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# A PERSPECTIVE OF HAZARDOUS WASTE AND MIXED WASTE TREATMENT TECHNOLOGY AT THE SAVANNAH RIVER SITE (U)

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**A PERSPECTIVE OF HAZARDOUS WASTE AND MIXED WASTE TREATMENT TECHNOLOGIES AT THE SAVANNAH RIVER SITE**

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**ABSTRACT**

Treatment technologies for the preparation and treatment of heavy metal mixed wastes, contaminated soils, and mixed mercury wastes are being considered at the Savannah River Site (SRS), a DOE nuclear material processing facility operated by Westinghouse Savannah River Company (WSRC). The proposed treatment technologies to be included at the Hazardous Waste/Mixed Waste Treatment Building at SRS are based on the regulatory requirements, projected waste volumes, existing technology, cost effectiveness, and project schedule. Waste sorting and size reduction are the initial step in the treatment process. After sorting/size reduction the wastes would go to the next applicable treatment module. For solid heavy metal mixed wastes the proposed treatment is macroencapsulation using a thermoplastic polymer. This process reduces the leachability of hazardous constituents from the waste and allows easy verification of the coating integrity. Stabilization and solidification in a cement matrix will treat a wide variety of wastes (i.e. soils, decontamination water). Some pretreatments may be required (i.e. Ph adjustment) before stabilization. Other pretreatments such as soil washing can reduce the amount of waste to be stabilized. Radioactive contaminated mercury waste at the SRS comes in numerous forms (i.e. process equipment, soils, and lab waste) with the required treatment of high mercury wastes being roasting/retorting and recovery. Any unrecyclable radioactive contaminated elemental mercury would be amalgamated, utilizing a batch system, before disposal.

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## 1.0 INTRODUCTION

The Savannah River Site (SRS) is a Department of Energy nuclear material processing facility operated by Westinghouse Savannah River Company (WSRC) to produce plutonium and tritium for defense applications. During the production process several hazardous, radioactive, and mixed waste streams are generated. Several facilities are in various phases of completion for waste processing and treatment. One of the proposed waste projects is the Hazardous Waste / Mixed Waste Treatment Building (HW/MW TB). This facility will process various solid hazardous and mixed wastes. This paper presents five of the proposed treatment technologies resulting from treatment alternative studies accomplished by the SRS. As part of the alternative studies and to ensure compliance with DOE Order 6430.1A the SRS surveyed other DOE sites to determine if any innovative technologies, proposed or in use at other DOE locations, could be used at the SRS. This survey and technology research resulted in the specific treatments covered in this paper. The five treatments to be discussed are:

- Size Reduction - Size reduction allows efficient use of RCRA disposal space and assists in the repackaging of wastes to be shipped to the Consolidated Incineration Facility (CIF) and Solid Waste Disposal Facility (SWDF). Typical wastes are lead shielding, HEPA filters, and wastewater treatment filters.

- Macroencapsulation - The specific process recommended is thermoplastic polymer macroencapsulation based on regulations and SRS needs. Macroencapsulation is a specified technology for radioactive contaminated lead and could be used on other solid heavy metal wastes (by variance).

- Stabilization / Solidification - Stabilization / Solidification of wastes in a cement or polymer matrix. Sludges and soils are candidates for this process.

- Mercury Roasting/Retorting and Recovery - A specified technology for high mercury wastes (Hg > 260 ppm). The recommended method is a vacuum oven.

- Mercury amalgamation - A specified technology for disposal of any radioactive elemental mercury. A batch system is recommended.

A comparison of the available process alternatives from vendors, proposed treatment technologies with a sound technical basis, and in use (or proposed) at other DOE sites were compared. The comparison was based on:

- Regulatory requirements
- Permitting requirements
- Technical feasibility
- Operability
- Flexibility of treatment for additional wastes

## 2.0 SORTING/SIZE REDUCTION

### Sorting/Size Reduction Process

The wastes scheduled to be handled by the facility are stored in a wide variety of containers. The exact contents of most waste containers are not fully known or the waste container has wastes requiring different treatment processes. As a result, a waste sorting module will be part of the HW/MW TB. After the wastes are characterized and verified some of the wastes will be repackaged for treatment at other SRS waste facilities and the rest will be treated at the HW/MW TB.

