

Pollution Prevention at Los Alamos National Laboratory

Green Zia Analysis: Cardboard Reduction and Recycling

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The Challenge: The DOE 2005 Pollution Prevention goals require that the Laboratory reduce routine sanitary waste generation by 50% by 2005. Based on FY 01 generation amounts, to meet this goal, 690 mt of sanitary waste must be eliminated or diverted from the Laboratory waste stream by September 30, 2005.

A waste profile of sanitary waste is shown in Figure 1. The top three waste types include paper, equipment/other, and cardboard. In FY 01, the Laboratory disposed of approximately 393 mt of paper, 315 mt of equipment and other miscellaneous materials, and 291 mt of cardboard. Source reduction efforts will be focused on the two major waste streams: paper and cardboard. The equipment/other category is a mix of materials that are not easily characterized and not readily recyclable.

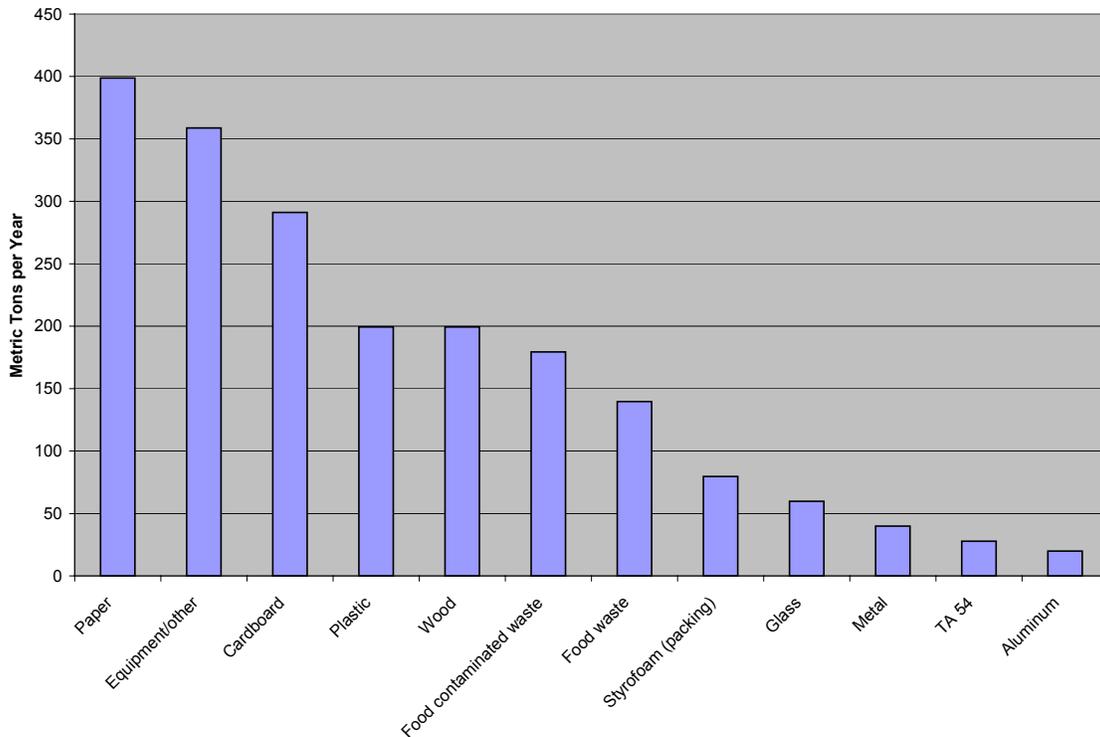


Figure 1. Sanitary Waste Profile

This paper will discuss how the RRES-AT/LANL team used the following tools to address the issues involved with sanitary waste reduction and recycling issues:

- Determining opportunities in the current process using process maps.

- Rank ordering of the opportunities to improve the process using Pareto analysis.
- Determining the root cause of the selected opportunity using a cause and effect (fishbone) diagram.
- Posing a consensus problem statement for generating process alternatives.
- Generating process alternatives.
- Selecting alternatives using a forced pairs comparison.
- Developing a formal action plan for the selected alternative.

