS, needs to comply with the provincial and federal regulations. In order to do so, the Principal Investigators (PI) have been asked to maintain a current inventory of their chemicals as well as a collection of up-to-date MSDS. The Environmental Health and Safety (EHS) department, who are responsible for inspecting the laboratories on a regular basis, will verify if the MSDS are current as well as check for accurate inventory. The PIs are free to use their own system to maintain their inventory, whether it is on paper, excel spreadsheet, a database or any other equivalent. The inventories and MSDS are not centralized, which means there are many duplicate documents in many laboratories. It also means that chemical inventories are not shared between laboratories, making it difficult for PIs to know if someone is in possession of a chemical they need, which might be in surplus in another laboratory. The lack of a standard form also affects EHS's inspection, making it more difficult for them to properly verify one's inventory.

Even though it is mandatory by law to have an accurate chemical inventory including updated MSDS, not everyone complies. In fact, some PIs don't even have an inventory. The reason why is simple: there is no enforcement from a provincial or federal body. Laboratories are inspected internally by EHS, but their power is limited.

Failing to keep an accurate chemical inventory can jeopardize safety. For example, in the event of an emergency (chemical spill, fire, etc.), the first responders would not have access to MSDS in order to know what they are dealing with. Currently, EHS asks the PI to post a "laboratory information card" on the door of all laboratories which manipulate chemicals. The information card indicates the different chemical hazards (flammability, reactivity, toxicity, etc.) located in the room as well as the location of the MSDS. Since these documents are kept in the laboratory, it is nearly impossible for the first responders to access them without being potentially exposed to a hazard. There are no centralized lists by building or room number.

[4] www.hc-sc.gc.ca/ewh-semt/occup-travail/whmis-simdut/index-eng.php

3. PROPOSED SOLUTION

During fall 2008, EHS and HWM needed to upgrade their radioactive material management software (purchasing, internal permits and disposal). A decision was made to try to kill two birds with one stone and to look for a system which could potentially manage chemical inventories and MSDS in addition to the radioactive material management. With help from procurement services, a Request For Proposal (RFP) was submitted in order to find suitable software. The winning bidder, Onsite Systems[5], proposed software which works on a "module" system. In short, there is core software which can manage the satellite modules which are linked to the core. Prices vary depending on how many modules are required. Also, the software is highly customizable, making it easy for McGill to tailor this new software to our specific needs. The first two modules we purchased were the radiation module and chemical inventory module. Since our radioactive management software was failing, we decided to implement Onsite System's radiation module first as part of phase 1 of the project. Phase 2 would be the chemical inventory module. For the sake of this report, we will focus on phase 2 of the project implementation.

As part of phase 1, the software was given a new name: "myLab". We will now refer to that name for the rest of the report. The Environmental Health and Safety (EHS) department also created a permanent position to administer all of myLab's modules, including the one discussed in this report. In order to provide a smooth transition between the actual chemical inventory system and myLab, we had to develop a strategy where the end-users would be disturbed to a minimum, but still provide the minimum information required to operate myLab. PI's were asked to:

1. Dispose of all unwanted chemicals to reduce their inventory before the transfer
2. Update their current inventory
3. Submit a list of chemicals to the myLab administrator

We decided not to ask the PI to import their inventory in myLab. Considering that many of them don't even have an inventory, it would be too much work for them. All that was asked was to clean up their act, give us the updated list and we will do the rest for them.

This is where we can tie the implementation of myLab with the "chemical inventory reduction campaign". The idea is to get funding from the SPF in order to be able to do the transition to myLab. As explained earlier, the HWM department is responsible for hazardous

[5] http://www.hpassist.com/

waste disposal, generated by research on a regular basis. We are not budgeted to organize large scale waste disposal events. In the past, we did organize what we called “Clean and Green” events, where we visited all McGill buildings with laboratories and collected everything the PI wanted to get rid of for free. These events were funded with a special budget approved by senior administration. Hundreds of liters of hazardous wastes were collected and disposed of accordingly, making the University a safer and more sustainable place to work. Unfortunately, these special events are a thing of the past and, even if most of the very old chemicals are now long gone, there are still places where they are accumulated. By asking PI’s to clean up their laboratories and submit an accurate chemical inventory, we knew that, in order to minimize the number of bottles to be inventoried, they could potentially dispose of a large volume of waste. We firmly believe that the “chemical inventory reduction campaign” will fast-track, as well as facilitate, the implementation of myLab phase 2.