The solid mixed and hazardous wastes to be treated at the HW/MW TB will be handled ALARA (radiation exposure As Low As Reasonably Achievable). To keep unnecessary exposure to a minimum all wastes will be sorted into non-contact handled and contact handled. The third category of wastes, tritiated wastes, will be kept separate from all other wastes. After sorting, each waste category to be size reduced will have its own special considerations during the size reduction process.

Size reduction is not a regulatory requirement but size reduction or size standardization makes treatment processing more efficient and allows more wastes to be placed in the disposal vaults. There is a DOE requirement for volume reducing the amount of waste disposed and generated at DOE facilities that supports the inclusion of a size reduction module.

The initial size reduction step will be to further sort wastes and then to cut wastes into process suitable sizes. Size reduction operations will be campaign processes to minimize the co-mingling of the different waste codes and to prevent treatment difficulties resulting from mixed waste codes. The size reduction equipment will be decontaminated and cleaned between campaigns to prevent co-mingling of waste codes. The specific size reduction process will depend on the waste category.

- Non-Contact Handled Wastes (NCHW)

  Large wastes can be cut with mobile shears mounted on an articulated boom or crane (if required). The whole waste form will be placed on the cutting floor and cut or sheared into appropriately sized pieces for the hopper of the baler. A grapple on another boom or crane will lift the pieces into the baler. Small pieces the grapple cannot lift can be shoved with a scraper blade into a hopper for accumulation for transfer to the baler.

- Contact Handled Wastes (CHW)

  Large pieces of contact handled wastes can also be cut with the mobile shears. Waste not suitable for shearing (i.e. process equipment, etc) can be cut either with an acetylene torch or with a portable band saw. Portable exhaust systems will remove fumes generated by cutting torches to the ventilation system. A portable vacuum can collect sawdust and residues from the sorting and cutting area for processing with the waste to be treated. The pieces will be lifted into the baler with the grapple, or some other manual device, provided the baler will not cause cross-contamination of waste streams resulting in a more difficult treatment process. If the baler would cause cross-contamination resulting in more stringent disposal requirements, the cut up pieces of waste can be placed directly into containers for further treatment.

- Tritiated Wastes

  Tritiated wastes will be contact handled or handled with hoods or gloveboxes. A glovebox with a portable band saw (as opposed as to a industrial size bandsaw) or similar equipment will cut process equipment (i.e. mercury diffusion pumps) to expose the interior tubing to assist the mercury removal process with the added benefit of size reduction. No further size reduction of tritiated wastes is planned.

After sorting and cutting up large bulky wastes, the wastes would be sent to the next size reduction step required. The proposed size reduction module will contain a shredder and a baler.

Combustible waste must be shredded and packed in cardboard containers, before it goes to the Consolidated Incineration Facility (CIF). The containers of combustible waste will be emptied into a shredder which will shred the waste into a size compatible with repacking into cardboard boxes meeting the CIF Waste Acceptance Criteria (WAC). The shredding equipment must satisfy these requirements:

- Capable of shredding wooden pallets
- Capable of shredding wastewater filter rolls
- Capable of shredding occasional nails found in pallets
- Capable of shredding plastic sheeting, paper coveralls, gloves, and other personal protective clothing
- Capable of shredding rags
- Capable of being conveyor belt fed
- Shredding blades must be removable
- Shredding blade design must allow decontamination before maintenance
- Shredding chamber and feed chutes shall have smooth welds and surfaces to prevent waste residue buildup during processing (This feature will ease decontamination efforts between campaigns)
- Shredding chamber must be capable of venting into the HEPA filter system. A vacuum system pulling through the shredding chamber directly to a HEPA system will significantly reduce airborne dust and contamination.
- Shredder must include a box-filling system

The packed boxes of shredded combustible waste will go to final assay (if required) and then to the CIF. There may be other waste streams requiring shredding (as opposed to compaction) prior to further treatment in the HW/MW TB. These wastes would be shredded and placed back into a container for movement to the next applicable process station in the TB.

