

IMPLEMENTATION OF THE OAK RIDGE NATIONAL LABORATORY'S CHEMICAL MANAGEMENT CENTER FOR THE USE OF EXCESS CHEMICALS

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ABSTRACT

The nature and variety of research that is done at ORNL results in a large and varied inventory of chemicals. The chemicals are expensive to acquire, inventory and manage, and more expensive to handle as waste. Chemical custodians are encouraged to limit their inventories to reduce cost and promote safety. Previously, the only option was to handle excess chemicals as waste. In 2001, ORNL established the Chemical Management Center to safely store excess chemicals and actively search for new users.

BACKGROUND

Oak Ridge National Laboratory, now operated by UT-Battelle, LLC, was established in 1943 to pioneer a method for producing and separating plutonium. During the 1950s and 1960s, ORNL conducted research in several fields related to nuclear energy, and built and operated several nuclear research reactors, in addition to performing important life sciences research. With the energy crisis of the early 1970's and 1980's, ORNL's activities expanded to include multiprogram research and development in support of national DOE missions.

ORNL currently has 3,800 full time staff and an annual average of 3,000 guest researchers visit the user facilities each year to conduct research. ORNL is a leader in several areas of research that support the Department of Energy's mission, including neutron sciences, carbon management, high performance computing, complex biological systems and materials science. ORNL's research capabilities also include analytical and separations chemistry and chemical sciences, environmental sciences, fusion science and technology, instrumentation science and technology, nuclear physics and astrophysics with radioactive beam technologies, biomass energy, fossil energy, energy-efficient technologies, nuclear science, life-cycle analysis, and health and environment risk assessment.

Due to the nature and variety of research, ORNL has a large inventory of chemicals. ORNL has in excess of 150,000 items with 30,000 unique items. Having this many and this variety of chemicals creates a potential safety problem, as well as significant costs associated with managing inventory and waste management. A study done in 1994 about the costs of waste management indicated that costs were event driven instead of volume driven. The costs of characterization, analysis and paperwork were virtually the same to process a very small item as they are to process drum quantities. Only the actual disposal costs vary. (1)

Historically, ORNL management has encouraged chemical custodians to reduce or limit their chemical inventories, but the only avenue provided was to process the material as waste. Furthermore, the custodians typically did not have to funds to process a large number of items as

waste, and the items they no longer had a designated use for still had value, frequently, significant value due to the nature and purity of laboratory grade chemicals. It is not unusual for a 500 gram quantity of pure chemical to exceed \$100 in value.

FACILITY DESCRIPTION

In 2001, the ORNL Pollution Prevention Program, using ORNL Operational Improvement Funds, established the Chemical Management Center. An existing warehouse was upgraded with heaters, vent fans and insulation. This was implemented to ensure that the chemicals are kept from freezing or exceeding their boiling points. While the building upgrades were being implemented, an Operations Manual, acceptance criteria, and web page were developed. Minor modifications were made to the web-based chemical purchasing process to encourage custodians needing chemicals to check the CMC inventory prior to purchasing new items.

CMC OPERATIONS

At this centralized facility, trained CMC personnel have evaluated the chemicals and actively work to find alternate uses and users for the chemicals. One of the goals of the CMC is to expand the universe of potential users, primarily internal to ORNL, but also including other DOE or federal sites, universities or manufacturers. The acceptance criteria (Figure 1) were established to ensure that the CMC receives only chemicals that have the potential of being used.

