VOLUME REDUCTION EFFORTS AT A BIOMEDICAL RESEARCH INSTITUTION

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ABSTRACT

Waste minimization and volume reduction efforts have always been an integral part of the research support activities of the Radiation Safety Department at Yale University. In June 1991 a shredder/ compactor began operation and provided a 21% increase in container weight.

INTRODUCTION

Low-level Radioactive Waste (LLRW) disposal costs have escalated to levels that are making the use of radionuclides impractical to the biomedical research community. Also, the generators of LLRW in Connecticut are assessed annually for the State's planning activities associated with establishing a new LLRW disposal facility. The State's assessment is currently based on LLRW volume shipped for burial during the previous calendar year. These rapidly escalating costs have required waste minimization and volume reduction efforts to become an integral part of the research support activities of the Radiation Safety Department at Yale University.

In 1970, the University's first LLRW compactor was installed. It made an immediate impact on the solid waste volume being shipped for disposal. Waste volume decreased by 35% in the 1970-1971 time interval. In 1974, a second more powerful compactor was purchased and installed. Figure 1 depicts the impact of compaction on the volumes of waste collected and the volume of waste shipped for burial between 1970 and 1979. The second compactor is still operational but seldom used with the addition of the new more sophisticated volume reduction equipment.

When it became clear that Public Law 96-573, "Low-Level Radioactive Waste Policy Act of 1980" (LLRWPA) was not going to be effective in leading to the opening of a new regional radioactive waste disposal facility, the Yale Radiation Safety Department began developing a five year plan for radioactive waste management at the University. The plan addressed the University's needs:

- to demonstrate additional volume reduction;
- for additional waste management staff;
- for interim storage;
- for a radiation analysis laboratory for radioactive waste identification and quantification;
- for the management of mixed waste;
- to institute a hold for decay program;
- for waste segregation; and
- to minimize waste generation.

The five year plan, instead of being implemented immediately was phased in, reevaluated annually, revised and expanded over the past six years. The final items of the plan are now in place. Now that it is clear that Public Law 99-240, "Low-Level Radioactive Waste Policy Amendments Act of 1985" will not result in a regional site (1) which will accept the University's waste, planning efforts of the Radiation Safety Department are continuing.

The possibility of interim storage has been assessed and a previous paper (2) discussed the anticipated problems of interim storage of LLRW generated by a biomedical research program. Design and associated renovations have begun on an interim storage facility located on site. An application for a Nuclear Regulatory Commission license amendment has been submitted and is under review. Waste segregation, hold for decay, volume reduction by compaction and supercompaction have all been implemented.

Facing the possible denial of access to the current disposal sites and the distinct possibility of not having a site to ship solid waste to for an extended period, together with an escalating State assessment, the Radiation Safety Department developed plans in 1988 to obtain a shredder/ compactor combination to enhance the volume reduction effort (Fig. 2). A contractor was identified and a unit was purchased. It was installed in May 1991 and began operation the next month.

The initial evaluation of volume reduction using the shredder/compactor will be measured in container weight and number of containers shipped for disposal.

RESULTS AND DISCUSSION

The shredder/compactor began operation in June 1991. Prior to June, waste was only compacted and the number of hold-down devices used per container was based on the level of technician expertise. An average of four hold-down devices were used per container prior to June 1991. Hold-down devices weigh 13 pounds each.

Data from October 1990 through May 1991 (Fig. 3) indicate an average container weight of 273 pounds with an average of 20 containers per month shipped for disposal (Fig. 4). This eight month period is consistent with previous years average container weight and number of containers shipped per month.

It is assumed that waste generation during a calendar year is not influenced by the academic calendar. Biomedical research is conducted without regard to the academic agenda, therefore the waste volume generated is virtually constant throughout the year.

Beginning June 1991, one minor and one major procedural change were implemented by the Radioactive Waste Program. Technicians were instructed not to use more than

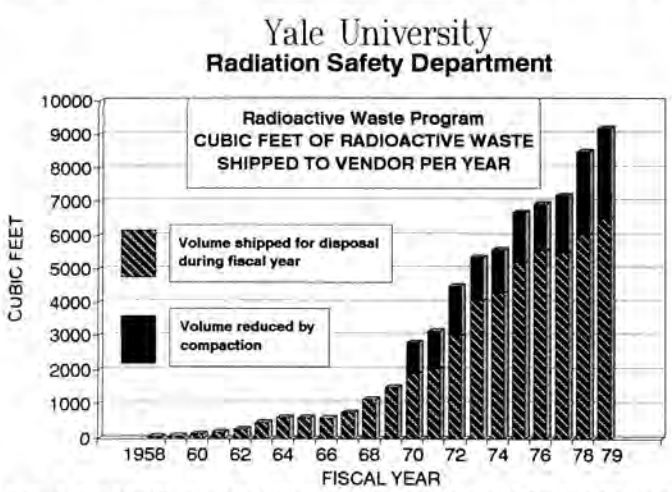

Fig. 1. Cubic feet of radioactive waste shipped to vendor per year.