For the baling process a commercially available scrap metal baler will compress waste into a suitably sized bale (i.e. 16" x 16" x 24"). The baler system procured should be suitable for all wastes. The actual baling chamber will have a vacuum system to cause a reverse flow of air through the baling chamber into a HEPA filtered discharge system to reduce dust and gas released into the general size reduction area during baling operations. The system must meet, but not be limited by, these requirements:

- The bale must fit inside the disposal container efficiently.
- The baler must automatically discharge the bale to a position a grapple or overhead conveyor can reach.
- A conveyor system or suitable substitute will take containers from the baler to the next process area.
- The compaction chamber must be accessible for decontamination.
- The capability to pull air through the compaction chamber to a HEPA filter system to reduce airborne contaminates.
- Parts, which are not in contact with the waste, should be protected from exposure to contaminants.

The baler would, depending on the waste being processed, eject the bales onto an automatic roller conveyor or be lifted by an overhead conveyor to take the baled waste to the next treatment process.

After the size reduced and/or treated wastes are ready for movement or final disposal, wastes will be packed into disposal containers. Packing wastes will be primarily a personnel procedure. Operating personnel would lift the wastes with a commercially available lifter attached to a pneumatically powered hoist (or manually as necessary). The packaging area will discharge into the HEPA filtered ventilation system. The hoist must be capable of lifting 10 tons.

Permits

Size reduction of hazardous and mixed wastes require a RCRA permit. Emissions from the ventilation filter system could require a NESHAP permit.

Flexibility of Treatment

The shredder and baler will size reduce any projected waste stream suitable for size reduction.

Alternatives

No Size Reduction

This alternative does not use the available vault space efficiently and does not repackage wastes for incineration. It would require less standardization of treatment processes due to odd sized waste forms. The alternative does not address the DOE requirement to minimize waste volume.

Compactor

Compaction of wastes directly into the disposal container will not allow easy macroencapsulation of wastes prior to disposal. The constant recycling of the container to the sorting area for more wastes could make positive control of waste stream segregation difficult.

## 3.0 MACROENCAPSULATION

### The Macroencapsulation Process

Macroencapsulation is the process of surface coating a waste with a material such as polymeric organics or with a jacket of inert inorganic materials to substantially reduce surface exposure to potential leaching media. There is an EPA regulatory requirement to macroencapsulate radioactive lead solids and the SRS might possibly be able to macroencapsulate other waste streams. The recommended macroencapsulation process uses a thermoplastic polymer. Thermoplastic polymer macroencapsulation has the following advantages:

- Readily available technology
- Simple technology (i.e. Low Risk)
- Simple Coating integrity inspection
- Simple recycling of poorly macroencapsulated waste
- Simple to engineer
- Little or no emissions
- Flexibility of treatment
- Efficient disposal space use
- Easy to permit

The process to macroencapsulate lead using thermoplastic polymers can be fully or partially automated or manually controlled. The amount of automation will be determined by the personnel protection requirements and by an economic analysis.

The proposed process will have four processing stages:

- Sorting and sizing of lead
- Thermoplastic polymer coating of lead
- Final cooling and inspection of waste form
- Final packaging for disposal.

This process flow would take the lead from unsorted bulk waste lead to a inspected/certified waste form to be transported to disposal vaults.

## Sorting and Sizing Lead

At the sorting/size reduction module waste lead would be sorted into recyclable lead and lead to be macroencapsulated. The lead to be macroencapsulated would be placed into a baler/compactor and reduced into a standard specified size (i.e. 16" x 16" x 6"). A standard size will be the important parameter for the lead block (i.e. the weight and density of the block can vary). After compaction a heated stainless steel screw thread eyebolt would be inserted into the lead block. The eyebolt would be heated to melt lead but not vaporize lead. This process would provide a secure method to transport the lead block without causing lead shavings or air emissions. Another alternative would be a stainless steel wire net to support the lead for the thermoplastic polymer treatment.

