THE RECYCLING ALTERNATIVE

Michael S. McGough, Edwin L. Tomlin
Quadrex Recycle Center
Oak Ridge, TN 37830

ABSTRACT

Nuclear facilities have become increasingly concerned with minimization of low level waste disposal costs. Burial space allocation, surcharges and increasing burial rates have contributed to substantial cost increases. Recycling of decontaminable materials provides one mechanism for disposal cost minimization. The operational and economic details of a large scale recycling operation are described.

The title of this paper is "The Recycling Alternative", and I am referring to recycling as an alternative to the shallow land burial of low-level radioactive wastes. Recently there has been much discussion of supercompaction and incineration and the effects that these technologies may have on volumes buried. I would like to tell you about a concept that is currently having a major impact on volumes buried.

A national waste newsletter recently asked "Where's the waste?", in referring to the drastic reductions in volumes received for burial in 1986. A large part of the volume reduction is being achieved through recycling.

We define recycling as the decontamination of materials which have a beneficial reuse. WE DO NOT PROCESS WASTE!!

Since 1982, Quadrex has operated a recycle center in Oak Ridge, Tennessee. During that time, we have processed over 750,000 cubic feet of contaminated materials.

This presentation will describe how a large scale recycling operation is implemented on a commercial basis. Hopefully, this information will be helpful in the assessment of near-term disposal options and how recycling will impact future burial site capacity requirements.

It is important to note that the types of materials we are dealing with here are non-compactible metallic materials, which have a beneficial reuse. The types of materials which can be compacted or incinerated are paper, plastic, PVC, etc., and do not include metallics.

Also, we are performing surface decontamination, thus all surfaces must be made accessible for decontamination, as well as for survey verification that they have been cleaned.

For example, a large heat exchanger or valve must be completely disassembled and proven clean prior to release, even if no decontamination efforts are necessary.

Initially, contaminated materials are brought into the facility and segregated for processing. At this point, a decision must be made regarding how the material will be treated (DECISION POINT 1). This decision point is the key to the economics of the entire operation. Materials may be cleanable with non-destructive techniques, such that they can be repaired and/or reused in existing form, (e.g. welding machines, scaffolding, cutting tools, etc.).

Materials may be designated for destructive cleaning where the end result is materials released as clean scrap (e.g. fuel racks, feedwater heaters, torus materials, etc.), or the materials may be identified as waste which should not have been sent in the first place (e.g. floor sweepings, glass, paper, plastic, etc.).

If the material is designated for non-destructive cleaning, it is disassembled and decontaminated with care to keep all the parts together and to preserve any machined tolerances.

Following decon, these materials are surveyed and clean materials are either released for reuse, as is, or released for repair and reuse. Materials which do not survey out clean are either rejected for further non-destructive cleaning or sent to the decision point shown on Fig. 1, at which time, it is decided whether the material can be cleaned or should be designated as waste.

If materials are designated for destructive cleaning, then they are disassembled and processed through one or more of six major process lines and surveyed for release as scrap.

Survey also serves as process control for decon lines. Process wastes, such as filters, clothing, paper, plastic, etc., are sent to waste. Survey rejects are either reprocessed or designated as waste.

Now you can see why these decision points (1 and 2) are so critical to the economics of the operation.

Materials, which turn out to be uncleanable, accrue costs through every decon loop they are processed. By now, our waste is made up of components from as-received materials, process wastes and decon rejects. These wastes are volume reduced via compaction, where possible, and repackaged for burial.

Now let's look at some numbers. If we use 1000 ft^3 of received materials as an example, about 5% -- or 50 ft^3-- are typically not cleanable and designated as waste. About 800 ft^3 -- or 80% -- will be destructively processed. About 150 ft^3 -- or 15% -- will be designated for non-destructive cleaning. From the incoming 150 ft^3 sent to non-destructive cleaning, about 90% is released and 10% becomes waste. From the 800 ft^3 processed destructively, 85% is released as scrap and 15% becomes waste.

A total of 185 ft^3 -- 18.5% of received volume -- is volume reduced and repackaged to a net burial volume of 140 ft^3. This 140 ft^3 is buried as waste, with 100 ft^3 under utility allocation (resulting from the circled waste volumes) and 40 ft^3 as Quadrex-generated waste (resulting from 2:1 volume reduction of the 80 ft^3 process wastes).

Now, let's look at the benefits of recycling:

ECOLOGICAL: Over 12 million pounds of resources have been recovered to date, thus minimizing volumes required for burial.

Based on EPRI and NRC data, it is expected that approximately 540,000 cubic feet of recyclable materials (i.e. non-compactible) will be generated annually. At the average volume reduction achievable in a large scale operation, burial volume requirements would be reduced by approximately 465,000 cubic feet, with a reduction of utility burial allocation requirements of 90%.

