ABSTRACT

The purpose of this report is to provide the reader with a basic understanding of Argonne National Laboratory's current general refuse disposal and material recycling programs, how they were developed, and where they are going. In order to better understand the current situation, a brief description of the facilities past practices is explained.

BACKGROUND

In the fall of 1992, ANL officially closed the on-site sanitary landfill, which had been the sole recipient of the Laboratory's general refuse waste stream since 1966. Prior to the fall of 1992, Laboratory personnel collected and hauled general refuse on a daily basis from all of the facility buildings to the on-site landfill. Waste minimization and, specifically recycling, became a higher priority when the Laboratory was required to look outside its fence line to dispose of its waste. When the Laboratory operated its own landfill, the costs of waste disposal were spread throughout several different ANL organizations and, therefore, were difficult to quantify. The sunk cost of landfill development and construction had been made many years before.
DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.
For one week, all of the dumpsters emptied on a daily basis were checked to see how full they were. Levels were recorded as 1/4, 1/2, 3/4, or full. Dumpsters from 17 buildings were collected on a daily basis, but only five needed daily service. The 1993 data was used as a basis to start a white paper recycling awareness effort and to renegotiate disposal rates with the current hauler. The paper recycling effort was strictly voluntary and has achieved better results than previous programs, but has never lived up to expectations. The dumpster sampling program did assist ANL in renegotiating a lower annual disposal rate with our hauler. A $45,000.00 reduction in annual fees was achieved. The results also pointed out the need for the more detailed study that was carried out in 1994.

**FIGURE 3**

1995 WASTE AUDIT RESULTS

During the summer of 1994, two summer interns conducted a detailed study of the garbage waste stream. They sampled and separated the garbage waste stream from multiple buildings for one week at a time. The results are summarized in Figure 2. The waste stream was separated into more components. Next the dumpster levels were again verified during several random weeks during the summer.

In general, the waste audit data was consistent with the previous year. However, the results of the white paper recycling effort were disappointing. The waste stream contained approximately the same amount of white paper as the previous year. The dumpster level study confirmed our previous year's information. This has developed into a more detailed study by the present waste hauler and ANL Custodial.
ANL had another opportunity to sample dumpsters for both content and level during the spring and summer of 1995. Two recycling trainees and one intern conducted random sampling again to assess the effectiveness of the recycling program in various buildings. Their findings were consistent with previous years indicating that although the amount of white paper being recycled had increased, the percentage in the waste stream remained reasonably consistent around 20%.

The white paper program is an example of a program that has achieved some success as a voluntary program, but has never achieved expectations. The ANL solid waste stream is about 2,000 tons annually, 20% of this is about 400 tons. Present data indicate that only about 33% of the white paper going to waste was recycled in the program.

In response to this change, the Laboratory began to analyze the way the general refuse waste stream was being managed and began to look closely at the types and quantities of materials in the waste stream. In the short time since the close of the on-site landfill, the Laboratory has focused on the following areas of concern:

1) addressing the need to recycle more materials from the waste stream,

2) identifying and quantifying the components of the general refuse waste stream,

3) expanding and developing Laboratory recycling programs.

These three areas of focus are interrelated and dependent upon each other. The Laboratory has made efforts to coordinate these areas so as not to impede future waste minimization and pollution prevention initiatives. The following sections provide a description of these areas of focus.

**Addressing The Need To Recycle More Materials From the Waste Stream**

ANL has an established history of recycling activities and programs. Prior to 1992, and since it's inception in 1946, the Laboratory has implemented a variety of recycling and waste minimization initiatives. These activities range from an established Scrap Metal Recycling Program and a White Paper Recycling Program to a variety of operating procedures and activities developed to conserve materials and resources.

After closing the Laboratory's on-site landfill in the fall of 1992, the Laboratory was faced with the difficult dilemma of choosing a waste hauler to transport and dispose of its sanitary waste. What made choosing a waste hauler difficult was that due to state-wide recycling legislation, all the qualified waste haulers were also capable of providing a variety of material
recycling programs in conjunction with waste hauling and disposing. The Laboratory recognized the importance of including these material recycling activities into the waste "management" contract, but was not willing to implement wholesale changes to its established and well intrenched waste and material handling procedures. For example, the majority of the proposals for recycling programs involved separating materials such as paper, aluminum, plastics, ferrous metals, glass etc. at the front end, much like is done in residential homes. This type of service for all these materials would not be compatible with Laboratory functions. Logistically, most of the Laboratory buildings do not have the space required for collection containers (internal or external). Manpower would also be a concern and custodial personnel would have to manage a multitude of material types along with their dedicated containers. Finally, the additional costs internal to the Laboratory and external to the vendor would not make these recycling programs cost effective.