## Thermoplastic Polymer Macroencapsulation

The standard size lead blocks would be lifted by the eyebolt, using an overhead conveyor, to a series of heated tanks containing molten polymer. The lead would be alternately dipped and cooled in the thermoplastic polymer until the desired thickness of coating is achieved (process is not unlike making a candle). The series of tanks would contain polymers of different colors (i.e. red, white, and blue) to ease the Quality Control (QC) checks of the macroencapsulated lead. Inside the tanks would be a wire basket (similar to a french fry basket) to catch any pieces that could fall off the lead blocks during processing. These pieces would be placed back in the compactor to be reprocessed. The end product would be a block of lead covered in polymer with a eyebolt sticking out of the top ready for final cooling, inspection, and transport.

### Final Cooling and Inspection

The blocks would continue to hang until the thermoplastic polymer is fully cooled and the coating is inspected. Any cracks or thin spots in the coating would be readily apparent to a visual inspection due to the different colors of thermoplastic polymers used in sequence in the coating process. The color seen through the crack would determine the depth of the crack. Any blocks failing inspection would be recycled through the thermoplastic polymer tanks until they pass. Any waste form that is destructively tested (i.e. cored) or the coating damaged in handling could be run through the tanks again to patch the damage.

### Packaging for Disposal

The passed waste forms would be placed in disposal containers and any void space would be filled with a material (i.e. clean sand) to provide structural stability of the final waste form if the disposal container requires it. The lead blocks would be sized so the coated block can be efficiently placed in the disposal container.

## Permits

Macroencapsulation of mixed wastes requires a RCRA permit. Wastewater generated during macroencapsulation and clean up water between campaigns may require permitted disposal. The ventilation system will connect to the HW/MW TB HEPA system so any emissions will be part of the general permit.

## Alternatives

### No Action

This alternative does not satisfy the requirement of 40 CFR 268.

## Macroencapsulation in Stainless Steel Containers

Macroencapsulation in stainless steel containers will be operationally and technically simple. If the existing sealed waste containers were not opened and the wastes inside repacked there will be volume inefficiency. A commercial compactor capable of compacting directly into B-25 boxes would allow efficient use of the vaults. If containers are not opened then a module will be needed to look inside containers to ensure there are no free liquids and only appropriate wastes are inside. INEL and Hanford have Real Time Radiography (RTR) instruments which would prove ideal for this task.

This option is specifically prohibited in the macroencapsulation definition in 40 CFR 268.42.

## Cement Based Macroencapsulation

Cement macroencapsulation is an option attractive for its relatively low cost and simplicity. Virtually any waste can be encapsulated with proper preparation. The increase in volume of the processed waste can be significant based on the amount of void space and packaging of the waste.

The disadvantage of using a cement based grout system is the problems concerning grout formulations and cracking. Inspection of the grouted waste form to ensure complete macroencapsulation is very difficult and recycling any poorly macroencapsulated waste would be difficult.

## Grouting Using Contaminated Water

The option of using process and cleanup wastewater to make grout would minimize the need to treat wastewater by other methods. The system is very attractive in theory and would provide an easy solution to the wastewater treatment problem at the TB. If adequate testing and operational control procedures were followed it would probably reduce the amount of wastewater to be treated elsewhere in the facility or at the SRS.

There are several disadvantages to this process. The formulation for each batch of grout would have to be tailored to the wastewater and tested prior to use to prevent failures in treatments. The most significant disadvantage is possible regulatory difficulty of mixing multiple waste codes and treating to a standard difficult to meet. Macroencapsulation of lead requires no Toxic Characteristic Leaching Procedure (TCLP) testing but if contaminated grout was used the grout itself would have to pass TCLP.

