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DEVELOPMENT OF A GLASS POLYMER COMPOSITE SEWER PIPE FROM WASTE GLASS

PROGRESS REPORT NO. 1
JULY-SEPTEMBER 1976

PROCESS TECHNOLOGY DIVISION
DEPARTMENT OF APPLIED SCIENCE

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Abstract

A program to develop methods for incorporating waste glass into composites which can be used for construction materials has been started. The goals for the program are as follows:

1. To provide the technical basis for energy conservation by the development, testing, and practical demonstration of products made from industrial waste materials.
2. Rapid transfer and implementation of the technology in the private sector.

The program goals will be achieved by performing the following tasks:

1. Determine the properties of glass-polymer sewer pipe to a degree that they are statistically acceptable with respect to relevant ASTM methods and standards.
2. Perform field testing of prototype and full-scale specimens.
3. Prepare energy budgets and cost analyses.
4. Involve the solid waste utilization industry in all phases of the program in order to provide a technical basis for the rapid implementation of the technology.

This report constitutes the first in a series of quarterly reports describing work performed on the program. Accomplishments during the period July-September 1976 are summarized.

Development of a Glass Polymer Composite Sewer
Pipe from Waste Glass

Progress Report No. 1
July-September 1976

Introduction

The utilization of solid urban waste could result in the production of substantial quantities of energy and in material recovery. Also, the problem of solid waste disposal which is of great concern to municipal and other governmental units, would be substantially reduced. It is becoming very expensive for municipalities to landfill its waste materials, and as a result, there is great interest in the development of waste management systems. While uses for recycled ferrous and non-ferrous metals are apparent, efficient methods for utilizing other components of urban waste such as glass and paper are needed.

Brookhaven National Laboratory (BNL) has performed preliminary experiments which indicated that glass and paper can be incorporated into composite materials which can be used for construction purposes.¹ Glass polymer composite (GPC) sewer pipe containing glass separated from urban waste has been produced and installed for field testing in the Town of Huntington, N.Y. and in Newark, N.J. Other potential applications include building blocks, chemical storage tanks, and insulating panels for use in energy storage systems.

Based upon the above work, a preliminary cost analysis was performed² and a technology transfer program was initiated.³ The latter resulted in the establishment of a cooperative program with an industrial company (Teledyne National) to utilize the glass fraction from a large urban waste plant now under construction in Maryland.

In June 1976 the Office of Conservation of ERDA initiated support of the program. The goals for the program are as follows:

1. To provide the technical basis for energy conservation by the development, testing, and practical demonstration of products made from industrial waste materials.

2. Rapid transfer and implementation of the technology in the private sector.

The program goals will be achieved by performing the following tasks:

1. Determine the properties of GPC sewer pipe to a degree that they are statistically acceptable with respect to relevant ASTM methods and standards.

2. Perform field testing of prototype and full-scale specimens.

3. Prepare energy budgets and cost analyses.

4. Involve the solid waste utilization industry in all phases of the program in order to provide a technical basis for the rapid implementation of the technology.

This report constitutes the first in a series of quarterly reports describing work performed on the program. Accomplishments during the period July-September 1976 are summarized.

Task 1. GPC Property Measurements

Work has been started to determine the minimum wall thickness of 8-in.-i.d. GPC sewer pipe required to meet the ASTM standard C-76. The three-edge bearing strength and the hydrostatic burst pressure will be measured for 3 wall thicknesses. Compressive strength measurements will also be made. The tests will be performed in a manner that will make the data statistically defensible and consistent with relevant ASTM methods

and standards. The results from these tests will be analyzed to determine the materials, energy, and cost trade-offs obtained when GPC is used as a replacement for vitrified clay or other suitable sewer pipe.

During the report period 7000 lb of glass, separated from municipal waste at the Bureau of Mines, College Park, Maryland facility, was received for use in the test series. The glass has been ground and blended to give the desired particle size distribution. All required chemical materials have also been obtained.

The design and construction of a series of pipe molds has been completed. Twelve in. sections of 8-in. inside diameter pipe with wall thicknesses of 0.625, 1.0, and 1.5-in. will be fabricated. Shop-delays resulted in the start of the pipe fabrication being postponed from early September to October. The forms are now completed and experimental work will commence early in October.

Task 2. Field Test and Inspection

Monitoring of the performance of GPC pipe currently in test in Huntington, N. Y. and Newark, N. J. will be continued. At Huntington, a total of 35 ft of 8-in. diameter pipe was installed during October 1972. Two pieces of pipe contained methyl methacrylate and 8 contained polyester-styrene. To date no problems with the pipe have been reported. A visual inspection was made in 1974 and another will be made during FY 1977.

In November 1975 ~ 12 ft of 12-in. diameter pipe was installed in a sewer line in Newark, N. J. The pipe is in an industrial part of the city and is exposed to acid-type waste from several chemical plants. Prior to installation the pipe was shown to conform to the ASTM strength and hydrostatic test specifications. The leakage rate at the joints was

also measured as well below that specified by the City of Newark. Figure 1 shows the pipe prior to installation. The connections between the GPC and the 12-in. vitrified clay pipe are shown in Figure 2.

A T.V. inspection of the pipe was made on September 17, 1976 after ~ 10 mo in service. No signs of deterioration were apparent.

Figure 1.

Figure 2.

References

1. Beller, M. and Steinberg, M., Glass Polymer Composites, BNL 17555, Jan. 1973.
2. Lindstrom, R. S. and Milgrom, J., Glass Polymer Composite Sewer Pipe, An Initial Evaluation of Its Commercial Potential, Arthur D. Little, Inc., C-74228, 1972.
3. Steinberg, M., et al., Promoting the Utilization of Solid Waste Glass Polymer Composite Technology in the Public and Private Sector, BNL 19394, Oct. 1974.

Distribution

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