ATTACHMENT D: CMC Acceptance Criteria	
A.	PHYSICAL CHEMICAL DATA REQUIRED FOR CMC ACCEPTANCE
1.	Chemical or product name including CAS and product numbers.
2.	Name of the chemical manufacturer.
3.	Adequate description of the chemical container including its size and current status (opened or unopened).
4.	Purity and physical state of the chemicals.
5.	Chemicals must be in original container, clean, and in good condition.
6.	Chemical container volumes should be less than fifty-five gallons.
7.	MSDS and date purchased, if available
B.	SOURCE DATA REQUIRED FOR CMC ACCEPTANCE
1.	Building number, room number, and directorate under which chemicals were utilized or required
2.	Name, badge number of donator
3.	Determination of chemical utilization in regards to radiological areas (Chemicals must be Green Tagged).
C.	CHEMICALS THAT WILL BE ACCEPTED BY THE CMC.
1.	Paints and coatings.
2.	Cleaning compounds.
3.	Adhesives and resins.
4.	Oils and solvents.
5.	Alcohols, acids, and bases.
6.	Laboratory Chemicals
7.	Others, on case-by-case basis
D.	CHEMICALS THAT WILL BE EXCLUDED FROM THE CMC
1.	Products with no demand on-site or off-site.
2.	Products not certified to be free of radioactive contamination.
3.	Customized mixtures of chemicals for specific applications.
4.	Chemicals contained in dispensing or squeeze type bottles.
5.	Products in unlabeled containers or suspected of not matching label and/or MSDS.
6.	Any materials that require accountability such as chemicals that are known drug precursors, drugs, and precious metals.
7.	Compressed gas cylinders (aerosol spray cans are acceptable).
8.	Aerosol spray paint products that do not meet federal, state, or local regulations.
9.	Explosive or unstable chemicals.
10.	Peroxidizable materials.
11.	Products with damaged packaging.
12.	Inoperable aerosol spray cans.
*These chemicals may be accepted on a case-by-case basis. Please call or e-mail the Center for a review by our chemist.	
E.	DELAYED ACCEPTANCE:
Acceptance of chemicals that meet all acceptance criteria may be delayed due to CMC space and inventory constraints. Chemicals that, upon acceptance and storage at the CMC would cause the CMC to exceed regulatory threshold limits (RQ, TPQ, TQ) and/or fire protection limits will be accepted when inventory levels of these chemicals drop sufficiently below these building inventory limits to allow storage of these chemicals.	

Fig. 1: CMC Acceptance Criteria

All ORNL divisions were notified that the facility was open for business and would accept chemicals they identified as unwanted, but usable. In the original survey, over 8,000 items were identified by division representatives as being available for transfer to the CMC. CMC operators aided the custodians in completing the submitting paperwork (Figure 2). Each item was reviewed to ensure that it met the acceptance criteria.

ATTACHMENT E: CMC Screening and Acceptance Form

PART 1: GVIGIE complete and submit to the CMC. Italicized items marked * are optional.

GVIGIE Name: _____ Date: _____
 Division: _____ Building: _____ Room / Control Area No: _____
 Custodian Name: _____ Badge No: _____ Phone: _____
 Chemical / Product Name: _____

CAS No: _____ REC ID No: _____ Physical State: _____
 Total No. of Items: _____ Quantity per Item: _____ (unit: gal., oz., lb., etc.)
 All Items Green Tagged (Y/N): _____ (Items NOT Green-Tagged will not be accepted)
 Typical Process Use(s): _____ (e.g., Lapping Compound, Sealant, Plating material, Coating)
 *Acquisition Price (\$/Item): _____ *Acquisition Price (TOTAL \$): _____ *DOT Hazard Class: _____

	Grouping 1	Grouping 2	Grouping 3
Number of Items in this grouping			
Manufacturer			
Purity / Grade			
Expiration Date / Shelf Life			
Type / Condition of container (Gaseous/Liquid/Solid, Unopened)			
*Approx. Purchase Date			

PART 2: CMC SCREENING RESULTS / FINAL SCREENING DETERMINATION

Screening Criteria (Y / N) A YES is Required for Acceptance	Y / N	Comments
Green tag is available and is properly completed		
All required information in PART 1 is completed		
Chemical does NOT require accountability (if drug precursor, drug, or precious metal answer NO)		
Container is Original, Labeled, Clean, and Less than 55 Gallons		
(1) Container is UNOPENED and UNDAMAGED (if opened or damaged, answer NO)		
(2) Aerosol spray cans are obsolete		
Aerosols meet federal, state and local regulations		
Chemical is NOT a compressed gas (if item is a Compressed gas, answer NO)		
(1) Chemical is NOT Explosive, Oxidizer, or Peroxidizable, (if any of these, answer NO)		
Sufficient DEMAND for chemical exists		
(a) Chemical fits within CMC Fire Protection limits		
(b) Chemical fits within Regulatory limits (if NO, indicate which Limit will be exceeded)		
(1) If any of these criteria are answered "NO" - the item may be accepted on a case-by-case basis		
(2) If none of these criteria are answered "NO" - the question will be escalated to find the chemical until such time that space becomes available at the CMC, or a hazard and consequences assessment has been completed per ESD-EM-103		
Criteria Met: Item Accepted into the CMC	Criteria NOT Met (describe)	
Criteria met but CMC space is currently insufficient	(recommendation)	

Screening Performed by: (Name) _____ (Date) _____
 Custodian verifies all information supplied is correct, and agrees to transfer to CMC: _____ (Custodian) _____ (Date) _____

Fig. 2: CMC Screening and Acceptance Form

Chemicals are segregated in the facility based on their Department of Transportation (DOT) for safety reasons. The facility has one large warehouse portion where the non-regulated chemicals (Figure 3) are kept, and several smaller rooms in order to segregate the flammables/combustibles, oxidizers, poisons, reactives and corrosives. All liquids and most solids are secondarily contained, and the flammables and combustibles are stored in flammable cabinets.