## 4.0 STABILIZATION / SOLIDIFICATION

### Stabilization / Solidification Process

Stabilization / Solidification, as it relates to mixed waste, refers to transforming the wastes into a more manageable, less toxic, or non-leachable form. It involves the process of using cementitious binders or other binders for the immobilization of characteristic and listed metal constituents and radioactive contaminants. The leaching potential of the constituent of concern is reduced by isolating the contaminants from environmental influences by microencapsulating the waste particles. Solidification adds material to a liquid or semi-liquid waste to produce a solid monolith. Stabilization refers to the conversion of a waste to a more chemically stable form and includes use of a chemical reaction to transform the toxic components to a new, non-toxic compound or substance as toxicity is defined by TCLP. The regulatory requirement exists to treat selected wastes to LDR standards prior to disposal with solidification / stabilization being the Best Demonstrated Available Technology (BDAT).

The recommended alternative for the HW/MW TB will primarily use cementitious binders to treat wastes. The selected alternative provides the best flexibility based on the predicted wastes (soils and sludges) and economic viability. Incoming waste forms will be accumulated in storage containers or waste tanks to ensure economical processing. Consideration should be given to mixing similar coded wastes for a homogeneous mixture to ease processing. The mixture can then be pretreated as necessary to improve the stabilization / solidification process. Examples of pre-treatment include pH adjustment, soil segregation, and contaminant removal to ensure a waste form meeting disposal criteria. The waste form would be slurried and then mixed with the cement grout in a process providing good shear and agitation. The grouted waste would then be poured into the disposal container for disposal.

The grout formulations would consist of mixtures of portland cement, flyash, slag, binders, and admixtures as required to stabilize/solidify the waste being treated. Since not all stabilization processes are compatible with all waste forms (i.e. high nitrate can inhibit cement solidification), bench-scale testing with waste forms would be necessary for optimum formulations. The cured waste form will require testing to verify it meets EPA and SRS disposal standards.

Some waste forms are not suitable for a cement based system and will require a liquid polymer stabilization or other suitable treatment (i.e. mercury contaminated soils). These wastes are expected to be minor volumes and would be treated on a case by case basis. The significant increase in treatment costs makes this process undesirable for general use.

A process to recycle any stabilized material failing final analysis is required. The process will break up the waste form for reprocessing. Thorough waste characterization and specific formulations should minimize the failure rate.

The cement technology is readily available and is used routinely at Superfund sites. The polymer system is used in the nuclear waste industry at the present time.

## Permits

Stabilization / solidification of mixed wastes will require a RCRA permit. Wastewater generated during stabilization and cleanup may require treatment before disposal. Air emissions from the stabilization area will be included in the general HW/MW TB permit.

## Alternatives

### No Action

This alternative does not satisfy the requirements of 40 CFR 268.

## Vendor Processing

Vendor treatment of the individual waste streams generated is probably the most economical process. If there is significant volumes of similar wastes to be stabilized generated on a regular basis then the process could be run by WSRC more economically.

## Alternative Oxidation / Microwave Melting

A microwave melter would provide an excellent final waste form for disposal. A microwave is tailored for powdered sludges and soils which are mixed with frit to produce glass. It would require modification for organic and mercury contaminated wastes.

The predicted volume of waste to be stabilized does not justify the cost and additional permitting of a microwave system or other oxidation alternatives.

## Thermoplastic Stabilization

Thermoplastic stabilization techniques include the use of asphalt, paraffin, polyethylene, and other polymers as solidification agents. The waste is dried, sifted, heated, and dispersed through a heated plastic matrix. The mixture is then extruded into a secondary containment system (i.e. steel drum).

The disadvantage to this process is the need for pretreatment of wastes. Any waste to be solidified will need to be thoroughly dry and size sorted prior to the polymer process. The process is expensive due to the high costs of polymers and high energy costs. The polymer extrusion equipment is also more expensive than cement solidification equipment. There is very little volume increase in the solidified waste form due to high waste loadings. However, the process does not lend itself well to large volume disposal molds (due to the need to keep thermal extrusion polymers molten) so efficient use of disposal vault space is difficult.

## Incineration / Vitrification

Incinerating the wastes at an incinerator capable of handling the projected stream (i.e. soils) and stabilizing the ash would address the requirements. However, there is not enough characterized volume in storage to justify a incinerator at the TB.

