

**INTEGRATING VOLUME REDUCTION AND  
PACKAGING ALTERNATIVES TO ACHIEVE COST SAVINGS  
FOR LOW LEVEL WASTE DISPOSAL AT THE ROCKY FLATS ENVIRONMENTAL  
TECHNOLOGY SITE**

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**ABSTRACT**

In order to reduce costs and achieve schedules for Closure of the Rocky Flats Environmental Technology Site (RFETS), the Waste Requirements Group has implemented a number of cost saving initiatives aimed at integrating waste volume reduction with the selection of compliant waste packaging methods for the disposal of RFETS low level radioactive waste (LLW).

Waste Guidance Inventory and Shipping Forecasts indicate that over 200,000 m<sup>3</sup> of low level waste will be shipped offsite between FY2002 and FY2006. Current projections indicate that the majority of this waste will be shipped offsite in an estimated 40,000 55-gallon drums, 10,000 metal and plywood boxes, and 5000 cargo containers. Currently, the projected cost for packaging, shipment, and disposal adds up to \$80 million. With these waste volume and cost projections, the need for more efficient and cost effective packaging and transportation options were apparent in order to reduce costs and achieve future Site packaging and transportation needs.

This paper presents some of the cost saving initiatives being implemented for waste packaging at the Rocky Flats Environmental Technology Site (the Site). There are many options for either volume reduction or alternative packaging. Each building and/or project may indicate different preferences and/or combinations of options.

**INTRODUCTION**

The purpose of this paper is to present some of the cost saving initiatives being implemented for waste packaging at RFETS. Historically, the Site used 55-gallon drums, plywood boxes, and metal boxes to package, ship, and dispose of LLW in accordance the Department Of Transportation (DOT) regulations for packaging radioactive waste based on activity limits. These packaging methods were generally sufficient to meet site needs during production. However, with the change in the Site mission from weapons production to Site closure, this is no longer the case. Following the initiatives being introduced by the Site's Waste Requirements Group, the Site is beginning to use more efficient packaging methods where possible. Some of the cost-saving initiatives being implemented at RFETS include the increased use of strong tight and IP-2 cargo containers,

the replacement of IP-2 metal boxes with strong tight metal boxes in plutonium D&D projects, the use of soft sided bulk packaging for large surface contaminated only (SCO) waste items, and the procurement of commercially available waste commodities. There are many options for either volume reduction or alternative packaging. Each building and/or project may indicate different preferences and/or combinations of options.

## **OVERVIEW OF INITIATIVES**

In order to reduce costs and achieve schedules for closure of RFETS, an analysis was conducted on the use of alternative packaging and transportation methods for the disposal of RFETS LLW. Some of the cost-saving initiatives being implemented at RFETS include the increased use of strong tight and IP-2 cargo containers, the replacement of IP-2 metal boxes with strong tight metal boxes in plutonium D&D projects, the use of soft sided bulk packaging for large surface contaminated only (SCO) waste items, and the procurement of commercially available waste commodities. Each of these initiatives is briefly described in the following subsections.

### **Increasing use of cargo containers**

It appears most sites within the Department of Energy (DOE) complex purchase new containers for packaging and shipping LLW to the Nevada Test Site (NTS) or another commercial low level waste disposal facility. Until recently, the Site adhered to this practice. However, in the Spring of 1999 when waste packaging demand was high, low production output from the vendors and quality control problems began to adversely affect performance of waste generating projects. Projects most impacted were those involving D&D, which generate large volumes of LLW from equipment stripout and demolition activities.

In order to meet the challenge of procuring sufficient waste packages for the site, the Waste Requirements Group (WRG), which is responsible for the procurement of waste packaging commodities, investigated alternative packaging types that could be utilized at RFETS. Research on the subject indicated that Lawrence Livermore National Laboratory (LLNL) and the Mound Plant had used refurbished cargo containers to ship LLW to the NTS. Upon review of DOT regulations, it became apparent that it was unnecessary to utilize new or even refurbished cargo containers to ship most types of LLW, i.e., a used cargo container meeting the requirements of a DOT strong, tight packaging (exclusive use shipment) would be adequate.

The Site had been using 55-gallon drums, plywood boxes, and metal boxes to package, ship, and dispose of LLW in accordance with DOT regulations for packaging radioactive waste based on activity limits. These packages were generally sufficient to meet site needs during production. However, with the change in the Site mission from weapons production to Site closure, this is no

longer the case. The Site needs to be using waste packages that are more efficient where possible. In 2000, the Site began to use cargo containers to package D&D waste. The primary advantage of the cargo containers is that the need to size-reduce waste items is, in many cases, eliminated.

Waste Guidance Inventory, and Shipping Forecasts, indicate that nearly 200,000m<sup>3</sup> of LLW will be shipped off site between FY2000 and FY2006. Recent efforts to replace the projected 55-gallon drums, metal crates, and plywood boxes with strong tight cargo containers have resulted in large (>\$10M) savings. Further savings (> \$10M) have resulted from the use of once-used cargo containers instead of new containers.

