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## Expanded Recycling at Los Alamos National Laboratory

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**Abstract:** The Pollution Prevention Program Office has increased recycling activities, reuse, and options to reduce the solid waste streams through streamlining efforts that applied best management practices. The program has prioritized efforts based on volume and economic considerations and has greatly increased Los Alamos National Laboratory's (LANL's) recycle volumes.

The Pollution Prevention Program established and chairs a Solid Waste Management Solutions Group to specifically address and solve problems in nonradioactive, Resource Conservation and Recovery Act (RCRA), state-regulated, and sanitary and industrial waste streams (henceforth referred to as sanitary waste in this paper). By identifying materials with recycling potential, identifying best management practices and pathways to return materials for reuse, and introducing the concept and practice of "asset management," the Group will divert much of the current waste stream from disposal. This Group is developing procedures, agreements, and contracts to stage, collect, sort, segregate, transport and process materials, and is also garnering support for the program through the involvement of upper management, facility managers, and generators.

Short term activities include documenting (and in some cases developing) procedures for items currently being recycled and reused; advertising the procedures on the Internet; implementing cardboard and mixed paper

products pilot projects; and examining the potential impact of increased sanitary waste disposal as a result of radioactive sort/segregate projects. Specific medium- and long-term options include the development, adoption, and dissemination of an "asset management" attitude and program regarding recoverable/reusable materials; tailoring recycling activities to facility needs; leveraging existing resources while expanding the scope of areas; and supporting the development and operation of a Materials Recovery and Monitoring Facility with the Los Alamos County landfill.

## **1. Background**

The Los Alamos National Laboratory's (LANL's) solid sanitary waste management system consists of all facilities, equipment, and procedures used to collect, store, transport, and dispose of the Laboratory solid sanitary waste stream. It also includes the facilities, equipment, and procedures used to process and market the recyclable and compostable components of the waste stream. The Laboratory's solid sanitary waste management system extends to off-site facilities, equipment, and procedures available from commercial and Los Alamos County solid sanitary waste management providers that the Laboratory uses. Solid waste as defined by the Resource Conservation and Recovery Act (RCRA) is any discarded material, either abandoned or recycled, including liquids, solids, semisolids, and contained gases. Solid waste can be hazardous, radioactive (including transuranic), or mixed hazardous and radioactive. This paper discusses only the nonradioactive, sanitary and industrial aspects of solid waste.

Solid sanitary waste refuse collection and disposal at the Laboratory are performed almost exclusively through a support services contract with Johnson Controls World Services, Inc. (JCI). Separate collections and disposal exist for administratively controlled waste that is nonhazardous, nonmanufacturing waste. Most of the solid sanitary waste generated by the Laboratory is collected and recycled or disposed via the JCI service contract into a landfill operated and maintained by the Los Alamos County. The County operates the landfill under a "special use permit" with the Department of Energy (DOE).

The Pollution Prevention Program Office (P30) is responsible for the organization and operation of the Laboratory recycling program. It is the policy of the DOE and the Laboratory to reuse or recycle to the maximum extent possible that which cannot be eliminated at the front end, and reduce or eliminate excess and other materials not used for their originally intended purposes, currently disposed of as waste.

The P30 designated a Recycling Coordinator as the single point of contact for all aspects of solid sanitary waste reduction, including: composting, affirmative procurement reporting,

incentives, awareness, and reporting. The Coordinator is responsible for coordinating the development, promotion, facilitation, evaluation, and annual reporting on the effectiveness of the recycling program. The Coordinator also chairs a cross-functional committee called the Solid Waste Management Solutions Group (Solutions Group) to coordinate and implement a long-term recycling strategy.

The Solutions Group was formed as an umbrella organization, consisting of P30 staff, JCI, Los Alamos County Landfill, ES&H, Business Operations Division, and Facilities, Security & Safeguards (FSS) Division. The group exercises their individual authorities collectively as a managing body to promote P2 and WMin in solid sanitary waste at the Laboratory through the development, coordination and implementation of a long-term solid sanitary waste management solutions strategy. The Solutions Group advises the Recycling Coordinator on strategies for reducing solid sanitary waste disposal and support decisions on methods to recycle effectively and efficiently.