Vitrification of the wastes will provide a stable waste form and would destroy the organics and drive off the mercury. Once again there is insufficient characterized waste volume to justify the cost. Any waste streams with organics require oxidation prior to disposal. There is a possibility of burning the wastes off site and returning the ash to the SRS for solidification and permanent disposal.

Sending the wastes off site to be incinerated / vitrified or incinerated on site by a vendor is economically attractive but the legal issues of out of state treatment and purchase of contaminated vendor equipment may need to be resolved.

## Grouting Using Contaminated Water

The option of using process and cleanup wastewater to make grout would minimize the need to treat wastewater by other methods. The system is very attractive in theory and would provide an easy solution to the wastewater treatment problem at the TB. If adequate testing and operational control procedures were followed it would probably reduce the amount of wastewater to be treated elsewhere in the facility or at the SRS.

There are several disadvantages to this process. The formulation for each batch of grout would have to be tailored to the wastewater and tested prior to use to prevent failures in treatments. The most significant disadvantage is possible regulatory difficulty of mixing multiple waste codes and treating to a standard difficult to meet.

# 5.0 RADIOACTIVE CONTAMINATED MERCURY TREATMENTS

## Radioactive Contaminated Mercury Waste Treatment

### Mercury Waste Considerations and Characteristics

The mercury wastes to be processed are contaminated with tritium (a radioactive isotope of hydrogen). The treatment technologies for tritiated mercury waste are no different from non-tritiated mercury waste. The considerations for tritiated waste are the constant off-gassing of tritium and protection of personnel handling the waste. The process will have be limited to tritiated wastes only. Tritiated mercury wastes will require careful control and separation from all other mercury wastes to minimize cross-contamination. The Radioactive Controlled Area (RCA) for tritium contaminated work space will be minimized in the HW/MW TB.

The handling precautions associated with tritium are:

- Waste contaminated with tritium will be constantly off-gassing
- Plastic suits are required for personnel working in the sorting and treatment facilities.
- An area will be assumed to be tritium contaminated once tritium wastes are processed through and personnel will require the appropriate protection.
- The sorting and treatment facilities for tritiated waste should be co-located to minimize the spread of contaminated waste.

The radioactive mercury waste streams identified are sprengle pumps, mercury diffusion pumps, tritium process beds, mercury clean up wastes, and possibly some soils.

Operation of the mercury treatment process and equipment will require operator training, careful monitoring, and safety precautions.

## Roasting / Retorting and Recovery

Roasting / Retorting and recovery of high mercury wastes (Hg >260ppm) is a specified technology, per EPA regulation 40 CFR 268, before disposal of mercury wastes in the HW/MW Vaults.

The process to volatilize mercury from radioactive contaminated process equipment, soils, and other solid wastes with radioactive contaminated mercury has four major components:

- A Mercury Oven
- A Condenser/Decanter
- Offgas Scrubbers
- Tritium Scrubber

Each component will be required to process tritiated mercury wastes.

The following is a brief description of the equipment and process flow required to remove radioactive contaminated mercury from wastes. Additional steps will likely be needed in the process (i.e. more preheaters and monitors) and specific parameters (i.e. vapor pressures and temperatures) have not been investigated fully. All of the technology to do this process exists and is used in the mercury industry and the DOE complex tritium facilities.

### Mercury Oven

The mercury oven could be electrically or gas heated to approximately 450 degrees Celsius (Hg boils at 357 C) with a blower or vacuum pump providing the required vacuum or negative pressure. The oven will be sized, at a minimum, to handle 8 liter sprengle pumps, mercury diffusion pumps, and tritium process beds. Process equipment with mercury residue inside will be cut apart to expose the inner passageways to expedite the removal of mercury vapors before being placed into the mercury oven.

## Condenser

The condenser will be connected to the offgas system of the oven to condense the mercury vapor. Depending on the composition of the waste other material (i.e. some organics) will condense here also. This should not be a problem as long as all mercury vapor is also removed. The condensate would be decanted for further distillation, treatment, or amalgamation as necessary. The gas coming out of the condenser will be recirculated through the oven in a closed loop or exhausted though the off-gas system.

