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**Title:** The Los Alamos National Laboratory Chemistry and Metallurgy Research Facility Upgrades Project - A Model for Waste Minimization

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Research Facility Upgrades Project  
A Model for Waste Minimization

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Abstract: The Los Alamos National Laboratory (LANL) Chemistry and Metallurgy Research (CMR) Facility, constructed in 1952, is currently undergoing a major, multi-year construction project. Many of the operations required under this project (i.e., design, demolition, decontamination, construction, and waste management) mimic the processes required of a large scale decontamination and decommissioning (D&D) job and are identical to the requirements of any of several upgrades projects anticipated for LANL and other Department of Energy (DOE) sites. For these reasons the CMR Upgrades Project is seen as an ideal model facility - to test the application, and measure the success of - waste minimization techniques which could be brought to bear on any of the similar projects. The purpose of this paper will be to discuss the past, present, and anticipated waste minimization applications at the facility and will focus on the development and execution of the project's "Waste Minimization/Pollution Prevention Strategic Plan."

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## 1 Background

The LANL CMR Facility, constructed in 1952, is currently undergoing the first phase of the CMR Upgrades Project (Project). Phase 1 addresses urgent capital equipment replacements and upgrades identified as the minimum essential effort required to maintain operations in the facility in the short term. This phase includes eight construction sub-projects that are in various stages of completion. A formal waste minimization plan was not developed prior to the initiation of the project. However, an aggressive waste minimization effort has been launched with the intent of avoiding waste destined for disposal and also to serve as a pilot implementation project for methods to be applied during Phase 2. Phase 2 of the project addresses building modifications that are required to maintain building infrastructure, improve worker and public safety, and strengthen environmental controls in order to extend the useful life of the CMR facility 20 years. It was originally anticipated that over 21,000 cubic yards of waste, mainly low-level radioactive, would be generated during Phase 2, with associated waste management costs exceeding \$66 million. Through the application of various waste minimization techniques the projected volume has been reduced to 5,200 cubic yards with waste management costs of \$16 million. In addition, the project has committed to an aggressive waste reduction goal of 40%, intending to reduce overall waste generation to only 3,300 cubic yards.

## 2 Waste Minimization Activities

### 2.1 Phase 1 - Electrical Upgrades

A major stage of Phase 1, currently underway, is the removal and replacement of the facility's aging electrical system. In planning for a subproject intended to relight the entire attic area of the facility all used fluorescent lighting was recovered intact, cleaned, and recycled, avoiding the generation of large amounts of low-level mixed waste. All lamp ballast were also recovered in a like manner to be tested for PCB content and disposal as clean waste when PCBs were not found. The lowest mercury content and energy efficient fluorescent tubes available were procured and installed as replacements to the older hazardous type. During the electrical upgrades currently underway in Phase I, an effort has begun that will result in the recovery of over 200 miles of wire and conduit. This wire, previously destined for disposal as low-level waste, is now being viewed as a valuable resource for the copper content. Recycling of this copper avoids the disposal of approximately 100 cubic yards of radioactive waste at a cost savings of nearly \$125,000.00. The miles of conduit which contained the wire is also being recycled, with the larger pieces being sold as fence post material. Not

only does this recycling effort avoid a large expenditure for waste handling and disposal, but revenues generated from the sale of the copper will be returned to the project as credit for future waste avoidance implementation, creating an incentive for the project to continue recycling. The project was also able to recover a large amount of lead and copper from a cable removal job which could have resulted in mixed low level waste generation. The 600 foot long cable, 3 inches in diameter, sheathed in a layer of lead and containing three 1/2 inch copper conductors, was removed in such a manner that radioactive contamination was avoided and the copper and lead was able to be recycled. The copper and lead from these two is generating revenues of approximately \$150,000.00. In addition, copper recovery from bus bar and junction boxes is anticipated to be in excess of 2,500 pounds, generating an additional \$3,000.00 in revenue and avoiding an additional cubic yard of waste.

## 2.2 Secondary Waste Generation

The avoidance of secondary waste generation has also been a priority of the project. Launderable, reusable, leased, containment barriers and personal protective equipment (PPE) will be used in place of one time use disposables. A secondary waste stream implementation plan is being developed with the specific intent of reducing secondary waste generation to the maximum extent possible. Preliminary calculations indicate that the full scale implementation of a leased, launderable, multi-use PPE program could have the impact of reducing PPE procurement, replacement, laundry, and waste management costs over \$8 million, during the remaining duration of the project. The plan addresses the use of alternative contamination barriers such as launderable tarps to replace the traditionally used plastics for lay down, and deconable and reusable containment structures rather than the standard plywood and plastic approach. In addition, simple substitutions such as launderable mop heads, launderable towels vs. paper wipes, and bulk chemical distribution, are being identified and implemented.

