

Technology Brief

SMALL-SCALE RECYCLED GLASS-TO-FINES PROCESSING SYSTEM

A number of uses for finely ground glass have been tested, including blasting abrasives, fused glass, polymer fillers, paint additives, hybridized cement, water filtration media, landscaping materials and roof coatings. The special glass grain sizing requirements for some of these applications could create market opportunities for small-scale processing operations.

Processing recycled glass for these applications requires size reduction equipment and some level of screening to remove basic contaminants. Physical specifications vary depending on customer requirements.

A study was conducted to evaluate the operational and economic feasibility of small-scale, post-consumer glass crushing and processing systems that remove debris and size glass “sand” suitable for various intermediate and high-value market applications.

The most basic glass processing system includes only a feed hopper and crushing mechanism. However, for most applications, certain ancillary equipment is required. Ancillary equipment may include infeed conveyors with speed controls to regulate the amount of material flow into the crushing mechanism, discharge conveyors, dust control devices, vibratory screens and trommel screens for control of particle size and debris removal. Other equipment may be included with more sophisticated beneficiation systems.

There are a few small-scale systems now on the market manufactured specifically for pulverizing glass into sand. Such equipment offers the ability to produce material of finer size gradation with potentially higher value market applications than that produced by traditional breakers. In addition, the manufacturers of this equipment have experience in dealing with the special issues of glass processing.



Key Words

Materials: Post-consumer glass.

Technologies: Glass sand processing.

Applications: Blasting abrasives, fused glass, polymer fillers, paint additives, hybridized cement, water filtration media, landscaping materials and roof coatings.

Market Goals: Increased access to local, value-added markets.

Abstract: Evaluation of the operational and economic feasibility of small-scale glass crushing and processing systems.

Small-scale crushers (one to two tons per hour) for producing glass sand may cost anywhere from \$10,000 to \$40,000 without conveyors and screening equipment. Complete systems can easily cost over \$100,000. As with any commodities-type processing, the economics of scale are very important and should be carefully evaluated in light of potential market values and volumes.

Processing post-consumer or post-industrial recycled glass into high-grade, industrial quality glass sand generally consists of the following steps:

Feedstock Acquisition

Recycled glass may be obtained from a variety of sources, but should be free of ferrous metal and other debris to reduce both the wear on crushing mechanisms and the cost of debris removal.

Feedstock Preparation

Before pre-screening for debris, it is best to feed the glass through a breaker to reduce it to 3/4-inch minus cullet. The cullet can then be filtered through an initial 3/4-inch pre-screen to further remove any gross debris.

Drying

Running the pre-screened cullet through a tumbling rotary drier helps to prevent dust collection bags from plugging.

Pulverizing

Multiple row hammermills work well to produce a uniform glass sand. A total of 16 or more hammers, assembled in a spiral configuration, have been used to increase impact efficiency. The rotor tip speed and feed rate should be adjusted so that the glass is pulverized but any remaining debris is left intact. This allows the debris to be screened after exiting the hammermill.

Dust Control

Dust is effectively removed from the stream of material using a negative pressure drop-out box, driven by a fan that draws the dust upwards and into a baghouse.

Final Debris Removal

Remaining paper may be removed during the final screening by vacuuming the top of the sizing screen or by using an air classifier.

Sizing

Rectangular, tilted bed screens have greater capacities,

while flat, vibrating screens do a better job of separating the gradations. A gyratory flat screen is adequate for feed rates of up to two tons per hour. Above that rate, multiple decked screens are necessary if clean sizing is required.

A Cost Model

A cost model was developed to assess the economic feasibility of one and two ton-per-hour processing systems. Fixed costs included equipment costs and mechanical and electrical installation costs. Variable costs included labor, building and equipment rental, utility, gas, oil, maintenance, supply, and debris disposal costs. Administrative costs were also estimated.

The cost model predicted a net loss of \$12/ton at one ton-per-hour, but a net profit of \$20/ton at two tons-per hour. Total production costs were \$105/ton and \$137/ton, respectively.

Protocol Dated: December 1996
Fact Sheet Update: November 1997

For More Information

For a copy of the full protocol, *Small-Scale Recycled Glass-to-Fines Processing System (GL-96-3)*, use the CWC Publication Order Form. If you need more information contact CWC: (206) 443-7746, email info@cw.org, or visit the CWC Internet Website at www.cw.org.

This technology brief was prepared by CWC, Managing Partner of the **Recycling Technology Assistance Partnership (ReTAP)**. ReTAP is an affiliate of the national Manufacturing Extension Partnership (MEP), a program of the U.S. Commerce Department's National Institute of Standards and Technology. ReTAP is also funded by the U.S. Environmental Protection Agency and the American Plastics Council.

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