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OPERABLE UNIT 1 TREATMENT OPTIONS JUNE 1993

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Operable Unit 1
Treatment Options

Introduction

An important part of the Remedial Investigation and Feasibility Study process is the TREATABILITY STUDIES. Before any decision is reached about how to clean up Operable Unit 1, the Waste Pit Area, the treatment options must be studied.

These studies generate information about the effectiveness of the treatment possibilities. The results of these treatability studies are used, along with overall cost evaluations for treatment, shipping and disposal, to evaluate and select the final cleanup remedy as part of the Feasibility Study process.

Specifically, treatability studies can provide information in seven areas:

- Does the treatment protect human health and the environment?
- Does it comply with applicable or relevant laws and regulations?
- Is it technically feasible?
- Is there a reduction in toxicity, mobility or volume in the short-term?
- Is there short-term effectiveness?
- Is it cost efficient?
- Is there long-term effectiveness?

There are three tiers of treatability study:

- Laboratory screening, to determine whether a technology might be appropriate for treating the specified wastes
- Bench-scale testing, to verify whether an alternative technology can meet the performance goals for the site
- Pilot-scale testing, to provide detailed cost, design, and performance data. Pilot-scale testing is not always necessary for evaluating alternatives.

Operable Unit 1 is assessing several treatment options for the waste pit area:

- Turning waste into glass
- Drying waste
- Mixing waste with cement
- Mixing waste with plastic
- Agglomerating waste particles

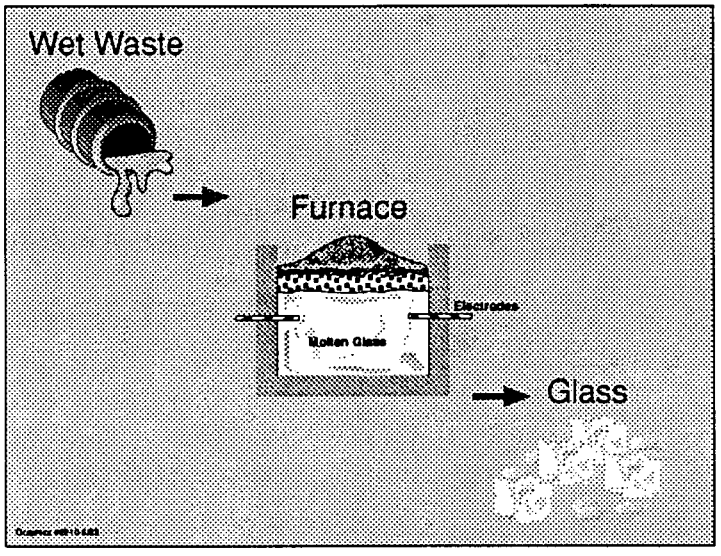
It is very likely that Operable Unit 1 wastes will require a combination of these treatments. Some of these treatment processes can produce air emissions; however, scrubbing systems and monitors will be incorporated to protect human health and the environment.

A summary of the treatments being studied for Operable Unit 1 follows.

For more information about the Operable Unit 1 treatability studies, call Dave Lojek, DOE Operable Unit 1 Branch Chief, at (513) 648-3127.

Vitrification

Vitrification is a treatment process that converts contaminated materials into a chemically inert and stable glass and crystalline product. The vitrification process can destroy combustible and some toxic portions of hazardous waste, while simultaneously incorporating and immobilizing residuals.



The final product is reduced in volume and mass by driving moisture from the waste permanently, destroying portions of the waste thermally, and consolidating the residuals into a dense glass and crystalline product.

Molten-glass processes are viewed as permanent treatment measures producing a waste form that is relatively safe for transport. Because the process reduces the volume of the waste, overall disposal costs also are reduced significantly.