More recently, the WRG has evaluated and implemented the use of once-used IP-2 cargo containers. Previously, the only option in use at RFETS for packaging SCO-2 waste was a 4'x4'x7' IP-2 metal waste box and limited use of new IP-2 cargo containers. Implementing the use of used IP-2 cargo containers will result in an estimated cost savings of \$5M through closure of RFETS.

### **Replacement of IP-2 metal boxes with strong tight metal boxes in plutonium D&D projects**

During the weapons production years at RFETS, LLW was packaged using metal drums, strong tight wooden crates and IP-2 metal boxes. Following a revision in the Authorization Basis for the Plutonium production buildings in 1998, the option to use wooden packages was eliminated. The simple fix was to use the IP-2 metal boxes available through the warehouse, even in cases when a strong tight container would be a compliant package. The RFETS IP-2 metal box is built to a unique RFETS design specification at great expense to the Site. This practice continued for several years until the WRG conducted a cost benefit analysis of introducing one of several strong tight metal packages available commercially.

The WRG contacted several vendors and invited some of these to provide a sample of their 4'x4'x6' strong tight metal box to RFETS for evaluation by the users and oversight organizations. These vendors were invited onsite to present the advantages of their container to interested organizations within Kaiser-Hill and its contractors.

In general, the following characteristics are required for this waste container.

- The container must meet the requirements for a Department of Transportation (DOT) Strong Tight Container (49 CFR 173.24a).
- The container must meet the stacking and shipping requirements associated with the waste acceptance criteria for the Nevada Test Site.
- The container must be manufactured from a non-flammable material (i.e. sheet metal).

- The container should be available in two sizes:
  - Full Size: Approximately 4'x4'x6' (Height, Width, Length)
  - Half Size: Approximately 2'x4'x6' (Height, Width, Length)
- The capacity of the container should be approximately 10,000 pounds (full size) and 5000 pounds (half size)
- The container should have a closure mechanism with rust resistant features for outdoor storage.
- The container needs to be fork truck and pallet jack compatible (i.e. skid mounted)
- The container lid needs to be interchangeable amongst like containers.
- The container lid needs to be adaptable for removal via mechanical and/or manual methods, which are non-obstructive to allow stacking of the filled containers.
- The container must be adaptable for use with a Nucfil-013 Carbon Composite Filter.
- The container must be a catalog-type commodity (i.e. off the shelf) to reduce the overall cost of the associated engineering and procurement.

The manufacturer of this container must be able to provide a sufficient number of containers to meet the waste generation needs of the Site (approximately 100 full size containers per month and 25 half-size containers).

The Site began full-scale use of a strong tight metal box in the summer of 2001. The cost savings to the Site from implementing use of this container is projected to be over \$5M.

### **Soft sided bulk packaging**

The D&D of some of the former uranium forging and machining buildings presents some unique waste disposal challenges. The successful decommissioning of these buildings will require disposal of some extremely dense, heavy equipment. Cargo containers can be used to package, ship and dispose of some of this equipment. However, the Waste Acceptance Criteria (WAC) for the NTS prohibits disposal of waste packages with void spaces. There are numerous pieces of equipment that would meet the capacity rating of a cargo container, but would leave a large volume of void space. Aside from not meeting the NTS WAC, the Site pays for disposal by volume rather than by weight, so there is also an economic incentive to identify a solution to this packaging problem.

Relatedly, the uranium buildings have historically used cargo containers for outdoor storage of excess equipment, much of which is contaminated. The age and condition of these cargo containers is such that certification of these containers as strong tight would not be cost effective. So, in addition to the large

equipment, the uranium D&D projects needed to identify a packaging solution for these contaminated cargo containers.

In order to meet this challenge, the WRG began contacting vendors to determine what available solutions exist in the commercial marketplace to overpack the existing cargo containers and the dense, heavy equipment. Several vendors were contacted to discuss solutions available to accommodate both waste management problems.

After eliminating hard sided overpacks due to economic and transportation constraints, soft sided containment options were evaluated more closely. Two vendors offered a two piece "butter dish" configuration composed of a two-ply polypropylene/polyethylene sewn material that would join together with a velcro closure around the belt line. This configuration would accommodate the old cargo containers whose structural integrity could be verified. For those containers whose integrity could not be verified, "flat racks" were recommended. These flat racks could be placed underneath the questionable cargo containers that can be filled with LLW and overpacked with a soft sided bulk packaging. In addition, the flat racks could be used as a platform to which the large dense equipment could be secured and then covered with a soft sided overpack of variable height.

Several vendors who supply flat racks were contacted to evaluate the RFETS applications that include both miscellaneous heavy equipment and cargo containers. The attributes imposed on these vendors include:

- New or like new condition; with current Container Safety Certification (CSC) inspection and manufacturers data plates.
- External dimensions must be within ISO standards for 20' flatrack / platform *(with a maximum platform height of no more than 13 inches without bulkheads)*.
- Official weight ratings must be permanently marked on exterior surface and visible from both sides. *(If bulkheads have been removed tare weight must be adjusted accordingly)*.
- Must have fork lift pockets standard location for ISO freight container.
- Minimum gross weight 50,000 lbs; minimum payload weight 40,000 lbs.