4. PROJECT IMPLEMENTATION

4.1 Timeline:

1. *Project start: June 2011*
2. *Inform PI through communications with myLab administrator: Ongoing*
3. *Set up 4 major pick up:*
    - *Otto Maass: fall 2011*
    - *Stewart Biology: February 2012*
    - *Lyman Duff: February 2012*
    - *Macdonald Stewart: April 2012*
4. *Pick up from smaller migrating laboratories: ongoing*
5. *Life Science Complex: Ongoing*
6. *Consolidate statistics: Fall 2012*
7. *Write final report: 2013*

Considering that there are over 800 laboratories at McGill, the myLab project team had to come up with a good strategy to successfully implement phase 2. After many discussions, it was decided that:

1. Chemistry is the department which holds the largest volume of chemicals to migrate. It will most likely be the most difficult department to deal with. If we can successfully implement phase 2 in chemistry, the rest should come easy. We will start with them.
2. Once chemistry is completed, we will send a general announcement to all other departments which are ready to be migrated. EHS will import their chemical inventory into myLab so they can start using it.
3. At this point, we are left with those who do not have an inventory and are probably reticent to switch to the new system. We will hire resources (students) to help them update their inventory and upload it in myLab.

In order to pick up the surplus chemicals, we had to schedule "hazardous waste disposal days" that would be synchronized with the inventory migration. We started with the Otto Maass building during fall 2011. This proved to be challenging since McGill University Non Academic Certified Association (MUNACA) voted a strike the first week of September. Many technicians from chemistry and HWM are members of that union, so things got slowed down drastically until January 2012. Then in February, we organized two waste days: one in Stewart Biology and one in Lyman Duff. The last waste day was held in Macdonald Stewart, at MacDonald campus.

Our communication strategy was to inform the building director of our hazardous waste disposal days, and ask them to send a building note to all laboratories informing them of the time, date and specific requirements regarding the logistics of the event. We also printed several posters which were displayed at as many locations as possible. A copy of the poster is included in Annex I.

For all departments which were not part of these special hazardous waste disposal days, they had to submit their waste inventories using our online hazardous waste pick up form. We asked the PI to write in the "additional information" section of the online form that the waste was part of the myLab migration. That way, the users were already familiar with the form, and we did not have to come up with a new tool to manage the inventory reduction requests. A copy of the form is in Annex II.

As for the Life science complex (McIntyre, Goodman Cancer Center, Bellini), we were able to manage the waste on site because our department is located in the McIntyre. All which was left to do was consolidate the data obtained from the hazardous waste collections in order to prepare statistics.

6. STATISTICS

We collected statistics for all the major pickups we did in Otto Maass, Lyman Duff, Stewart Biology, Macdonald Stewart, the Life Science Complex (McIntyre, Bellini and Goodman), as well as all the individual labs which submitted an online pickup request. In order to understand how we ended up with these numbers, one needs to know how we actually package and transport the hundreds of chemicals that were part of this project. For us to be compliant with the provincial and federal regulations, we need to first segregate the different bottles according to their chemical compatibilities. Then we can pack them in 205L steel drums, using vermiculite as a packing agent. The vermiculite will prevent contact between bottles, as well as provide proper absorbing power in case of a leak. Since we transport and dispose of the chemicals in their original bottles (we do not pour the content out), we can only estimate the actual volume of waste which was collected for the sake of this project. Some bottles are full, others almost empty. But even if we do not keep track of every single bottle's volume, we do know how much vermiculite we are using for packing on average. We can easily estimate the volumes of chemical waste picked up. As a rule of thumb, a 205L steel drum filled with vermiculite and chemical bottles will hold around 80L. Depending on how full the drum is, we can calculate the approximate volume picked up that day. Here is an example of a drum packed with laboratory chemicals and vermiculite (commonly called "labpack"):

