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BENEFICIAL REUSE OF U.S. DOE RADIOACTIVE SCRAP METAL

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ABSTRACT

The U.S. Department of Energy (DOE) has more than 2.5 million tons of radioactive scrap metal (RSM) that is either in inventory or expected to be generated over the next 25 years as major facilities within the weapons complex are decommissioned. Since much of this metal cannot be decontaminated easily, past practice has been to either retain this material in inventory or ship it to DOE disposal sites for burial. In an attempt to conserve natural resources and to avoid burial of this material at DOE disposal sites, options are now being explored to "beneficially reuse" this material. Under the beneficial reuse concept, RSM that cannot be decontaminated and free released is used in applications where the inherent contamination is not a detriment to its end use. This paper describes initiatives currently in progress in the United States that support the DOE beneficial reuse concept.

DOE SCRAP METAL INVENTORY

The current inventory of DOE radioactive scrap metal is very large. In 1993, the Quadrex Corporation was contracted by DOE to conduct a detailed inventory of radioactive scrap metal currently in storage within the DOE complex. Based only on information "documented in publicly available sources," Quadrex estimated the total DOE-wide RSM inventory to be 396,000 tons. The summary results of this inventory is indicated in Table I.

Table I
DOE Weapons Complex Scrap Metal Inventory
(Quadrex-1993)

Metal Type	Tons	Percent
Aluminum	16,250	4.1
Brass	10	.1
Copper	11,215	2.8
Lead	747	.2
Monel	1,745	.4
Nickel	47,524	12.0
Steel	143,221	36.1
Mixed	175,594	44.3
TOTAL	396,306	100.0

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In its report, Quadrex qualified the data with three major limitations.

1. "Key DOE sites do not presently track RSM as a separate waste item."
2. It is "very difficult to determine, solely from publicly available documents, either the true quantities of RSM that are in inventory at all DOE sites, or the current and projected generation rates for scrap metal at DOE facilities."
3. "Many sites simply lack the knowledge of on-site RSM inventories due to the length of time that the materials have been stored, and the apparent fact that RSM at some sites has been disposed of for decades with little documentation on metal types or contaminant levels."

Quadrex estimated in the report that if the documented inventory of 396,000 tons is added to the estimated 594,000 tons of metal that will be generated just from the D&D of the Oak Ridge, Portsmouth and Paducah gaseous diffusion plants, that the total current inventory could be up to 991,000 tons. If estimates were to include future D&D metal generation (up to 90,000 tons/year) within the complex, the total RSM inventory could easily exceed 2.5 million tons.

Recognizing the limitations of the 1993 survey, the Department Of Energy is now once again updating the inventory. The revised estimate is expected to be completed in late 1994 or early 1995.

CURRENT DOE INITIATIVES

At least five initiatives are underway within DOE to support the beneficial reuse of DOE radioactive scrap metal. Although several of these initiatives were started earlier, all of them support the DOE overall strategic initiative entitled "Recycle 2000."

RECYCLE 2000

Recycle 2000 is a proposal to promote the reuse of DOE-generated radioactively contaminated metals within the DOE Environmental Management program. Specifically, the proposal is to recycle radioactively contaminated scrap steel from decommissioning efforts into containers for disposal within the DOE system of other types of radioactive waste generated during site cleanup efforts. Recycle 2000 is highly focused so as to be manageable and achievable within the near term (i.e., by the year 2000).

In the past, DOE has developed policies and then talked with stakeholders to explore how to implement the already selected policy. Since the Departmental recycling policy will have a major impact on activities on and near DOE sites for a number of years into the future, DOE is taking the opportunity to incorporate stakeholder views internal and external to DOE prior to determining whether Recycle 2000 should proceed as proposed.

Several sites around the DOE complex have already pursued recycle and reuse of radioactively contaminated materials. In late 1993, DOE decided to implement a national strategy to coordinate and expand these individual site efforts. The proposed Recycle 2000 policy and the determination of an approach for obtaining stakeholder input to the proposal originated in a July 1994 planning meeting involving interested parties internal and external to DOE. The proposal was discussed with attendees at the July 1994 Radioactive Scrap Metal Conference.

A December 1994 meeting was held to bring together stakeholders to obtain their views on Recycle 2000 as proposed. Prior to the December meeting, representative stakeholders were identified and invited, and information packages on technical issues were prepared. Information briefings on the technical issues were presented on the first day of the December meeting, followed by two days of stakeholder discussion of the issues. DOE is currently developing an implementation approach, incorporating stakeholder input generated at the meeting.