The Green Zia Team included the following participants:

- Orlando Archuleta, LANL-FWO-SWO
- Patricia Gallagher, LANL-RRES-AT
- Pam Rockage, C Division
- Diane Gorman, C-Division
- Janet Frensdorf, BUS- DO
- Jim Stanton- JCNNM-HENV

Process Mapping

Process maps were developed for the cardboard collection, processing, disposal and recycling processes. An overview process map illustrating the cardboard collection, disposal and recycle flows is provided in Figure 2.

Cardboard Recycling (01)

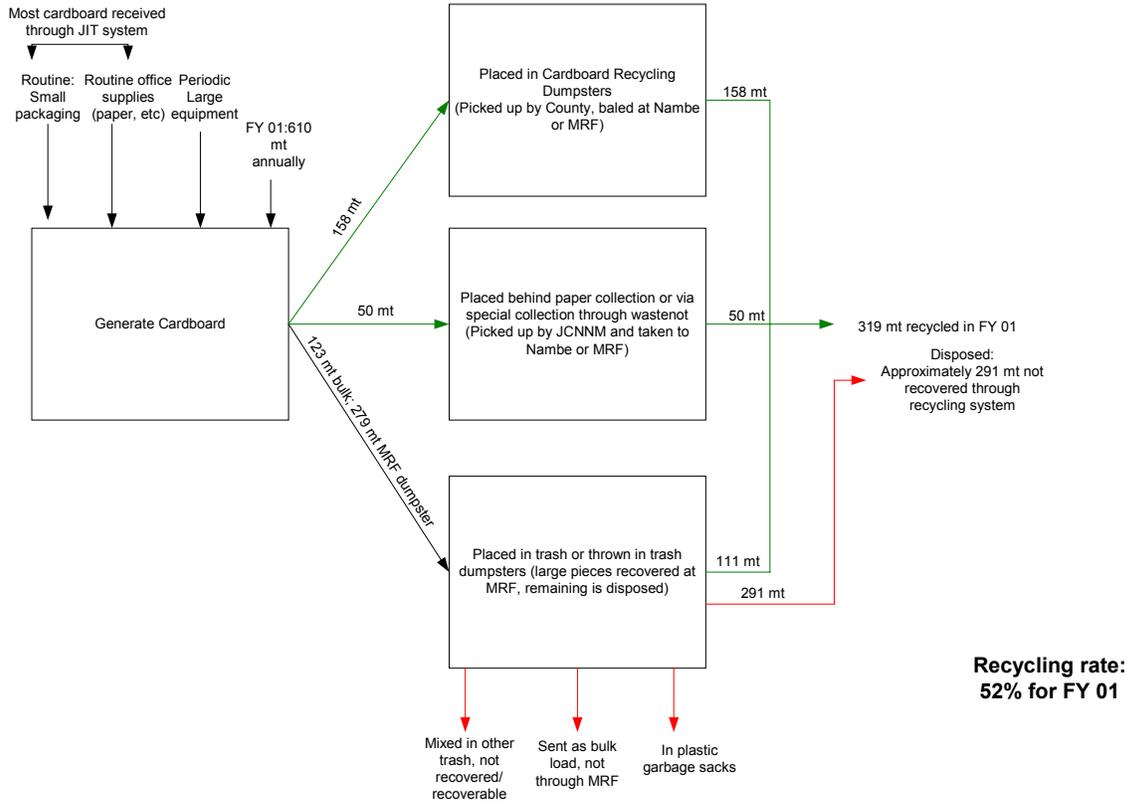


Figure 2.