After a thorough evaluation, the Laboratory selected a waste hauler, XL Disposal, that could separate recyclable materials from the waste stream after collection. XL Disposal operated a Material Recovery Facility (MRF) that mechanically and manually separates recyclable materials from the waste stream. This allowed the Laboratory to maintain its established means of handling the general refuse waste stream, and still be able to recycle a portion of the waste stream. XL Disposal was eventually purchased by USA Waste Services, Inc., (September 1994). USA Waste Services, Inc., has since improved the level of performance at the MRF and is currently separating 25% to 30% of the waste stream delivered to the MRF. The types of materials separated and recycled at the MRF include the following: all types of paper, cardboard, glass, wood, aluminum, metal, plastic, etc.

This method of recycling is not as common as "front-end" separation methods practiced in many residential and industrial/commercial programs. However, the structure of the Laboratory's facilities and it's established general refuse management procedures have made the "back-end" recycling method a more efficient and cost effective means to recycling the Laboratory's general refuse waste stream.

Based on data provided by USA Waste Services, Inc., daily general refuse generated by the Laboratory in 1994 and 1995 averaged approximately 2,000 tons per year. USA Waste Services, Inc., estimates that approximately 500 tons of material was recycled from the Laboratory's waste stream during 1994 and 1995.

Identifying the Components and Quantifying the General Refuse Waste Stream

Since 1992, when the Laboratory began to "export" its general refuse waste stream, it very quickly became apparent that in order to reduce the costs of waste transport and disposal, the
Laboratory must reduce the amount of waste transported and disposed. The contract between ANL and USA Waste Services, Inc., requires the Laboratory pay a fixed rate per day based on the total cubic yardage of service scheduled. Daily and/or weekly fluctuations in waste levels did not alter the fixed weekly rate. In order to reduce the amount of general refuse shipped off-site, the Laboratory had to start by identifying "how much" and "what kind" of general refuse waste was generated at ANL. The following two activities can be used to compile this information.

1. **Identifying the types of materials in the waste stream.** By identifying the types of materials being disposed as general refuse, the Laboratory can target large volume components for segregation and recycling prior to disposal, and thus, reduce waste transport and disposal costs by diverting components of the waste stream. An example of this would be the White Paper Recycling Program.

2. **Quantifying the general refuse waste stream.** Quantifying the waste stream involves correlating the actual volume of general refuse transported and disposed versus the volume of general refuse the Laboratory has paid to transport and dispose. It was believed that many Laboratory buildings were being "over serviced," i.e., the cubic yardage of refuse generated at the buildings was believed to be less than the volume of service for which the Laboratory paid. For example, a building with a 6 yd³ container was billed at a rate of 6 yd³, even if the building routinely generated only 2 yd³ of refuse per pick up.

It is important to note that the daily pick-up schedule for cubic-yard refuse containers at Laboratory buildings was established prior to the closing of the Laboratory's on-site sanitary landfill. The schedule had not been developed yet with the understanding that rates for transport and disposal were based on the size of the container rather than on the actual volume of waste in the container. Thus, the preexisting refuse collection schedule at the Laboratory was not compatible with the "new" cubic yardage billing procedure agreed to in the general refuse transport and disposal contract. For the purposes of cost savings and volume accuracy, the Laboratory had to quantify the volume of the general refuse waste stream.

The general refuse audits in 1994 and 1995 generated data that tracked the volume and weight of each of the above waste stream components. The data was then compiled, assessed, and compared to data provided by USA Waste Services, Inc., to determine the critical large volume waste components. The graphs within the 1993 and 1994 Refuse/Trash Surveys illustrate the composition of the general refuse waste stream.
Based on this data, it is easy to identify the critical large volume waste components in the ANL general refuse waste stream. If all of the paper and cardboard components of the waste stream are combined, the largest contributor to the ANL general refuse waste stream is that of paper products. In 1994 paper and cardboard material accounted for 63% of the waste stream by weight and 62.8% by volume. In 1995, paper and cardboard material accounted for 59% of the waste stream by weight and 52.5% by volume. This information was then compared to the data and information provided by USA Waste Services, Inc., the Laboratory's general refuse contractor. USA Waste Services, Inc., verified that, although their numbers differed in some ways, the basic percentage breakdown of material components in the ANL general refuse waste stream was consistent with what they had observed and documented while processing the waste stream. Thus, the Laboratory was able to identify a large volume component of the general refuse waste stream.