## 2.3 Phase 2 - Design Review

While Phase II of the project is only in the conceptual design stage significant waste reduction gains have resulted from the project team's commitment to waste minimization. It was originally anticipated that over 21,400 cubic yards of waste, mainly low-level radioactive, would be generated during Phase II. Through the application of value engineering studies and other waste minimization techniques during design review; 6,400 cubic yards of waste soils were avoided by using the excavated soils as a retaining wall, 8,350 cubic yards of waste were avoided through the reuse rather than replacement of large amounts of the supply

and exhaust ductwork system. It has also been calculated that through the avoidance of this primary waste an additional 1,450 cubic yards of secondary waste was avoided. These reductions (16,200 cubic yards) have lowered the Phase II waste generation projections to 5,200 cubic yards at a cost savings of over \$50 million. In addition, a recent value engineering study recommended the reuse of existing 4 inch acid waste drain lines, previously destined for removal and disposal. If this option is adopted it could avoid as much as 30 cubic yards of TRU-mixed waste.

#### 2.4 Phase 2 - Waste Minimization/Pollution Prevention Strategic Plan

With these achievements as a starting point, the project has also adopted an aggressive Waste Minimization/Pollution Prevention Strategic Plan which targets 40% of the remaining 5200 cubic yards as a waste reduction goal. Achievement of this goal would realize an additional cost avoidance of \$10 million. The plan not only establishes a dynamic waste reduction goal, but also firmly institutionalizes management commitment, resources, and the basic framework for achieving the target. The strategic plan calls for a logical approach for dealing with each potential waste stream. The approach includes four steps; 1) A Waste Stream Analysis- to identify the nature and amount of the potential waste, 2) An Options Analysis-an investigation of all potential dispositions for the waste, including disposal, 3) A Barriers Analysis-to identify and find possible solutions to barriers to implementation of viable options, and 4) Detailed Implementation Plans - to describe the specific actions needed to make implementation of the preferred options happen. This process has already begun with involvement of ideas for implementation in Phase II including: the decontamination, in place, of acid waste drains that were slated for removal and disposal at high worker safety and environmental risk; the closed loop recycle of liquid effluents in the building's duct washdown, chiller, and acid drain systems as opposed to the current practice of discharging to the Radioactive Liquid Waste Treatment Facility; and the chemical removal of scale from water supply lines rather than complete removal and replacement. Additionally, an implementation plan is currently being written for all secondary waste streams, as described above. While all, or possibly none, of these ideas may evolve into full blown implementation, the process of developing the ideas, recognizing and attempting to overcome the barriers to their implementation, and documenting the results of the attempt, should serve as a valuable resource to other similar projects.

## 2.5 Waste Minimization Awareness

A Waste Minimization Awareness Plan has been drafted and initial execution has begun. The first stages are geared toward educating the crafts people involved in the project as to the importance of waste minimization, attempting to create a sense of ownership of the problem, and buying commitment to resolving the challenges of implementation. Initial results have been very favorable, with crafts personnel and professional staff being equally enthusiastic and receptive. Actual awareness presentations have served as an excellent forum for presenting waste minimization techniques (i.e. procedures for gathering wire for recycle) but have also been very productive as an arena for waste minimization idea exchanges. Excellent ideas have been suggested by crafts personnel, who have a different perspective on waste generation issues than project management or pollution prevention program staff. Future awareness initiatives will be geared toward taking full advantage of this distinct viewpoint, which looks at waste generation problems from the hands-on, floor level. Enthusiasm for participation in this process has been fueled by the inclusion of novelty items, such as baseball caps with the logo "CMR Upgrades - Wired for Waste Minimization", playing on the theme of the electrical upgrades, and Southwestern design tee-shirts, complete with chili peppers, declaring "CMR - Hot on Recycling." In addition to the presentations to personnel actually working on the project, the awareness plan has also identified customers external to the project, who must be communicated to concerning the lessons learned from the CMR Project. Initial meetings have been held with other project leads and a formalization of the process for sharing this information has begun.

## 3 Conclusion

While the CMR Upgrades Project is still in the initial stages of developing its full waste minimization/pollution prevention agenda, it clearly has established itself as a leader in the area of applied waste minimization techniques, affecting very large waste generation volumes. As more successes are being achieved the challenge to the project will be to insure that other like undertakings share in the lessons learned from this endeavor. The role of model facility has been eagerly assumed by the project. The benefit to other endeavors have phenomenal waste avoidance potential if the lead of this model facility is followed.