The goal of The Laboratory's recycling program runs parallel to the DOE goal to achieve a recycling rate of 33% of generation by December 31, 1999.

## **2. Objectives**

The Laboratory's objective is to reduce or eliminate solid sanitary wastes generated from Laboratory operations as much as technically and economically feasible. The main objective of the Solutions Group is to assure that the Laboratory is achieving 33 percent recycling where it makes sense (and dollars) to do so. Achieving this goal will require the Laboratory to streamline existing recycling activities, increase the number of materials recycled, account recoverable waste materials, and track and account for recycling activities.

## **3. Procedures**

In solving the problem of how best to meet the recycling goal the Solutions Group accepted the following tasks to restructure the solid sanitary waste management system in a way that improves both environmental performance and business performance.

- o Document current recycling procedures - develop procedures where none exist;
- o Advertise the recycling procedure documentation on the Internet;
- o Streamline current recycling procedures;
- o Assess expansion of items that can be recycled;
- o Pilot potential program expansion items; and
- o Implement successful pilots on a lab-wide basis

## 4. Discussion

The following ideas were considered and argued to enable the Solutions Group to learn more about the recycling opportunities and constraints facing the Laboratory.

### 4.1 Streamlining the Recycling Program

Altering the recycling program to make it more efficient was the first challenge adopted by the Solutions Group. This task was undertaken jointly by the Laboratory, JCI, Los Alamos County (LAC), and DOE with a review of possibilities for sharing resources, uniting efforts where possible, and developing a cost-effective, customer oriented approach. These discussions took place over a period of 90 days in an *ad hoc* subcommittee format that discussed commonalities, cooperative collection, recycling activities, composting, and cost comparison.

#### 4.1.1 Commonalities

The Commonalities Subcommittee determined that the Laboratory, JCI, and LAC programs share the following common attributes.

- o Disposal of solid sanitary waste in LAC landfill
- o Recycle similar materials
- o Compost green materials at LAC landfill
- o Perform similar collection procedures

The commonalities subcommittee concluded that LAC should outline specific activities both LAC and JCI perform in order to identify redundancies. The activity comparison will be submitted to the Solutions Group for assessment of redundant activities as a streamlining effort.

#### 4.1.2 Cooperative Collection

The Cooperative Collection Subcommittee determined the following:

- o JCI and LAC use similar vehicles for waste collection
- o JCI operates at the direction and requests of Laboratory management for waste reduction activities
- o JCI has additional responsibilities for collecting hazardous, toxic, and classified waste streams
- o JCI and LAC could have common collection for cleared areas and use a common site to monitor and recover materials for recycling

The cooperative collection subcommittee concluded that JCI could leverage the resources of LAC to streamline collection. Through the activities summary submitted to the Solutions Group by the Commonalities subcommittee, opportunities for JCI to use LAC resources will be identified and implemented.

#### 4.1.3 Recycling

The Recycling Subcommittee found that integrating JCI recycling material sales with LAC could offer a higher potential market from recycling vendors due to economies of scale and access to

municipality coalition pricing. Combining Laboratory "assets" with those of the County presented the challenge of ensuring that the Laboratory would receive revenues from the sale of recyclable items commensurate with the volume of materials contributed by the Laboratory. Additionally, because the markets for paper and cardboard fluctuate so widely, the agreement between the County and their vendor is that the vendor accept both the revenue and any losses for a fixed contractual price, thereby averting the fair accounting issue. Because of Public Law 103-329 the Laboratory cannot allow a vendor to accept any revenue generated from government-owned property.

The committee found that recycling rates in the county and at the Laboratory were similar, and noted that LAC does not share the need to monitor waste to prevent introduction of hazardous materials, toxic, and special wastes from being characterized as sanitary waste.

This subcommittee concluded that supporting the operation of a facility at LAC that would accept materials sorted and segregated for recycle/reuse, and additionally would monitor refuse entering the facility, and sort recyclable/reusable items from the refuse while monitoring for radioactive or hazardous constituents. The potential facility is referred to as a Material Recovery and Monitoring Facility (MRMF) and would maximize recovery by drastically reducing the amount of materials actually disposed of while maximizing economies of scale of the recycled items. The issue of returning the revenue received to the Laboratory would still need to be addressed.

