Drying for Fine-Sizing of Crushed Glass

Material: Recycled Glass

Issue: *Fine-sizing of crushed glass below 1/8-inch typically requires that the glass be dried prior to the use of sizing screens. Drying is especially important when seeking a tight gradation of finer material from No. 16 mesh down to No. 200 mesh. Moisture content in post-consumer container glass can cause the glass to clump together and adhere to screening equipment, inhibiting proper screening, and resulting in glass that is out of size specifications for the application. Understanding efficient glass drying technologies and protocols is essential in meeting fine-sizing requirements when processing recycled glass.*

Best Practice: Glass bottles and containers typically contain moisture when they arrive at the material recovery facility (MRF). The moisture is from food residue and exposure to precipitation during collection or stockpiling. Although coarse glass generally drains and flows very easily, with little apparent cohesion, reducing the particle size of the cullet increases the overall surface area, resulting in much greater apparent cohesion. It may seem like a paradox that while coarse glass used as construction aggregate has been shown to be very permeable, finely crushed glass retains moisture extremely well. This may be because the large particles of coarse glass have no pockets to hold moisture, and drain freely. In finer grades, however, the close packing of the particles results in the surface tension of the water holding the particles together in a similar manner to that seen when water is between two sheets of glass. Increasing the apparent cohesion causes the cullet particles to clump together and adhere to processing machinery and sizing screens. Piles of finely ground glass on impermeable surfaces have been found to retain water literally for years. Therefore, only movement and heat, not time, can dry finely-crushed glass.

As explained above, excess moisture is especially detrimental to glass fine-sizing operations. This best practice illustrates some of the techniques used to dry the glass during the fine-sizing process. For additional information on fine-sizing, refer to the *Fine-sizing of Recycled Glass* Best Practice.

The most common dryer is an inclined tumbling rotary unit, which in aggregate processing can be larger than 30 feet long and 6 feet in diameter. Much smaller units have been built for small volume glass processing. These units are usually placed after a precrusher but before the pulverizing stage in the glass-processing scheme. Material tumbles by gravity from one end to the other as the unit spins. Heat is generated with a natural gas burner and blown through the unit with a fan. Information on appropriate flow rates and dryer temperatures are best obtained from manufacturers or by performing trial runs. Dryers of this type can also be paired with air cyclones to remove airborne dust during processing.

The biggest challenge with wet glass in a fine-sizing operation is its tendency to clog the sizing screens. This phenomenon is called blinding. Some glass processors combine drying with screening. When using a trommel screen, the trommel cylinder is usually inclined to facilitate flow of the glass from one end of the screen to the other (see the *Screening Technologies for Recycled Glass* Best Practice). The heat source can be positioned at the low end of the trommel with a fan to cause the heat to flow up the trommel screen and dry the glass as it moves downward.

Heat sources can also be used in conjunction with vibratory screens. Vibratory screens using an elliptical vibration motion have been found to be efficient for generating tight grades of fine-sized glass. The elliptical vibration keeps the glass more "lively," enhancing screening speed and minimizing blinding. Two types of heat sources are common options for vibratory screens. A heat source with a fan can be positioned so that the heat is projected up through the screen, drying and removing dust to a baghouse. Alternatively, vibratory screens are often available with heated screens. Heated screens are not as effective with very wet glass, but may not require a bag house because they do not generate as much dust as a fan.

Generation of fugitive dust should always be considered when adding dryers to the screening process (see *Dust Control Strategies for Glass Processing* Best Practice). If possible, the screens and dryers should be enclosed, which will also help conserve energy. The enclosed screens and heater may then be paired with a baghouse or air cyclone to help remove airborne dust. When designing the glass processing system, the end-user should also remember that dryers will require additional space, energy, and costs.

To help minimize the need for dying, glass cullet stockpiles should be stored inside or covered during wet weather. The glass should be protected from additional moisture exposure during processing, especially if processing occurs outside. Wet fine-sized glass can also be difficult to transport, especially during loading and unloading. Vibration during shipment can cause the wet cullet to densify. The moisture serves as a lubricant to help the relative movement of the particles in becoming a denser material, causing clumping. For additional moisture considerations in the processing and shipment of cullet, refer to the *Moisture Considerations in Processing and Distribution of Glass Cullet* Best Practice.

Implementation: Reducing glass moisture through drying increases the production rate of glass fine-sizing operations by reducing blinding. It also helps the recycling facility meet the size specifications for the intended application.

Benefits: Reducing glass moisture through drying increases the production rate of glass fine-sizing operations by reducing blinding. It also helps the recycling facility meet the size specifications for the intended application.

Application Sites: Glass processing facilities

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

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