A monitor to detect mercury vapor will be installed in the gas stream leading to the condenser. When the gas stream is free of mercury vapor the contents of the vacuum oven and recirculating system plus purge gas volumes will be sent to the off-gas scrubbing system.

## Off-Gas System

The offgas system will need the ability to remove any remaining mercury, organics, and any other undesirable air emissions. The small amount of mercury vapor that could be in the vented gas would be deposited (amalgamated) in a series of gold traps. The traps could then be disposed of at amalgamation capacity or recycled (if feasible) using the vacuum oven. A carbon column would be installed, if needed, to strip any organics present in the offgas. The carbon column would then be burned to destroy the organics. Scrubbers to remove other undesirable emissions (i.e. sulfur compounds) may be needed depending on waste compositions.

Tritium Removal System

The system to remove tritium would include a preheater, a heated reactor vessel to convert hydrogen isotopes to oxides or waters, and a zeolite bed to strip out oxides or waters. A system would have to be installed to recycle and recover tritium when the beds become saturated or the beds will require sealing and disposal. The off-gas from tritium stripping may need to be cooled and then sent through a HEPA filter

Mercury Amalgamation

Radioactive contaminated elemental mercury has an EPA specified technology of amalgamation before disposal. The recovered mercury can be triple distilled and then possibly sent to a federal strategic reserve for storage as a industrial material (if possible) or amalgamated prior to disposal in the HW/MW Vaults. The amalgamation process will be a batch system capable of handling the amounts of mercury generated at SRS for disposal. There is radioactive elemental mercury at the SRS presently, and there will be elemental mercury produced as a by product of the Defense Waste Processing Facility (DWPF), a high level waste vitrification plant, in the future.

Permits

Treatment of mercury wastes will require a RCRA permit. Mercury treatment will require permits for air emissions and solid wastes. The requirement for permits will be determined after the processes are designed.

A permit for any emissions of tritium (NESHAP) will probably be required.

## Alternatives

### No Action

Does not satisfy the requirements of 40 CFR 268.

### Vendor Processing

The vendor option for all non-radioactive mercury is economical and is readily available. The vendor option for radioactive contaminated mercury wastes is probably not feasible due to the unique problems associated with tritium. The tritiated wastes will have to be treated here at the SRS. The equipment used will become tritium contaminated and will require disposal at the SRS.

### Treatment at HW/MW TB Without Tritium Recovery

This alternative uses the proposed retorting / roasting and recovery process to remove the mercury. The resulting off-gas would then have a permit to emit the amount of tritium generated by the process instead of recovering the tritium. This will require calculations of the total tritium that will escape during the process and then receiving a NESHAP permit or a modification of an existing permit. Permitting this option would be difficult and is probably not practical given the amount of tritium to be released.

### Elemental Mercury Stockpiling

Sending radioactive contaminated elemental mercury to a federal strategic materials repository would reduce the storage requirement and disposal costs of treating the material as waste. The mercury would have to be triple distilled and manifested as a industrial material and even then there could be problems with shipment to another state.

If the political problems of disposal can be resolved this alternative is the most desirable method of handling elemental mercury.

The equipment to triple distill mercury will need to be provided in the HW/MW TB if mercury is to be sent to the stockpile.

Until this procedure is approved and documented the HW/MW TB will be designing the capability to amalgamate the excess mercury in accordance with 40 CFR 268.

## Treatment at Existing Tritium Facility

Handling tritiated wastes will require special considerations for personnel safety requirements, overall hazards and safety requirements, and engineered release prevention requirements. The existing Savannah River Site tritium facilities meet these requirements and may be available in the future. If treatment is accomplished at existing tritium facilities a RCRA permit will be required there. The modifications and permitting could negatively impact SRS tritium operations.

At this time the requirement to treat tritiated wastes exists at the HW/MW TB. It will probably be much cheaper to build the mercury oven in the tritium facilities and pipe into the existing tritium recovery system than to build the entire system in the HW/MW TB. This option is being actively investigated.

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