#### *4.1.4 Composting*

The Composting Subcommittee found that JCI and LAC were working satisfactorily together in the composting operation. The only matter of special importance was obtaining a Class A permit to add sludge to the green waste to augment the decaying process.

#### *4.1.5 Cost Comparison*

The Cost Comparison Subcommittee learned that revenues from sales are comparable. They also learned the costs for dumping refuse is a prorata charge based on total landfill tonnage over the billing period. Los Alamos County code dictates the LAC costs for refuse collection and that JCI operates "on call" with contractually established man hour rates. The LAC costs are based on an annual dumpster rental fee plus fixed pick up costs, plus a landfill usage fee. The JCI costs are based solely on pickup service that includes the usage fee. Costs were comparable.

#### *4.1.6 Streamlining Summary*

The *Ad Hoc* Committee acted as a catalyst to begin removing barriers to an efficient operation. They immediately addressed several actions to reduce costs and eliminate duplication.

Actions such as joint refuse collection and a common site to monitor and recover materials for recycling will require overcoming procedural barriers.

#### 4.2 Assess the Potential to Expand Recycling

In order for the Solutions Group to provide recommendations and guidance for expanding the recycling program it was necessary to evaluate generation and document existing recycling options. The criteria for expanding recycling was based on the knowledge that expansion should not be undertaken without a realistic assessment of the market and the costs associated with collection and transportation. Low collection, the absence of a suitable market, and high transportation costs, can individually or in combination make the collection of recyclable materials economically unattractive. The criterion established included the following:

- o Potential recovery of materials;
- o Potential for increased revenue generation ;
- o Potential for increased waste management cost avoidance; and
- o Potential employee support for recycling.

##### 4.2.1 Generation Evaluation

LAC tracks LANL waste generation, however, different types of sanitary waste disposed of in the same container are not tracked separately. The *Final Report, Los Alamos National Laboratory Solid Waste Characterization Study, 1993* identified waste generation sources and waste streams by location. This data was used in conjunction with data from LAC to create a current picture of solid sanitary waste generation at the Laboratory. The Laboratory interprets the DOE recycling goal to mean achievement of a recycling rate of 33% of generation by December 31, 1999. In 1995 we generated 10,072 metric tons of solid sanitary waste and recycled approximately 2,434.5 metric tons. This is roughly 24% of the waste stream. In 1996 we are on a pace to divert 15 % from the landfill. (1996 recycling rate is assumed to be low due to increased data collection efforts.)

**Table 1. Solid Sanitary Waste Generation**

1995 Generation = 10,072 metric tons	Recycled 24%	1995 Landfill Disposal = 76%
Construction/Demolition: debris, rubble, pallets, scrap metal & wood	Pallet reuse	
Preventative Maintenance & Janitorial: scrap metal & wood, paper products	Scrap metal recycle	
Office Administration: various paper products, office trash	Site-wide white paper recycling and mixed paper recycling pilot	
Office Reorganization: desks, chairs, partitions, computer equipment	Redistribution and Marketing	
Canteen Operations: food waste, cardboard, tin, glass, aluminum	Cardboard recycling pilot program	
Shipping & Receiving: cardboard, plastic, Styrofoam	Cardboard recycling pilot program	
Laboratory Operations: safety goggles, plastic gloves, rinsed glass containers, etc.		

#### 4.2.2 Documenting Existing Recycling Options and Solutions

To assess expansion of the recycling programs, the Solutions Group researched whether to add additional materials or increase the collection rate of current materials. The first step was to document, and develop when necessary, procedures for all materials currently being recycled. Each procedure provides instructions on recycling a specific material. This instruction includes segregation of unacceptable from acceptable materials; arrangement of materials for pick up; and includes any provisions such as paperwork necessary, or staging instructions such as palletizing the material for easy pick up. The results of this effort can now be found on the P30 Recycling Home Page at <http://perseus.lanl.gov/PROJECTS/RECYCLE/> on the Internet.