- Cardboard Generation: Cardboard is generated through procurement activities. Most cardboard is brought on-site through the Just in Time system; other cardboard is generated through procurement of equipment such as computers, printers, copiers and other materials. It is notable that furniture vendors are required to manage cardboard and packaging as part of delivery services.
- Dedicated Cardboard Dumpster and Roll-Off Collection: Cardboard dumpsters and roll-offs are located across the site. Cardboard is collected once a week by Solid Waste Operations. This material is delivered to the MRF for baling.
- JCNNM Cardboard Collection: JCNNM-MGPM picks up cardboard as part of the white paper recycling collection system. Cardboard is delivered to the Materials Recycling Facility MRF for baling, along with white paper. Special arrangements for pick-ups can be made through JCNNM by contacting wastenot@lanl.gov.
- Cardboard in Trash Dumpsters: Cardboard is often thrown in trash dumpsters and, depending on the collection route, may go directly to the County Landfill for disposal or may go through the MRF where much of the cardboard is recovered. The great majority of dumpster loads bound for the MRF are collected in

Packmasters and are compacted for collection efficiency; compacting cardboard in mixed loads may lead to contamination if food or liquids are commingled in the load, rendering material unrecyclable.

Rank Ordering of Opportunities

Pareto analyses were developed using waste generation by waste type information as shown in Figure 1. Cardboard is the third largest waste stream generated by the Laboratory and was chosen as an improvement project based on reduction or diversion potential as compared to other waste streams.

Root Cause Analysis and Statement of Problem

The team examined the issues associated with waste generation with a cause and effect diagram to identify potential causes of the problem. The diagram is presented in Figure 3.

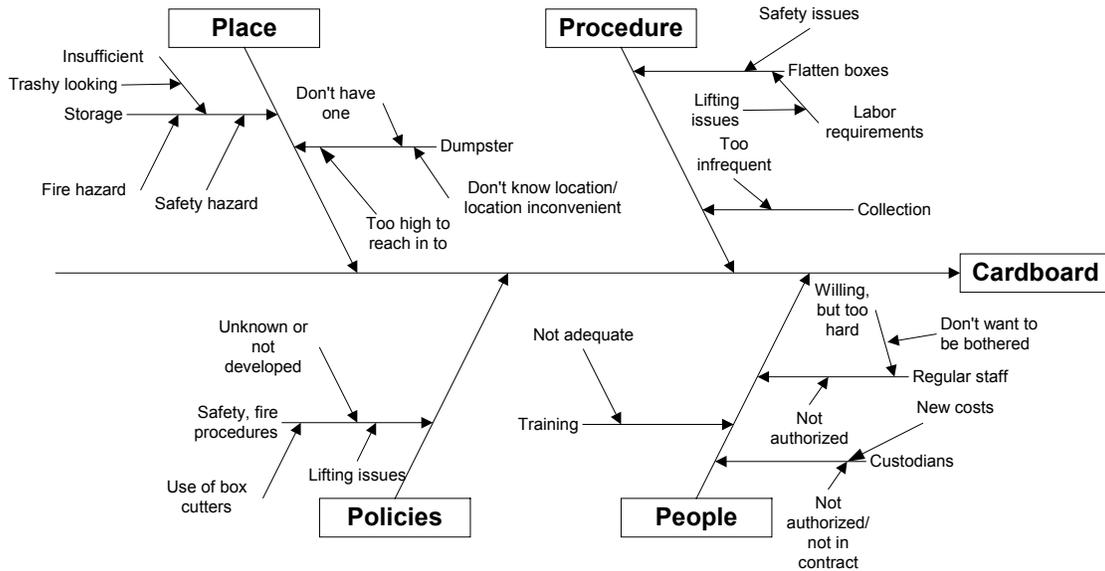


Figure 3. Fishbone Diagram for Cardboard Management Issues

The following is a detailed list and description of the items present on the cause and effect diagram.

- Storage at White Paper Recycling Centers: Storage areas are limited and are serviced every two weeks. Recycling areas may not be sufficient and become over-filled and trashy, posing fire and safety hazards.
- Cardboard Dumpsters: Administrative and custodial staff may not know where cardboard dumpsters are located near their buildings. Dumpster locations may be

located in areas that are not convenient and are thus underutilized. Some areas may not have a cardboard dumpster available to them.