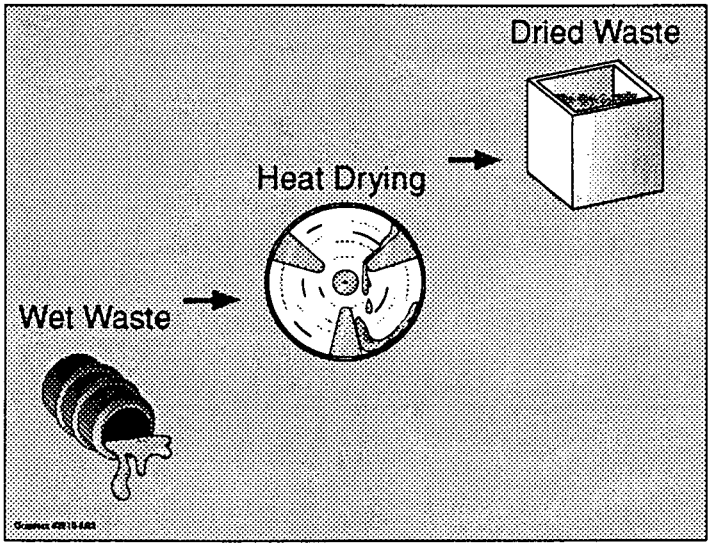
A small vitrification melter is being installed on site to test the process and to determine the best mix of Operable Unit 1 waste materials. It is expected to be working this summer.

Drying

Residue drying involves removing the water and moisture content of the waste materials. One heat drying process being considered for Operable Unit 1 wastes uses an existing rotary kiln. Drying reduces the volume of waste, and the process also can handle large volumes of waste — in the range of tons per day.

Rotary kilns are capable of processing solids, sludges, slurries, liquids and solids simultaneously. The flow of material through a rotary kiln is determined by the kiln's slope and rotation speed, as well as by the characteristics of the material being processed. Mechanical tumbling of the waste material in the rotary kiln — much in the way a clothes dryer operates — exposes damp material to continuous and uniform heat.

As the material moves through the kiln, surface water and any absorbed moisture evaporate before the dried material is discharged. The kiln is installed on a slight slope so the bed of solids advances through the kiln by the force of gravity.



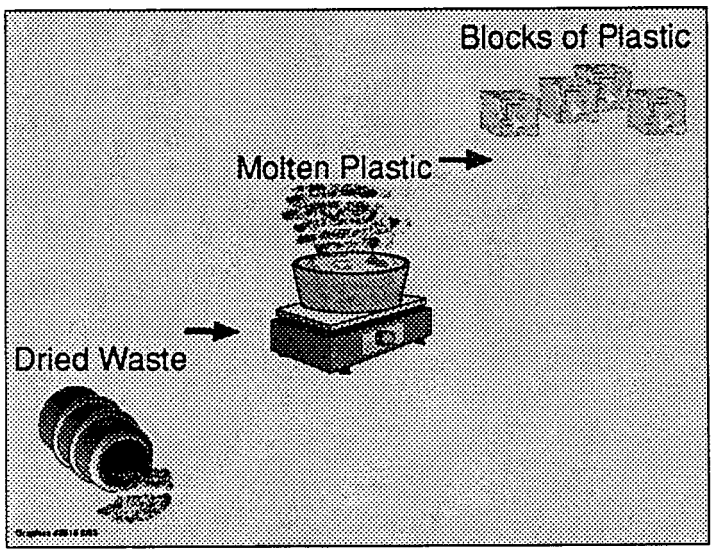
Additional heat drying equipment being considered for testing includes, but is not limited to, flash dryers, spray dryers, and multiple hearth dryers.

An existing rotary kiln will be used to evaluate this treatment option. Operable Unit 1 wastes will be tested in 1994.

Operable Unit 1 plans an on-site pilot test for another drying process in mid-1994.

Polyethylene Encapsulation

Encapsulation is a process involving the complete coating or enclosure of a toxic particle or waste agglomerate with a new substance. Polyethylene (a type of plastic) is heated and the waste is mixed with the material. Upon cooling, the mixture becomes a solid and traps the contaminants in the matrix.



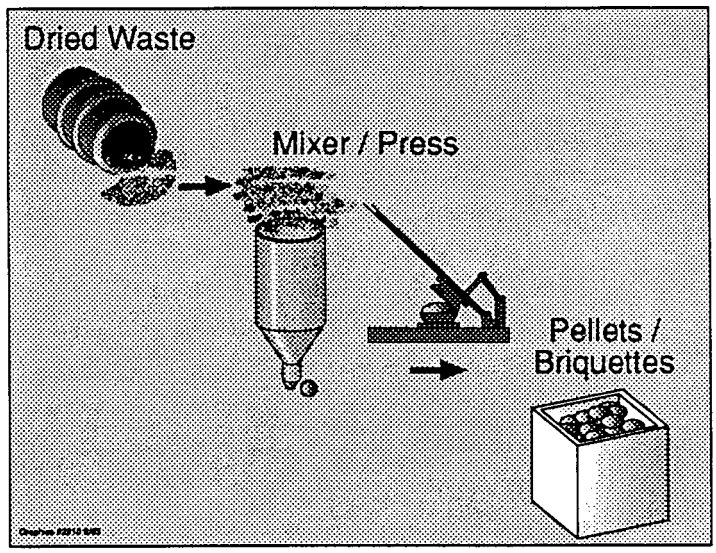
Some characteristics of the polyethylene encapsulation processes:

- Process can handle a wide variety of heterogeneous waste materials
- The wastes adhere well to the plastic materials and the end product can be shipped without expensive storage containers
- Lower contaminant mobility than most other techniques
- Relatively moisture-resistant
- Wastes must be dry prior to treatment

Operable Unit 1 will begin testing this process this summer.

Agglomeration

Minute particles of chemical or mineral fines are difficult to handle and can create a dust hazard. The only practical way to work with these particles is to increase their size by combining them. Agglomeration is the process of particle size enlargement in which small, fine particles, such as dusts or powders, are gathered into larger masses, clusters, or briquettes. Agglomeration reduces the material to a dust-free form that can be disposed, recycled, or processed.



There are three general categories of agglomeration:

- Pelletizing
- Compaction or compression
- Heat treatment

Pelletizing is the formation of pellets, balls, or granules. The particles do not cling together by using mechanical pressure from the outside, but form during growth agitation. Growth agitation involves coating the individual particles with water or other liquid binders, then mechanically rolling the particles, generally in a rotating disc or drum-type pelletizer. The resulting material is then dried. Pelletizing adds volume.

Compaction is a process in which the particles are compacted with pressure into solid, stable materials, such as briquettes. Compaction reduces the volume of wastes.

Heat treatment or heat bonding is a thermal agglomeration method most often used as a second step in an agglomeration process. Agglomerates produced from other methods can be heat treated to produce a harder, more durable agglomerate with much different chemical characteristics. Particles

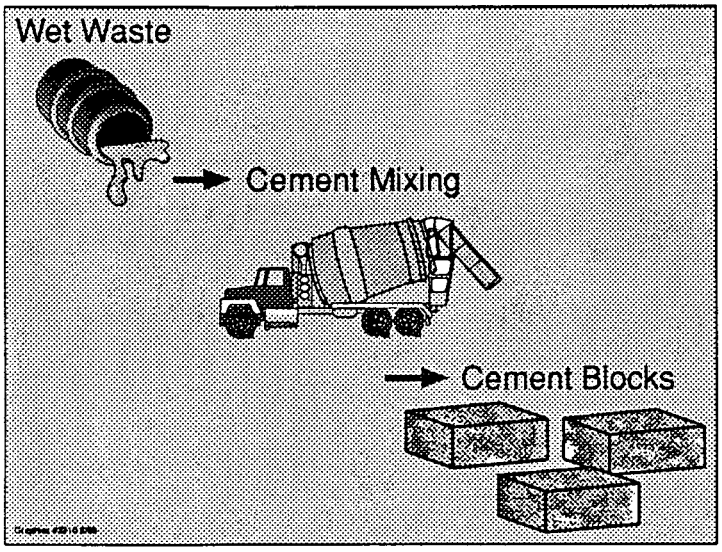
may also be fused into hard lumps by rolling them in a kiln at near melting temperatures.

Operable Unit 1 expects to begin testing the agglomeration process by the end of June 1993.

Cement Stabilization/Solidification

Stabilization/solidification are treatment processes that are designed to accomplish one or more of the following:

- Minimize or prevent any leaching of hazardous constituents
- By producing a solid block, limit loss of contaminants by decreasing the surface area exposed to the environment
- Improve the handling and physical characteristics of the waste



Stabilization/solidification usually involves adding materials — in this case, cement — to ensure that the hazardous constituents are maintained in their least mobile or toxic form. Operable Unit 1's stabilization/solidification study involves mixing the waste with cement or other binders to create a solid waste form.

Stabilization/solidification increases the volume of wastes. But these treatments are being assessed because they result in the transformation of liquids or semi-solids into environmentally safer forms. Cement solidification laboratory tests have been ongoing for the past year; cement stabilization laboratory tests will begin this summer.

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