#### 4.2.3 The Potential to Expand Recycling

The list of materials currently being recycled is extensive. The Solutions Group concluded that adding material with low potential recovery to the collection program would result in low value added. The Group therefore resolved to increase the collection rates of the current items. The Solutions Group analyzed the

existing Laboratory recycling program collection methods and procedures from the aforementioned documentation, and embarked on a streamlining effort that would consider current and projected program budgets.

## **5. Results**

The Solutions Group recommended a phased approach to recover more recyclables along with continuing employee awareness to heighten the inherent socio-economic advantages to be gained from recycling/reusing. This approach was dictated because of limited access to funds for research, employee awareness, and equipment. Timing of the phases is dictated by funding. To expand recycling the phased approach discussed in the following paragraphs was recommended.

### *Phase 1*

Increase collection of postconsumer paper and cardboard. Implementation of this phase consists of simply implementing the current mixed paper and cardboard recycling pilot programs lab-wide. The pilots for these materials provided a realistic assessment of employee acceptance before full-scale operation. Mixed paper recycling collects all paper products except carbons, paper with pressure sensitive adhesives, transparencies, photographs, tissues, paper towels, and candy wrappers - a marked increase over recycling strictly white paper. This kind of paper recycling reduces the amount of employee effort required to separate various paper types thereby increasing employee cooperation in the program. The pilot mixed paper program achieved an increase of approximately 250% over white paper recycling. Implementing the pilot cardboard recycling throughout the Laboratory will require placing large bins near several additional high volume operations.

Phase 1 also includes optimizing interim storage of mixed paper by providing durable desk top and desk side recycling containers and centrally placing larger 60 - 90 gallon containers for bulk collection. Historically, white paper is placed in 2 cubic foot cardboard boxes that are shipped to the vendor with the paper. Switching to durable containers will reduce costs in the long-term and eliminate the image of wasting cardboard boxes.

### *Phase 2*

Expand the recycling program by purchasing or leasing a compactor/bailer to increase the density and transportability of collected materials. During this phase, a central point of contact for all recyclable/reusable items will be established, streamlining collection of recyclable nondurables (such as paper) and collection of assets for reuse (such as desks and chairs). Transportation schedules will be optimized by leveraging the janitorial, recycling, redistribution and marketing, and material delivery systems. Using various staff to assist in the collection and transportation of recyclable/reusable items and centralizing recycle/reuse communication will greatly assist in adopting an

attitude of "asset management" to view all materials as potentially recyclable/reusable.

Adoption of the "asset management" attitude and optimization of collection and transportation will also assist in absorbing the expected increased sanitary waste generation from Radioactive Materials Management Area (RMMA) low-level waste (LLW) sort and segregation activities. It is anticipated that as RMMAs are reduced and/or there are tighter controls on the amount of materials being allowed into RMMAs, what would have been LLW will be a new sanitary waste generation source. It is imperative that this new generation source be anticipated and diverted from disposal.

### *Phase 3*

Support the construction and operation of a MRMF to remove recyclable materials from the solid waste stream after it has been picked up as refuse in addition to accepting pre-sorted/segregated items. The MRMF is expected to use a monitoring station along with standard sorting equipment for segregating out of the "trash" those recyclable items. This monitoring would prevent radioactive or hazardous waste from being sent to the landfill as well as capture the recyclable material that was not previously sorted or segregated. The mixed paper pilot program illustrated the importance of making recycling as easy as possible for the generators. This phase would consolidate Laboratory/LAC operation.

### **Conclusion**

The current program has achieved a maximum recycling rate of 24% of sanitary waste generation. The achievement of a 33% recycling rate will require introducing the concept and practice of "asset management" in the short term and supporting the development and operation of a MRMF in the long-term.

### **7. References**

*Avoidable Waste Management Costs*, INEL-94/0205, Jan 1995.

*Executive Order 12856*. August 1993. Federal Compliance with Community Right to Know Laws and Pollution Prevention Requirements

*Executive Order 12873*. October 1993. Federal Acquisition, Recycling and Waste Prevention

Final Report, *Los Alamos National Laboratory Solid Waste Characterization Study*. DCN: 5102-001-RT-AAFL. July 1993.

*Public Law 103-329*. Federal agencies are authorized to receive and use funds resulting from the sale of materials recovered through recycling or waste prevention programs.



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