So here are the statistics for the project:

Building	Flammable and corrosive material (L)	Reactive material (kg)	Cyanides (kg)
Otto Maass	280	15.364	2.321
Lyman Duff	760		
Stewart Biology	220		0.160
MacDonald Stewart	640	5.082	0.418
Centennial Centre	160		
Life Science Complex	320		
Frank Dawson Adams	320	2.250	1.250
Montreal Neurological Institute	560		
M.H. Wong	120	5.786	0.510
TOTAL	**3380 L**	**28.482 kg**	**4.659 kg**

7. DISCUSSION AND CONCLUSION

7.1 Discussion

The intention of this project was to take the opportunity presented by the implementation of myLab's chemical inventory module, and use it to reduce the amount of old chemicals on both McGill's campuses. We know for a fact that many researchers did not possess an updated inventory, so we thought that by requesting them to dispose of their old bottles, it would be easier for them to abide by the regulations, which requires all researchers to have an up to date chemical inventory. It was difficult to determine how many PI's who possessed expired chemicals actually disposed of them. To achieve this, we would have required a list of chemicals to be disposed for each and every one of them, and that often "turns off" PIs, who then decide not to dispose of their material.

This is not the first time that HWM set up a clean-up event like this one. Back in 2004, we organized a "Clean and Green" event where PIs were invited to dispose of their obsolete chemicals. To encourage them to get rid of as much material as possible, we accepted everything: cylinders, unknowns, reactives and other potentially problematic items which we normally charge for. To make sure that every single laboratory was aware of this operation, we attached a tag to every door with a laboratory information card in the targeted building. The tag indicated the event, date and time where we would be accepting the waste. It was not necessary to use the same strategy this time, because the myLab administrator was responsible for coordinating the move from paper inventory to electronic. She was able to mention the inventory reduction project directly to the PI.

If we look at the statistics, we can conclude that:

- With no surprises, Lyman Duff, Macdonald Stewart and Montreal Neurological Institute (MNI) were the biggest waste generators. Lyman Duff is known to be very research intensive, Macdonald Stewart was basically the rally point for the whole Macdonald Campus, and the MNI is using a chemical waste room to store their obsolete chemicals, which makes it easier for researchers to remove chemicals from their inventory whenever they need to.
- Otto Maass numbers were a little low. Although, during the last "Clean & Green" event (2004), we removed over 6000L of unwanted chemicals from the building, thanks to the Chair who was very pro-active about it. The "inventory reduction project" confirms that the accumulation of obsolete chemicals has not increased drastically over the last 8 years.
- We collected over 33 Kg of various reactive materials and cyanides. Considering that these chemicals are highly hazardous and that they are usually packed in bottles of 100 g or less, this is a huge accomplishment.
- Some departments did not get rid of any chemicals. But again, we were not forcing anybody to dispose of chemicals. It was up to them to decide if they rather keep their bottles and add them to their chemical inventory, or just dispose of them.

Remember there is a dollar amount attached to every single bottle that a PI possesses, and there is nothing we can do to force them to dispose of a chemical unless it poses a threat to the health and safety of the McGill community.

7.2 Conclusion

A big part of what would determine the success of our project was resting on our communication strategy with the research community. With the myLab system being a new software which was imposed on them, we had to be careful on how we would sell it to them. MyLab is a tool which will help them comply with the current regulations, improve their laboratory inspection scores, give them access to electronic MSDS, facilitate chemical sharing as well as improve sustainability. The "chemical inventory reduction" project was to facilitate this transition at no cost to the researchers. I believe we were successful in doing so. We were also able to:

- Reduce the number of unwanted hazardous chemicals on our campuses
- Ensure proper and safe disposal of those chemicals
- Provide a safer environment to the McGill community
- Free valuable laboratory space in our buildings
- Fast-track implementation of myLab by reducing the amount of bottles to be inventoried

It was difficult for us to forecast the volume of chemicals which would be disposed of by the research community, so we used numbers from similar operations we did in the past. As expected, the estimations were a bit higher than the volumes we collected, which is a very good sign. Researchers tend to accumulate obsolete chemicals and we are trying to prevent that by having special projects similar to this one as often as we can afford. It has been 8 years since the last one, so the timing was right.

