In']al Correspondence

cc: LRC

Chemolite Sludge Disposal

To: MJB

From: JMO

Subject: Encapsulation of Hazardous Material

Date: June 27, 1979

3M

INTRODUCTION

3M is currently faced with the problem of disposal of a large quantity of slightly hazardous sludge and ash from Chemolite and much smaller quantities of more toxic wastes from research and pilot production facilities. Encapsulation is a process whereby potentially harmful material is "permanently" removed from uncontrolled migration through the biologically active zones of the environment by locking the material within a very stable substrate such as asphalt, concrete, plastic, glass, ceramic, etc. A number of encapsulation methods are available. 3M has used one, Chem-Fix, to stabilize both organic and inorganic sludges prior to landfilling on site.

Encapsulation, or fixation, is economical when either dealing with a small quantity of either very toxic or radioactive material or a large quantity of slightly toxic material for which no suitable landfills are located nearby. With fixation, the treated wastes are usually landfilled, but in much less secured landfills, minimizing transportation costs. Due to concern over the durability of the fixing medium, environmental disposal of the "stabilized" waste is not widely practiced. For slightly toxic material disposal might be allowed by the MPCA provided the fixed waste passes their acid leach test and the medium possessed long term stability in the use intended. These comments were made by Martin Little of the MPCA. There is also a strong possibility of adverse PR due to the current public awareness of the so-called Chemolite hazardous wastes.

ECONOMICS

Justification, once proven to be environmentally acceptable, has to be on the basis of economics. Landfilling the "hazardous" incinerator ash and sludge at Milwaukee costs approximately $45 per ton. Assuming 3,000 tons, the disposal cost is $135,000 per year. Should a "slightly hazardous" landfill be sited in Minnesota the cost of landfilling would likely fall in the $15 to $20 per ton category, or $45,000 to $60,000 per year.

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Exhibit
2567
State of Minnesota v. 3M Co.,
Court File No. 27-CV-10-28862

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CHEMICAL AND PHYSICAL PROPERTIES OF ASH AND SLUDGE

Table I shows the size distribution of the ash and sludge. Over 84% of the sludge sample was lower than 325 mesh, or 45 microns. The ash sample was much coarser, with only .2% passing the 32 mesh.

Tables II and III contain the approximate chemical composition of the incinerator ash and sludge. The ash is hazardous, according to MPCA regulations, due to the lead and chrome, while the sludge would be labelled hazardous due to the lead concentration, on a compositional basis. A significant portion of the sludge is unburnt carbon.

LITERATURE SEARCH

In the Appendix is a computer literature search. Most of the articles dealt with radioactive wastes. One is by Chemfix, Inc. None of the articles appeared to be applicable to 3M problems, except 78-05536 which would need to be translated.

In addition, the Environmental Laboratory contains a book, entitled, "Toxic and Hazardous Waste Disposal" Volume One, by Robert B. Pojasek. This volume discusses different stabilization/solidification processes, prior to ultimate disposal. Quoting from page 7,

> "The final consideration is the ultimate disposal site. Wastes which have been properly stabilized and solidified can be disposed of in a well engineered, <u>nonsecured</u> landfill."

DISCUSSION

1. Concrete

The incinerator ash upon grading and washing could be added as aggregate to concrete. It is unlikely that a concrete supplier would take the material unless he was paid for the disposal. Assuming 1,000 tons of ash, 400 cy, 7,600 cy of concrete would be required at a 5% by volume addition rate, or 3,600 cy for 10%. Mixing with concrete and landfilling at a local nonsecured landfill is a possibility as long as the mixture is about 1 to 1.

Milwaukee $44.40 x 2.5 = $111.00 per cy or $44,400/yr

Concrete at $40.00/cy + landfilling at $10.00/cy
+ transportation at $6.00/cy
= $56.00/cy

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Labor and equipment charges plus it is likely that more than a 1 to 1 waste/cement ratio would be required, make this alternative attractive only if current landfill charges increase substantially at Milwaukee.

3M does not routinely use thousands of cubic yards of concrete and it would be hard to believe that a concrete supplier would be willing to serve as a "hazardous" waste disposal agent.

Conclusions: Concrete is the ideal medium for solidifying heavy metals due to rigidity, stability, and alkalinity. Only the incinerator ash could be added to structural concrete without adversely affecting its properties. Both the sludge and ash can be mixed with concrete and solidified prior to landfilling locally in a nonsecured landfill, but the economics are currently not favorable. It should be considered a potential future option.

2. <u>Asphalt</u>

Problems with asphalt are degradability and minimal alkalinity. While both the incinerator sludge and ash could be mixed with asphalt and used to pave 3M roadways, it is likely that unless it is widely dispersed, the material would leach out under acid leach conditions. Asphalt solidification was discussed with Martin Little, MPCA, and he said that if the material would pass their acid leach test, he could foresee no problems with MPCA approval. The asphalt would have to be broken into small pieces, 1 inch chunks, for leaching to simulate the worst condition it would enter a landfill.

An MPCA leach test was run on asphalt to see the effect upon pH. After 72 hours the leach solution pH was 4.7.

Conclusion: Asphalt solidification would not be recommended.

3. <u>Ceramic Cement Aggregate</u>

This is by far the most attractive of the processes reviewed. The boiler and incinerator ash and both sludges would be mixed with clay, extruded into small chunks, and fired in a kiln to 2,000^{o}F. The product, a light aggregate, is worth between \$20 to \$30 per ton to concrete suppliers. This alternative is being actively investigated by George Harrison and Les Axdahl. Firing would destroy the residual organics and fuse the heavy metals into a ceramic matrix. Then adding to concrete offers a protective redundancy.

Conclusion: This alternative should be thoroughly explored for the current Chemolite wastes.

JMO

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Attachments

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