The flat rack (~\$4000.), together with the soft sided bulk packaging (~\$1000.) forms an integrated packaging solution which is both compliant and cost effective for both the heavy dense equipment and the cargo containers whose structural integrity is in question.

### **Procurement of commercially available waste commodities**

The practice of preparing a RFETS engineering specification and associated drawings for every quality controlled product procured by the Site is a carryover from the weapon production mission at RFETS. Even though alternative

procedural mechanisms are in place at RFETS, this practice has remained the preferred process probably due to cultural barriers to change.

The WRG has initiated several attempts to procure waste packaging commodities in a way that relies more heavily on the vendors' quality and engineering capabilities. The first of these attempts was the procurement of strong tight waste containers as commercially available, "off-the-shelf" items.

The potential cost savings to the Site is derived from not preparing, reviewing, approving or updating the associated procurement specification and drawings. All of these functions are performed by the vendor more efficiently, and quite possibly, with a higher level of quality than if they were performed at RFETS since these are functions that the vendor may need to perform for other customers. Who better to prepare drawings and specifications for a particular waste package than the company that is in business to build the package?

The challenge that we have is to ensure that items being offered in the marketplace meet all the requirements for packages when they are being loaded with waste by Site personnel, when they are being transferred around the Site (e.g., for assay), when they are transported down the public highways, and when they are received by the disposal site. At first, this seemed to be a very non-trivial matter that could prove to be a major stumbling block capable of derailing the entire effort. However, it turned out that the constraints we work within at RFETS are not dissimilar to those imposed at other sites. For instance, we identified several vendors who are accustomed to meeting the 5x stacking criterion imposed by NTS, which exceeds the 3x stacking criterion imposed by the commercial disposal sites. It soon became evident that with adequate communication with all the parties who have a stake in a given packaging configuration, the challenge of meeting all the various requirements can be met.

The procurement of commercially available waste commodities continues as an initiative whose cost savings potential is, while hard to quantify, not trivial.

## **CONCLUSIONS**

In order to reduce costs and achieve schedules for closure of RFETS, an analysis was conducted on the use of alternative packaging and transportation methods for the disposal of RFETS LLW. Some of the cost-saving initiatives being implemented at RFETS include the increased use of strong tight and IP-2 cargo containers, the replacement of IP-2 metal boxes with strong tight metal boxes in plutonium D&D projects, the use of soft sided bulk packaging for large surface contaminated only (SCO) waste items, and the procurement of commercially available waste commodities.

Waste Guidance Inventory, and Shipping Forecasts, indicate that nearly 200,000m<sup>3</sup> of LLW will be shipped off site between FY2000 and FY2006. Recent efforts to replace the projected 55-gallon drums, metal crates, and plywood

boxes with strong tight cargo containers have resulted in large (>\$10M) savings. Further savings (> \$10M) have resulted from the use of once-used cargo containers instead of new containers. More recently, the WRG has evaluated and implemented the use of once-used IP-2 cargo containers. Implementing the use of used IP-2 cargo containers will result in an estimated cost savings of \$5M through closure of RFETS.

The WRG contacted several vendors and invited some of these to provide a sample of their 4'x4'x6' strong tight metal box to RFETS for evaluation by the users and oversight organizations as a potential replacement of many of the IP-2 metal boxes. The Site began full-scale use of a 4'x4'x6' strong tight metal box in the summer of 2001. The cost savings to the Site from implementing use of this container is projected to be over \$5M.

In order to identify a packaging solution for contaminated cargo containers and large dense equipment, the WRG began contacting vendors to determine what available solutions exist in the commercial marketplace. The challenge was to overpack the existing cargo containers and the dense, heavy equipment. Several vendors were contacted to discuss solutions available to accommodate both waste management problems. Two vendors offered a two piece "butter dish" configuration composed of a two-ply polypropylene/polyethylene sewn material that would join together with a velcro closure around the belt line. This configuration would accommodate the old cargo containers whose structural integrity could be verified. For those containers whose integrity could not be verified, "flat racks" were recommended. These flat racks could be placed underneath the questionable cargo containers that can be filled with LLW and overpacked with a soft sided bulk packaging. In addition, the flat racks could be used as a platform to which the large dense equipment could be secured and then covered with a soft sided overpack of variable height. The flat rack (~\$4000.), together with the soft sided bulk packaging (~\$1000.) forms an integrated packaging solution which is both compliant and cost effective for both the heavy dense equipment and the cargo containers whose structural integrity is in question.

The practice of preparing a RFETS engineering specification and associated drawings for every quality controlled product procured by the Site is a carryover from the weapon production mission at RFETS. The WRG has initiated several attempts to procure waste packaging commodities in a way that relies more heavily on the vendors' quality and engineering capabilities. The potential cost savings to the Site is derived from not preparing, reviewing, approving or updating the associated procurement specification and drawings. All of these functions are performed by the vendor more efficiently, and quite possibly, with a higher level of quality than if they were performed at RFETS since these are functions that the vendor may need to perform for other customers. The procurement of commercially available waste commodities continues as an initiative whose cost savings potential is, while hard to quantify, not trivial.