Fig. 3: CMC High Bay; Non-regulated Materials

A web page (Figure 4) was developed to provide users easy access to the submittal forms and to query the facility's inventory. Links were established to purchasing avenues, existing material exchange and the Pollution Prevention Program's web page.

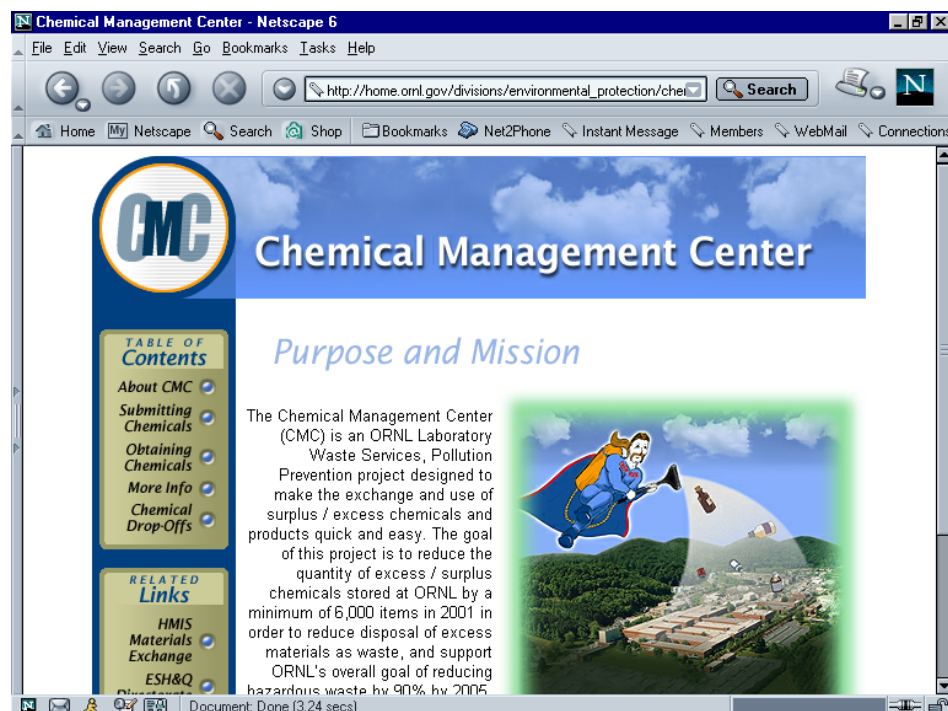


Fig. 4: CMC Main Web Page

COST ANALYSIS

The improvements to the existing storage building cost \$100,000 and were completed by ORNL Engineering and a construction contractor. Operational costs for the year were \$300,000. These costs for the first year are slightly higher than estimated costs for subsequent years, because of the additional costs with developing the Operations Manual, training the CMC staff, purchasing spill response equipment and secondary containers, and developing the web site. After seven months of operation, the facility inventory of 2,741 items was valued at \$138,807. 1,277 items valued at \$43,015 had been transferred to custodians seeking the material. 156 items valued at \$36,137 were donated via the state of Tennessee's asset transfer program to local colleges and universities. Avoided waste management costs of items transferred to a new user are conservatively estimated at \$61,560. The estimated operational budget for subsequent years is \$250,000.

SUMMARY

In 2001, during the first year of operation (beginning on a limited scale in January and opening full-scale in May), the CMC staff facilitated the transfer of 4,996 unwanted items from original control areas to new custodians, original manufacturers, the CMC inventory or to the waste system.

This effort improved overall chemical safety at ORNL by removing unwanted chemicals from individuals' inventories, improving the inventory accuracy, and by providing a chemical removal and delivery service to ORNL.

The CMC continues to operate in 2002 with a new focus on moving chemicals from the CMC to new on or off site users. The CMC provides research and maintenance staff a cost-effective resource bank of usable chemicals. Additionally, this effort promotes safe and efficient research and maintenance operations by reducing local control area inventories. The reduction of chemical clutter in laboratories will reduce the likelihood of spills, make it easier to locate wanted chemicals and reduce the amount of time required to maintain up-to-date chemical inventories.

REFERENCE

1. Evaluation and Analysis of Waste Generation and Cost Trends Related to Pollution Prevention Opportunities in the Government-Owned Research and Development Laboratory Setting, A Thesis Presented for the Master of Science Degree The University of Tennessee, Knoxville Anne Carol Prosser Ostergaard December 1996.