



Best Practices in Glass Recycling

Types of Glass Crushing Equipment

Material: Recycled Glass

Issue: A number of types of crushing mechanisms have been tried to reduce glass bottles and containers to cullet. In selecting the proper crushing equipment, a potential user should be familiar with the various types. *Selection and use of inappropriate equipment may result in excessive wear on equipment or reduced throughput, leading to increased operating costs. Further, some types of crushing equipment will fracture glass in a way that produces shards rather than uniformly shaped particles. This best practice introduces some of the basic types of glass crushers.*

Best Practice: Designs of glass crushers have evolved from equipment used by the rock crushing and industrial minerals processing industries. *Two types crushing equipment are abrasion crushing and impact crushing. Abrasion crushing (or, more correctly, attrition), uses friction and compression to fracture material and includes equipment such as jaw crushers and cone crushers. Because of the highly abrasive nature of glass, impact-crushing equipment is preferred over abrasion crushing for greater durability and more uniform shape.*

Glass crushers fall into an intermediate area of materials processing. They are generally smaller than rock crushers, primarily because of volume requirements. A full-scale glass beneficiation facility may process about 50,000 tons of glass per year, or about 25 tons per hour. The revenue from processing 50,000 tons of furnace-ready cullet may be about \$1,500,000 per year, which could be adequate to support the operation. In contrast, a quarry or concrete recycling operation processing only 50,000 tons per year probably could not generate enough income to sustain itself.

Glass is more abrasive than many natural aggregates. This means that special alloys are needed to minimize wear on the equipment. But special materials are expensive, making the existence of reliable markets critical to capitalizing the processing. The potential revenues from processing must justify the wear and expense of specialty alloys.

There are many variations to each of these crushing mechanisms. This list is not intended to be definitive. In addition, the equipment discussed is for the production of cullet, and is not appropriate for glass fine-sizing. For information on factors involved in the selection of processing system components, refer to the [Selecting Recycled Glass Crushing Equipment](#) Best Practice. Details on fine-sizing are included in the [Fine-Sizing of Recycled Glass](#) Best Practice.

Hammermills Hammermills usually consist of a series of free swing bars (hammers) attached to pivots which are fixed to a rotating shaft. Bottles fed into the mechanism are broken by the swinging hammers and discharged. The pivots help the hammers to transfer the impact energy to the target material while minimizing wear on the hammers and maintaining shaft speed, protecting the bearings of the main shaft. This involves re-circulating oversized processed glass through the mill until it is reduced to the desired size.

Rotating Disk and Breaker Bar A rotating disk design consists of a series of lobate or irregularly shaped disks spaced at regular intervals along a rotating shaft. As the shaft spins, the disks crush the bottles

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against stationary breaker bars. The spacing between the disks and the breaker bars govern the processed cullet size.

Rotating Drum and Breaker Plate Bottles fed into this mechanism are crushed by numerous bars mounted on a spinning drum. These bars also propel the glass at a stationary breaker plate. The spacing between the bars of the drum and breaker plate control the size of the cullet. The drum of this crusher typically rotates at a lower speed than the axles of the previously discussed crushers.

Rotating Breaker Bar The rotating breaker bar design consists of numerous longitudinal bars fixed to a rotating shaft. This crusher is similar to the hammermill crusher, but the breaker bars are not allowed to pivot at the shaft.

Vertical Shaft Impactor A vertical shaft impactor uses a rotating thrower device, which propels the incoming bottles at impact plates around the inside of a vertical casing. The velocity of the material and the geometry of the thrower and impact surfaces govern the size of the finished cullet. These are among the more expensive crushers. However, they minimize wear, especially of rotating parts, and in some configurations use the glass for both the injected material and the wear parts.

Helically Fluted Rollers This design entails two interlocking helical rollers spinning on adjacent counter-rotating shafts. Bottles fed into this mechanism are crushed between the interlocking rollers. The space between the rollers controls the size of the cullet.

Implementation: The end-user should be familiar with the various crusher designs before purchasing. Specific crusher information should be obtained by consulting product manufacturers, interviewing past or present equipment users, and visiting facilities that utilize crushing equipment. In selecting a specific crusher design, the end-user should consider various factors such as operating cost, equipment maintenance, safety features, finished cullet quality, system portability, and power requirements.

Benefits: There are an increasing number of alternative glass processing facilities and companies selling equipment for processing glass. A basic understanding of the various types of glass crushing equipment is critical to make intelligent equipment selections. Purchasers should always be critical of information received from vendors, especially those without experience specific to the glass processing industry.

Application Sites: Glass processing facilities

Contact: For more information about this Best Practice, contact CWC, (206) 443-7746, e-mail info@cw.org.

References:

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