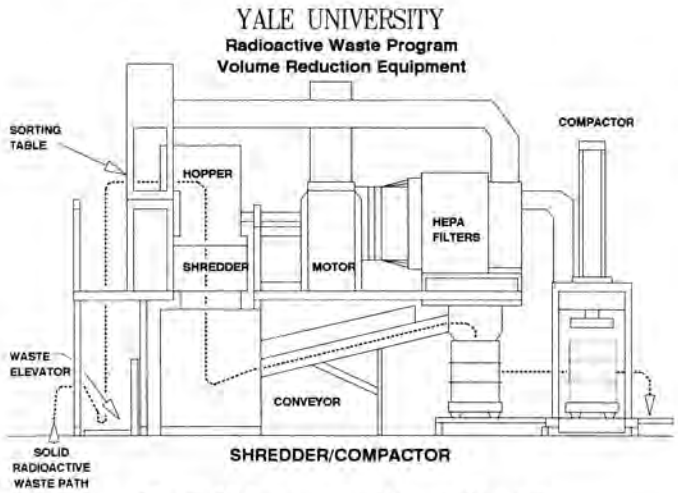

Fig. 2. Volume reduction equipment.

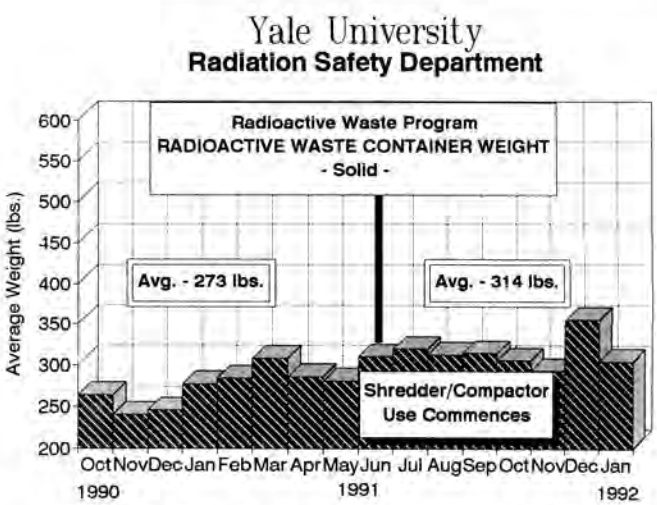

Fig. 3. Radioactive waste container weight-solid.

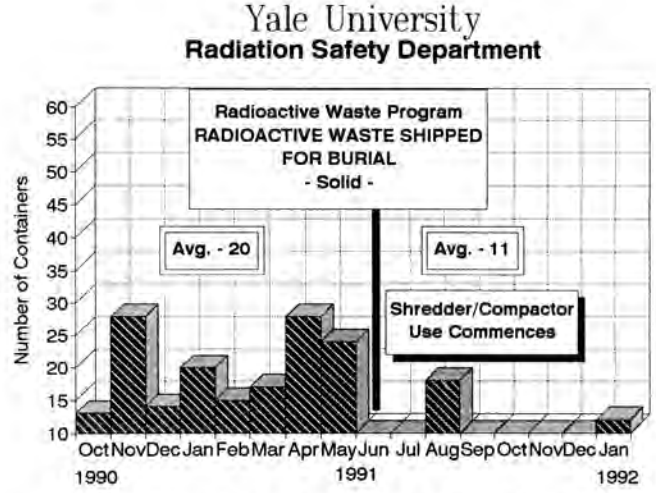

Fig. 4. Radioactive waste shipped for burial-solid.

three hold-down devices per container (minor) and use of the shredder/compactor commenced (major). Drum weights now average 314 pounds per container with an average of 11 containers being shipped for burial per month.

Based on initial averages, drum weight increased by approximately 15% and the number of containers for shipment to burial decreased by 45%. In 1990, Yale University shipped 250 dry waste containers at approximately $675.00 per container. If a 45% decrease in the number of containers shipped was applied a savings of $75,900 would have been realized. The initial pay back of the investment will be obtained in approximately 1.5 years. If the drum weight is corrected for the number of hold-down devices (4 prior to June, no more *than* 3 commencing in June) a subtraction of 13 pounds from the pre-shredder/compactor average would yield 260 pounds versus 314 pounds, an actual weight increase of approximately 21% (54 pounds) due to shredding.

CONCLUSION

The use of a shredder prior to compaction has increased drum weights by 21% and decreased proportionally the number of containers shipped for burial. An investment pay back will be realized in approximately 1.5 years.

Operationally, the shredder has allowed for a visual inspection of the waste. Deficiencies in waste segregation have been identified and properly rectified by the laboratory involved.

Technician's use of the equipment has been safe, efficient and without any radiological consequences. Personnel quickly and easily gained an expertise for the equipment.

All shredded/compacted waste is sent for supercompation. Initial review of supercompacted shredded waste shows little reduction in volume reduction ratios (this will be presented in a future paper). In 1990 the supercompacted volume reduction ratio was approximately 2 to 1 and 1991 was 1.72 to 1. It appears that if a bio-medical research institution is sending 1000 cubic feet or more of waste for burial after supercompaction, substantial savings may still be incurred if shredding is performed prior to compaction.

REFERENCES

1. R. E. GINGERICH, G. R. HOLEMAN and J. A. HILEMAN, "Selection of Candidate Sites for a LLRW Disposal Facility in Connecticut," International Symposium WM'92, Tucson, AZ, USA, (March 2-6, 1992, in press).
2. G. R. HOLEMAN, "Anticipated Problems with Interim Storage of Low-Level Radioactive Waste Generated by Biomedical Research Programs," International Symposium WM'91, Tucson, AZ, USA, (February, 25-28, 1991).