Key elements of the Recycle 2000 Program, as currently envisioned, are as follows:

- The proposed Recycle 2000 objective is that it will be common practice by the year 2000 that DOE recycles radioactive scrap metal into waste containers for storage/disposal of waste within the DOE complex. The proposed goal is to use 50 percent or more of waste containers made from radioactive scrap metal.
- The stakeholders will provide detailed input to the proposal and DOE will identify and incorporate stakeholder values prior to developing the policy, if DOE determines that it should be advanced.
- The Recycle 2000 concept is initially limited to the on-site use of fabricated containers from scrap steel to enable DOE to maintain close control and ensure proper handling by trained experts.
- This effort does not preclude other recycling efforts the sites are conducting or are planning to undertake.
- Recycle 2000 is in the spirit of the President's commitment in Executive Order 12873 that Federal agencies promote "cost-effective waste prevention and recycling activities" to conserve disposal capacity.

It is expected that the DOE Recycle 2000 policy will be finalized and issued in early 1995.

SHIELD BLOCK FABRICATION

Fernald participated in a major initiative in 1993 to fabricate shield blocks from DOE radioactive scrap metal. Working with the Scientific Ecology Group (SEG), the DOE Fernald plant recycled 2,200 tons of radioactive scrap metal that had accumulated in a scrap metal pile over the 40-year plant lifetime. SEG, a company operating a licensed radioactive metal melting facility, cast the metal into shield blocks for use by Los Alamos National Laboratory in DOE physics programs. By beneficially reusing this material, DOE avoided utilizing 238,000 cubic feet of burial space and achieved a net cost benefit of \$1M.

The SEG metal melt facility continues to serve DOE and nuclear utilities as a full-scale commercial operation and to date has successfully melted and recycled over 25,000 tons of contaminated scrap metal.

CARBON STEEL WASTE CONTAINER FABRICATION

In 1993, SEG was awarded a contract by the DOE Morgantown Energy Technology Center under a Program Research and Development Announcement (PRDA) to demonstrate "technologies to remove, decontaminate, recycle, reuse and dispose of materials from decontamination and decommissioning activities at DOE sites."

Fernald was directed by DOE to support SEG in demonstrating that radioactively contaminated scrap metal can be recycled and reused to fabricate waste disposal containers. Fernald supplied 70 tons of contaminated scrap metal to SEG for this project. SEG decontaminated the metal to less than free-release levels, melted it at a commercial facility, shipped the metal to a non-licensed rolling mill, and, finally, used the rolled metal to fabricate LLW shipping containers meeting specifications provided by Fernald. These containers were returned to Fernald and, in January 1995, loaded with actual radwaste and shipped to the Nevada Test Site for disposal.

The PRDA has demonstrated that large quantities of radioactive scrap metal existing within the DOE complex, whether it is melted in a contaminated or uncontaminated state, can be utilized for waste container fabrication. SEG is also demonstrating the fabrication of rebar and metal fibers for use in fabricating reinforced concrete waste containers and the fabrication of specialty stainless steel canisters.

Separately, a Low-Level Waste Container Working Group, with members from 10 major DOE facilities has been established not only to optimize the design and standardize the fabrication of waste burial containers but also to determine how these containers can be fabricated on a large scale from DOE radioactive scrap metal. This effort is driven by the estimates that over 300,000 containers will be required within the DOE complex over the next 30 years. This effort, which was started in early 1994, supports the goals outlined in the Recycle 2000 initiative.

STAINLESS STEEL WASTE CONTAINER FABRICATION

Westinghouse Savannah River Company has initiated a separate program to demonstrate that huge stainless steel heat exchangers can be recycled into 55-gallon drums and 100 cubic foot boxes. These containers will be used not only for burial but also for the long-term outdoor storage of waste material prior to disposal. Westinghouse estimates that approximately \$10 million of disposal costs will be avoided. An important aspect of the initiative is a plan to establish a privately-operated recycling facility near Savannah River. As the first stage of this project, Manufacturing Sciences Corporation (MSC) and Carolina Metals (a subsidiary of Nuclear Metals) were each awarded a contract to fabricate a small number of stainless steel containers from contaminated slug boxes at the Savannah River Site.

The overall program is part of a "Reclamation and Reduction of Nuclear Residues" program sponsored by the South Carolina Research Authority. The purpose of the program is not only to reduce the volume of low-level contaminated metal stored in South Carolina but also to provide a boost to South Carolina's economy through creation of a new industry to provide jobs, an expanded tax base and spinoff businesses associated with metals recycling.

NATIONAL CONVERSION PILOT PROJECT

Manufacturing Sciences Corporation (MSC) has been awarded a contract by DOE to decontaminate a building at Rocky Flats and make it suitable for use as a privatized commercial entity. Specifically, MSC will decontaminate Building 83 which contains two large rolling mills. At the completion of the project, DOE will make the building available to a commercial enterprise to use for the fabrication of products manufactured from DOE radioactive scrap metal.

It seems logical that such a facility with its rolling mills will ultimately play some role in the waste container fabrication effort anticipated by Recycle 2000.

SUMMARY

Many radioactive scrap metal beneficial reuse and recycling initiatives are now underway within the DOE. Collectively, these initiatives will go far in determining the ultimate success or failure of DOE recycling efforts.