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MINIMIZING WASTE IN ENVIRONMENTAL RESTORATION

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ABSTRACT

Environmental restoration, decontamination and decommissioning (D&D), and facility dismantelment projects are not typically known for their waste minimization and pollution prevention efforts. Typical projects are driven by schedules and milestones with little attention given to cost or waste minimization. Conventional wisdom in these projects is that the waste already exists and cannot be reduced or minimized. In fact, however, there are three significant areas where waste and cost can be reduced by careful planning and execution. Waste reduction can occur in three ways: 1) beneficial reuse or recycling; 2) segregation of waste types; and 3) reducing generation of secondary waste. This paper will discuss several examples of reuse, recycle, segregation, and secondary waste reduction at ANL restoration programs.

BENEFICIAL REUSE

Historically, environmental restoration projects dismissed reuse or recycling as not viable options. Project managers saw no viable use for any material because it was all contaminated and thus not desirable. D&D and restoration programs would drive the backhoes and wrecking ball up to the project, dismantle everything, then it would be packaged, documented as waste, and shipped off. The driver for this type of restoration project was the preceived cost of doing anything different.

The Experimental Boiling Water Reactor (EBWR) was the first boiling water reactor, operating from the mid 1950's and producing power into the 1960's. Argonne National Laboratory (ANL) engineers were planning to build a hardened structure for the interim storage of transuranic and radioactive waste. The EBWR structure was seismically designed, tornado resistant, had a main operating floor rated at 2000 pounds per foot, and an overhead crane rated at 20 tons. After the D&D project removed the reactor and associated components, the structure would make an excellent storage facility. There were no potential tenants looking for a used reactor building. Reusing the building would

save significant construction costs and would eliminate the need to decontaminate a new building in the future. EBWR is currently being converted to a storage building. DOE has estimated the cost savings associated with this effort at between 2 and 4 million dollars.

The Chicago Pile 5, another Argonne reactor facility also undergoing D&D, had a vapor sphere used primarily to maintain constant pressure within the containment. The facility was a non-contaminated half-sphere. Engineers identified this facility as a candidate to become a salt-storage facility for road salt. The facility required minimal modification to fit the new need. The cost savings associated with this effort was $200,000K.

Reusing large facilities like reactor containments and vapor spheres is interesting, but there are not many opportunities for this type of activity. Most reuse activities are small efforts of a few components. ANL has been very successful reusing shielding (lead, concrete, and steel) from various projects. The Pulsed Neutron Source (PNS) recycled a million pounds of steel to Fermi National Accelerator Laboratory as part of their Trevatron upgrade. Several projects have reused slightly contaminated shielding material resulting in savings.

A more interesting case of recycling involved dismantelment of an accelerator. The accelerator has 33 unique electron tubes that were manufactured specifically for this facility. A user on-site was capable of using the tubes in present research programs. The project saved in excess of $100,000.

The final example of reuse is an interesting case of cooperation between a restoration program and a construction project. Restoration was digging several unused vaults out of one area of the site. The vaults had been used to store radioactive material and were slightly contaminated. The restoration project would generate a large hole that they would then fill with dirt procured off-site. At the same time, several small construction projects would be digging holes for footings and would dispose of the dirt off-site. The project managers worked together, and although schedules were not completely compatible, decided they could share the clean dirt. At this point, environmental compliance was consulted. They were reluctant to approve reusing the dirt unless it was completely characterized. They recognized that we could unconditionally release the material without a detailed spectrum of analysis and recommended that on-site controlled usage was preferable. While the effort did not fill the projected hole, the foundation for cooperation was set.

Several demolition projects have characterized material as clean and have been able to recycle steel and other metals as scrap. The Building 212 H-Wing is an excellent example. This area was a foundry used to make fuel pins for the Chicago Pile 5 reactor. It contained several large presses and other equipment. The first step was an attempt to identify users for the 30+ year old equipment. This was unsuccessful. The equipment was dismantled, and radioactive components (primarily the dies) were segregated as waste. The clean metal went to the scrap recycle. This project saved significant sums in disposal.

Segregation of Waste

The 317 Area Remediation Project also worked with Waste Management on remediation of an area known as the "map tubes." The tubes were pipes 6.6 meters long and ranging in diameter from 5 cm to 20 cm. When the facility was built, 159 tubes were fabricated using lead to waterproof the pipe joints. The pipes then were embedded in a concrete monolith. The project decontaminated the pipe sections and removed those that could not be decontaminated. The project managers recognized that the joints would be considered mixed waste due to the contaminated lead. The remaining portions of pipe would be low-level waste. The pipe sections were cut to segregate the mixed from the low-level portions, resulting in a minimum generation of mixed waste. Recognizing that the different components represent different hazards can be very beneficial. This example generated approximately 50ft^3 of mixed waste and 2500 ft^3 of low-level waste. Had all of the pipe sections been disposed as mixed waste, the cost would have been extensive. The mixed waste portion was shipped to Hanford for storage, eventual treatment, and disposal. The low-level portion was disposed of directly. This approach saved approximately $300,000, and this does not include cost for monitoring in storage and eventual treatment when a facility is built.

Several demolition projects at ANL have used sampling and segregation to maximize their recycling potential. The H-Wing Demolition Project has taken a foundry area used for uranium fuel pellet fabrication and removed the major machinery. Careful sampling and surveys by Health Physics (HP) found that most of the material was recyclable. In addition, because contamination was very low and isolated to only a few areas, minimal protective clothing would be required. The sampling increased worker productivity and maximized recycling of the metal. This same philosophy is being used in other projects, with similar results.

Other examples have included segregating soil as it is sampled, separating different materials, and simple demolition projects currently separate non-contaminated materials. The cost of disposal has altered the perspective one historically took to demolition.

Reducing Secondary Waste

Secondary waste, generated in the characterization step of a restoration project, can be very significant. Every bore hole dug is first, expensive to dig, and second, generates waste in the drilling process. Finally, the sampling and analysis steps for multiple bore holes also generate waste in the Laboratory. ANL used the Plume Code to identify high priority sample locations at the 317 Area Project. This resulted in 125 fewer bore holes and reduced sampling. The reduced sampling program saved approximately $50,000.00 in analytical cost alone. Each bore hole is 4cm in diameter, and they average approximately 2m deep. The dirt from each hole represents several cubic feet. Secondary waste associated with PPE during the drilling and sampling stages of the process will generate additional wastes. The savings associated with not using a two man crew to drill 125 holes is substantial. Finally, there is the savings in data reduction associated with fewer samples. The savings from reduced waste generation and bore holes not dug has not yet been calculated.

Conclusion

There is a very important role for waste minimization and pollution prevention in environmental restoration projects. Waste minimization and pollution prevention can provide significant savings in terms of cost and waste by using some very simple techniques. Project personnel must look for cost savings opportunities, and aggressively pursue them when they arise. When each of these environmental restoration projects discussed here was being developed, waste minimization and pollution prevention was not planned. The opportunities were identified and implemented during project execution. This is frequently the case. As a result, it is essential to be alert to unexpected waste minimization and pollution prevention opportunities that may occur in projects.