What went right:

- **Good communication plan:** We worked together with building directors to inform the occupants of our upcoming visit. Posters were visible and very catchy.
- **Everything was accepted:** In many cases, we did not ask for a list of chemicals. That way, researchers could just show up with whatever they had, and we accepted it, no questions asked.

- **No incidents:** even if some chemicals were very old, we did not have any incidents while transporting, processing or disposing of the chemicals

Room for improvement:

- **Perfect communication plan:** Some departments did not use our services to dispose of obsolete chemicals. It is possible that they did not want to get rid of it, but also that they did not hear about our project. I don't think that tagging every single laboratory door with a "clean & green" label is necessary (like we did in 2004), but maybe a hybrid system between the tags, posters and emails. We could also have an information session prior to the event to explain our intentions.
- **Use this opportunity to educate researchers:** We do not have many opportunities to meet directly with the research community. We did some safety awareness during the collection of chemicals, but it could have been more structured. For example, we could have printed posters explaining how overstocking chemicals cost money not only to the researchers, but to the University as well.

We are very happy with the end result of this project and are looking forward to perform a similar intervention in a few years from now. Hopefully we can learn from this project and optimize our next intervention to make the best out of it.

8. ANNEX I: Hazardous Waste Disposal Event Poster

TO ALL RESEARCHERS

As part of the process of migrating your chemical inventory to the new myLab system, we are organizing a hazardous waste collection for the Stewart Biology building. The goals of this event are:

- Remove unwanted chemicals from your inventory
- Provide a safer work environment by disposing of expired or unstable chemicals which pose a safety issue (like ether, perchloric acid, picric acid, THF, etc)
- Facilitate the transition to myLab chemical inventory module

The HWM team will be accepting your chemicals on Thursday, February 2nd 2012 from 9h00 to noon on the 3rd floor loading dock (next to the biology store). Please send your list of items to Kim.bray@mcgill.ca (or fax 4633) **by Friday, January 27th 2012.**

Thank you for helping us keep our University a sustainable and safe place to work.

Christian Bouchard
Manager, Hazardous Waste Management

9. ANNEX II: Hazardous Waste Disposal Form

Hazardous Waste Management Web Forms

- Online spill report form
- Old electronic / laboratory / scrap metal equipment
- **Online waste pickup request**

Online waste pickup request

Please fill out all **required fields** in the identification section.

Clearly identify wastes by chemical name. State the type and volume of the containers as well as the number of containers we will have to pick up. If you have different containers of the same chemical, make an entry for each. For example:

```
Glacial acetic acid, 4L, glass, 3 units
Glacial acetic acid, 250 mL, glass, 5 units
```

When you submit this form, a copy will be sent to you as well.

1. User identification

First Name:
Last Name:
Department:
Building:
Room:
Phone #:
Fax #:
Email:

2. Materials to be picked up

Product (chemical name)	Container: volume	type	# of units
	100mL	Glass	
	100mL	Glass	

3. Additionnal information

Should you have additionnal information about your list, or if there is anything you wish to tell us, please indicate it below.

Clear Send form

10. REFERENCES

- Hazardous Products Act (R.S.C., 1985, c. H-3): http://laws-lois.justice.gc.ca/eng/acts/H-3/
- Regulation respecting information on controlled products: http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=3&file=/S_2_1/S2_1R8_A.HTM
- Canadian Center for Occupational Health and Safety (CCOHS): http://www.ccohs.ca/oshanswers/legisl/msdss.html
- Health Canada – Workplace Hazardous Materials Information System official national site: http://www.hc-sc.gc.ca/ewh-semt/occup-travail/whmis-simdut/index-eng.php
- Onsite systems – Environmental Health and Safety Assistant: http://www.hpassist.com/