Dollar savings are utility specific, but considerations for calculating these savings are the recycling costs vs. gateprice, plus surcharges (if applicable); container costs, allocations savings, and transportation costs.

NRC document *NUREG/CR-4555* "Generic Cost Estimates for the Disposal of Radioactive Wastes" estimated non-compactible trash disposal costs at \$140 to \$260/ft^3, not including surcharges.

In summary, for non-compactible, reusable metallic materials, recycling has both economic and ecological benefits, provided that the economies of scale can be maintained. From a national perspective, recycling makes sense. But it is doubtful that the economies of scale necessary to achieve these volume reductions can be supported on a regional basis.

BIBLIOGRAPHY

U.S. Nuclear Regulatory Commission, NUREG/CR-4555, Generic Cost Estimates for the Disposal of Radioactive Wastes. Washington, D.C.: Office of Resource Management, 1986, p. 91.

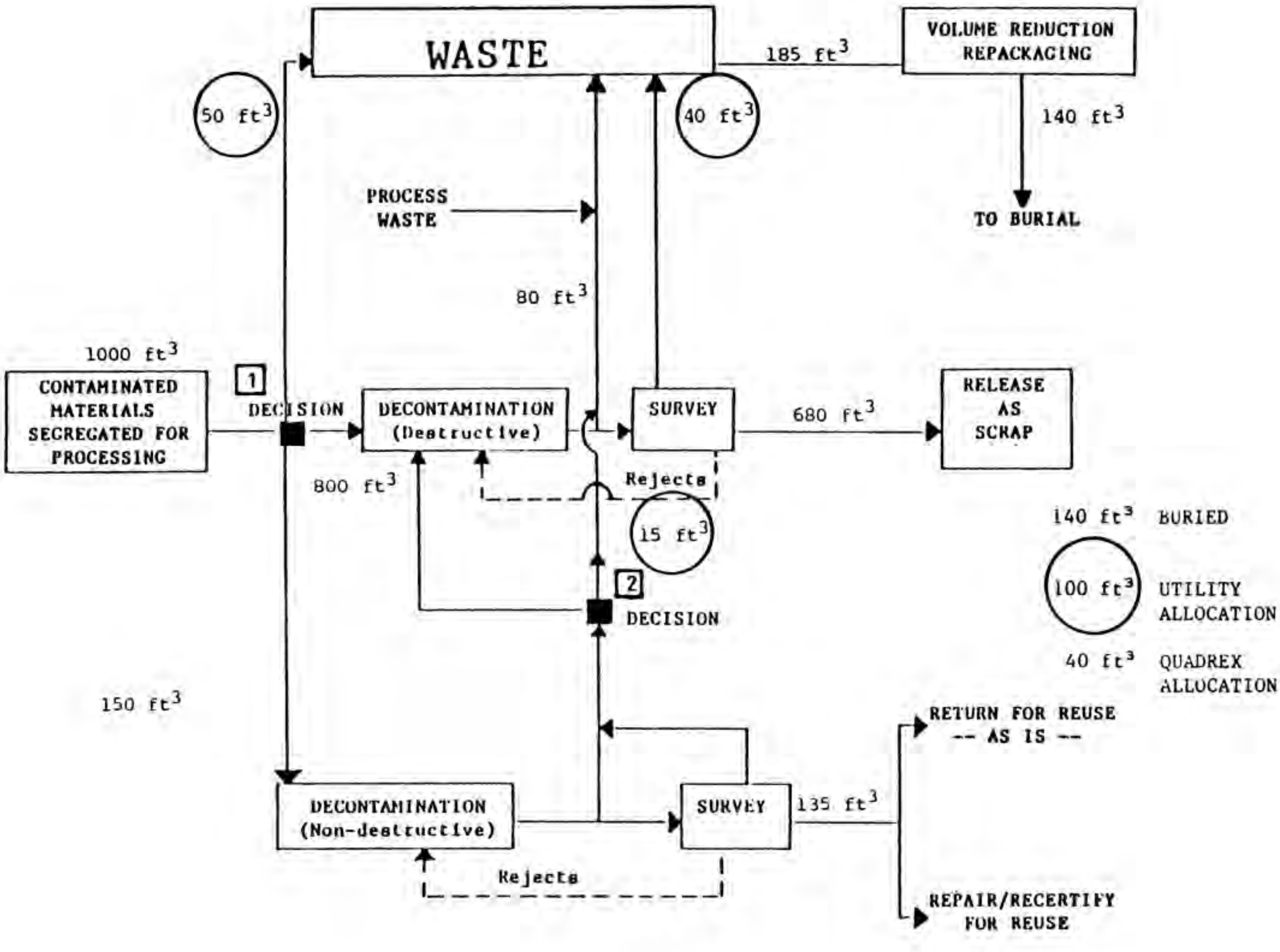

Fig. 1. Process Flowchart.