In conjunction with the waste audits at Laboratory buildings, EMO-WP monitored the capacity levels of cubic yard refuse containers at various Laboratory locations. This activity identified several Laboratory building locations, which required the reduction of container service or a reduction in the size of the cubic yard refuse container(s). Both of these options would reduce refuse transport and disposal costs for the Laboratory by decreasing the total cubic yards of container service provided per week.

In June of 1995, the Solid Waste Recycling Committee, a subcommittee of the Waste Minimization Advisory Committee, submitted a report to Laboratory management titled the General Refuse Cost Savings Strategy. The members of the committee included Rod Merrick of Plant Facilities and Services - Custodial (PFS-CU), Jan Muller of Chemical Management Technologies (CMT), and Keith Trychta of Environmental Management Operations - Waste Management (EMO-WM). This report provided data supporting the reduction of cubic yard container service throughout the Laboratory facility. The report stated that the "cubic yardage reduction strategy" would decrease cubic yardage service by over 220 cubic yards per week. This translates to an annual cost savings of over $50,000.00. Rod Merrick of PFS-CU worked closely with USA Waste Services, Inc., to develop the strategy. The strategy required the shifting of cubic yard refuse containers throughout the Laboratory site, and reducing pick-up service at individual building locations based on need. The Laboratory management approved the strategy, and by the fall of 1995, the strategy was being successfully implemented by PFS-CU and USA Waste Services, Inc.

Expanding and Developing Laboratory Recycling Programs

Once the components of the Laboratory's general refuse waste stream had been adequately identified, and the waste stream
itself had been sufficiently quantified, the Laboratory's focus shifted to reducing (or removing) components from the general refuse waste stream. As discussed above, the available data and information overwhelmingly indicates that the largest volume component in the Laboratory's general refuse waste stream is paper and cardboard. Thus, the best strategy to reducing the amount of general refuse waste is to attack the most significant segment of that waste stream, paper, and cardboard. The Laboratory had to develop a program that could successfully separate the large segment of paper and cardboard from the rest of the general refuse waste stream, without radically changing the existing waste and recycled materials collection procedures or drastically increasing the cost of general refuse management.

In June of 1995, the Solid Waste Recycling Committee submitted a second report to Laboratory management titled the ANL Paper Recycling Assessment Report. The report essentially made two recommendations. The first, was to transfer the management of the paper recycling program to a division that had a vested interest in its success. The second, was to expand the current white paper recycling program to include mixed office paper (cardboard would be added later). Laboratory management accepted the recommendations and assigned PFS-CU to manage the contract for the paper recycling program. This was a logical choice because as PFS-CU was already managing the USA Waste Services, Inc., contract for general refuse transport and disposal, the success of the paper recycling program(s) directly impacts the costs of general refuse transport and disposal. EMO-WM would provide support to PFS-CU for the development and management of the paper recycling contract(s). EMO-WM is interested in optimizing the Laboratory's recycling programs, in an effort to achieve DOE performance measures which require the Laboratory to decrease the amounts of overall waste generated each year.

Laboratory management also accepted the recommendation to expand the white paper program to include mixed office paper (and cardboard). EMO-WM would develop, coordinate, and implement the program expansion in cooperation with PFS-CU, Building Managers, and Laboratory-wide participants.

In January 1996, PFS-CU and EMO-WM agreed to initiate a Mixed Office Paper Recycling Pilot (MOPP) Program at selected ANL buildings. The MOPP Program Plan was developed by EMO-WM and contains a program description, background, required procedures, and etc. The MOPP Program Plan provides an overview of the programs key elements. Please reference this document for MOPP Program details.

Between January 1996 and June 1996, the MOPP Program has been implemented in 13 ANL buildings. On average, the MOPP Program has reduced the cubic yards of refuse generated at each building by over 60% percent. The costs for refuse transport and disposal in these buildings has been drastically reduced as well. Please
reference the MOPP Program Waste Reduction Data January 1996 to May 1996.

The goal of the EMO-WM is to implement the MOPP Program into the remaining (25 to 30) Laboratory buildings by the end of CY96. EMO-WM has received $45,000.00 in funding from DOE to use in the implementation of the MOPP Program. The funding will be used towards educational materials, summer intern workers, additional cubic yard containers, and structural improvements to buildings to accommodate the material generated by the MOPP Program.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.