- Cardboard Recycling Procedures: Recycling procedures require that boxes be flattened prior to storage at white paper collection areas or in cardboard dumpsters. This requirement may pose lifting and handling problems as well as safety issues associated with using sharp tools such as box cutters. It is unclear if safety procedures or work authorizations are developed for this activity. Many offices do not have dedicated staff to support such activities. As a result, the burden falls on administrative staff or boxes are simply thrown away rather than recycled.
- Staff Involvement and Participation: Laboratory staff is interested in recycling but may be too busy or think it is not their responsibility to flatten cardboard and place in the proper storage areas. As stated above, work authorization may not include use of sharp objects or lifting and handling of larger equipment boxes for flattening.
- Custodial Staff: Management of cardboard is not currently in the scope of work of custodial staff. As such, cardboard recycling may be out of the scope of work of custodians. Much cardboard is thrown into dumpsters as a result. Custodians often throw trash into trash dumpsters rather than cardboard dumpsters even when the cardboard dumpsters are co-located with the trash dumpsters. Expansion of custodial services may increase costs to FMUs.
- Awareness and Training: Staff and custodians may not be aware of proper recycling procedures. Also, staff may not be aware of cost differential of recycling (free to generator) versus disposal (\$722/ton).

Problem Statement: Cardboard recycling is not maximized due to lack of awareness of Laboratory staff and lack of custodial support. Also, JIT deliveries, which is the largest source of cardboard generation, use excessive cardboard in delivery of supplies.

Development of Alternatives

A brainstorming tool was used by the team to generate possible alternatives to the problem identified. The alternatives that resulted from this activity are as follows:

1. Make cardboard recycling part of custodial responsibility.
2. Educate FMUs on cost of recycle versus disposal.
3. Involve FMUs in cardboard recycling program to raise awareness.
4. Build recycling incentive into Kleen Tech contract.
5. Provide more consistent service including more frequent pick-ups of recyclable materials at white paper collection areas.
6. Request special cardboard recycling services for large equipment and computers.
7. Locate cardboard dumpsters near trash dumpsters to be more convenient.
8. Improve signage on dumpsters.
9. Reduce cardboard boxes that come on site through JIT.
10. Develop employee awareness/education campaign for cardboard recycling and source reduction.

11. Provide maps for cardboard dumpsters to all buildings.
12. Give custodians handtrucks for taking cardboard to dumpsters.
13. Provide staff with safety cutters to reduce hazards of flattening boxes.
14. Allow unflattened cardboard in cardboard dumpsters.

Selecting an Alternative

The team used a forced-pair comparison to select alternatives that should be implemented in the near term. Many of these alternatives were similar and were combined. The final ordering was reviewed by the group and is presented below.

1. Work with Kleen Tech, Zone Managers, and Facility Managers to expand custodial services to include cardboard recycling.
2. Increase recycling pick-up services provided by JCNNM.
3. Work with JIT and other vendors to reduce cardboard packaging coming on-site.
4. Locate cardboard recycling dumpsters in more convenient places.
5. Provide maps to cardboard dumpsters.
6. Conduct an awareness campaign on cardboard recycling.
7. Allow unflattened cardboard in dumpsters.

Action Plan

The team decided that increasing recycling capacity, encouraging custodial support for recycling and working with BUS 5 to reduce cardboard packing entering the Laboratory provided good opportunities for increasing diversion of cardboard from the Laboratory waste stream.

Action Item	Organization	Due Date	Comments
Recycling Capacity			
Assess capacity needs of current JCNNM recycling pick-up system; make recommendations for expanded service.	RRES-AT/JCNNM/SWO	10/02	
Conduct awareness campaign for cardboard recycling	RRES-AT/JCNNM	08/02	
Custodial Support for Recycling			
Assess costs associated with custodial support of recycling services	RRES-AT/JCNNM/SWO	05/02	
Work with FMs and Zone Managers to assess interest in custodial support for recycling	RRES-AT/JCNNM	09/02	
Revise work orders to include custodial recycling support	FMs	09/02	
Cardboard Use Reduction			

Work with JIT vendors to reduce cardboard in JIT deliveries	RRES-AT/BUS 5	12/02	
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