A RAD WASTE COMPACTION PROGRAM FOR A MEDICAL CENTER

Kenneth L. Miller, Lottie A. Varano, Barry H. Brosey

Milton S. Hershey Medical Center
Pennsylvania State University
500 University Drive
Hershey, Pennsylvania U.S.A. 17033

1. INTRODUCTION

In the early stages of our programs growth and development (1) our waste handling problems were not of a major concern. We had approximately 65 radioisotope laboratories which were moderately active in conducting biological research. The total number of drums of radioactive waste generated required one and sometimes two waste shipments per year to a nearby radioactive waste burial site. The closeness of the burial site permitted us to rent a truck and act as private carriers on round trips that normally took no more than a day. Waste burial costs of approximately 85¢/ft^3 did not put a major strain on our operating budgets.

Unfortunately, this unpressured operating situation was short-lived. Opening of the hospital and clinical section plus additions to the physical plant and the biological research programs added tremendously to the utilization of radioisotopes. We suddenly found ourselves with the need to dispose of over 600 thirty gallon drums of radioactive waste per year. To make matters worse, our nearby commercial burial site closed, forcing us to ship to an alternate site several states away. Lack of adequate storage space, increased costs of commercial shipping and an inflationary spiraling, which quadrupled burial costs, forced us to initiate a waste volume reduction program. As an alternative to increasing environmental contamination through increased incineration and disposal via the sanitary sewer, we decided on a waste compaction program. Our compactor which is shown in Figure 1, has been in operation for over a year and has proven to be economical and effective. The various features of the compaction program will hence forth be discussed.

2. COMPACTOR FACILITY

After reviewing numerous commercially available compactors, we chose the Model 55A RAM FLAT Compactor manufactured by S & G Enterprises, Inc. of Milwaukee, Wisconsin. The features we liked best about this compactor included: (a) it is designed to meet OSHA requirements, (b) the drum is totally enclosed during compaction by a 3/8" thick steel plate door, (c) the unit generates up to 85000 pounds of compaction force with compaction ratios up to 10:1, (d) the use of a modified compaction head permits compaction within a 55 gallon steel drum. Undesirable features included: (a) the necessity of partially removing the drum from the compactor each time more waste is added, (b) the need to add progressively smaller volumes to the drums as they begin to fill, (c) the generation of airborne contamination through compaction. This latter problem necessitated the addition of a filtration system to eliminate odors and airborne contamination.

3. TYPES OF COMPACTIBLE WASTE

The types of wastes which we have found suitable for compaction in this system include most of the dry compactibles, i.e. disposables gloves, absorbent pads, paper, glassware, plastics, syringes, and other dry materials. Large objects which will not fit in the drums and rigid objects such as metals which could penetrate or cause distortion of the drums or damage to the compactor must be handled in an alternate manner.

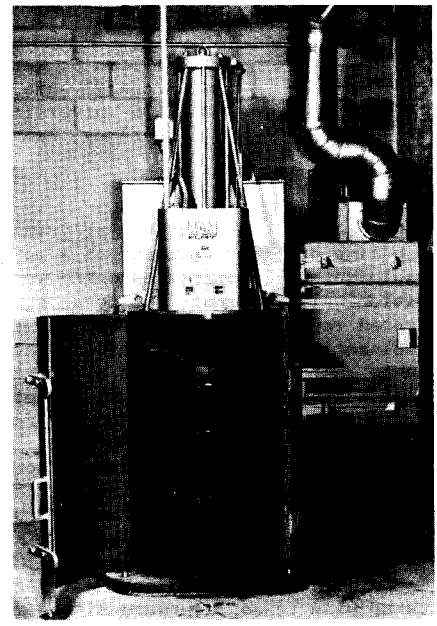

Figure 1. Waste Compactor and Filter Bank in Compaction Room.

4. COMPACTION EFFECTIVENESS

Although the system can give compaction ratios of up to 10:1, we have found in actual practice that we are achieving average compactions of 4:1. This difference is due primarily to the types of waste which we are compacting and the difficulties previously mentioned regarding adding waste as the drum begins to fill. The weight of a drum filled with compacted laboratory waste ranges between 300 and 500 pounds.

5. FILTERING SYSTEM

Compaction of radioactive waste in this unit does lead to airborne contamination and odors during use because there is a small space between the compaction head and the inside of the drum. In actual practice airborne concentrations were measured which approached MPC_a (2) when compacting wastes containing several millicuries of total activity from isotopes of H^3, C^{14}, P^{32}, and S^{35}. In our situation this airborne contamination and odor problem was worsened by a poorly ventilated waste storage room.

To solve this problem we decided to provide the compaction chamber with the ventilating system which is shown in Figure 2. A hole was cut into the compaction chamber and the chamber was exhausted through a filter bank containing a throw-a-way type fiberglass roughing filter backed by a HEPA filter and an activated charcoal filter. A 600 CFM blower provides sufficient air movement to exhaust the compaction chamber while maintaining an air flow into the chamber which averages 1000 fpm. The exhaust air is vented straight to the outside.

Since adding the ventilating system, we have eliminated the odor problem and the problem with airborne contamination outside the compaction chamber. Subsequent measurements have shown the filter bank is successful in removing all radioactivity from the air which is exhausted to the outside.

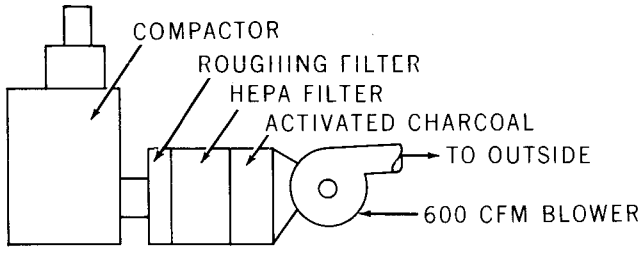

Figure 2. Compactor Ventilation System.

6. COST ANALYSIS

Prior to initiation of the compaction program, we were providing the laboratories with DOT approved fibre broad containers which were simply capped and made ready for shipment when full. The average cost of each container was $7.35. Since installation of the compactor, we have replaced these containers with 17 gallon metal cans, with lids, which we were able to purchase from Navy Surplus for 25¢ each. For an added nominal fee we were able to have these cans painted lemon yellow and have radioactive material warning labels attached. A plastic bag liner permits easy removal of the waste each time the container is filled and eliminates the need for dumping. This smaller size, also, makes it easier to load the waste into the larger steel drums for compaction. Replacing the more expensive containers in the labs resulted in an appreciable yearly savings even after the cost of the 55 gallon steel drums used for compaction was subtracted.

Predictions are that this savings on drums coupled with the savings on burial and shipping costs will enable us to pay for our compaction program in less than two years. The total cost of the system including ventilation system and installation was $10,670. A more far reaching savings may ultimately be reached because disposal of our low level radioactive waste requires minimal space at the burial sites.

7. CONCLUSION

Initiation of a waste compaction program has enabled us to keep pace with an ever increasing volume of radioactive waste being generated by clinical and research uses of radioisotopes at a new Medical Center. This program has provided us with savings in waste disposal costs as well as space required for waste handling and storage. The installation of a filtration system has eliminated the odor and airborne contamination problems which were generated through the compaction process.

1. Miller, K.L.: "A Radiation Safety Program for a New Medical Center," in Proceedings: Ninth Midyear Topical Symposium of the Health Physics Society, Denver, Colorado, U.S.A. February 9-12, 1976.

2. U.S. Nuclear Regulatory Commission, Rules and Regulations Title 10 Code of Federal Regulations, Part 20.