Conveyor Technologies for Glass Processing

Material: Recycled Glass

Issue: *Glass is a hard, highly abrasive, and sometimes very sharp material which can cause excessive wear on ancillary processing equipment such as conveyors. Excessive wear can lead to costly downtime and higher maintenance costs, detracting from the economics of glass recycling. This Best Practice describes some of the issues to be considered before purchasing conveyors for glass processing systems.*

Best Practice: If glass-processing systems kept glass completely contained and within the equipment, most of the wear would be restricted to the actual crushing mechanisms. However, every system generates some amount of fugitive glass. Some of the fugitive glass is fine glass particles that can cause abrasion in moving parts like pulleys and bearings by contaminating lubricants and grinding down surfaces. Glass pieces also wedge into moving parts and fall below conveyor belts to build up over time, interfering with belt performance. In addition, post-consumer cullet contains beverage residue and moisture, which can cause it to stick to conveyor surfaces. The conveyor system must be designed to anticipate these occurrences. The following issues should be considered when designing a conveyor system.

Cleats. A decision must be made whether or not to use cleated belts. If the cullet is wet or sticky, it may be preferable to use a belt without cleats, so a belt scraper can be installed on the underside of the conveyor. It is also easier to seal belts without cleats to prevent glass particles from falling off the conveyor. However, belts may need to be inclined to move glass between discharge ports and entry ports of processing system components or for loading and stacking of materials. The maximum incline of cleatless conveyors is about 18 degrees.[1] Where a steep incline is required, belt cleats of various designs can be employed to facilitate flow. Belt cleaning must also be considered when using cleats. Brushes can be employed for belt cleaning on both cleated and cleatless conveyors, but do not clean as well as scrapers.

Bearings. Conveyors frequently use sealed bearings on pulleys and motors to minimize wear from fine dust contaminating the lubricant. Open grease-lubricated bearings can be protected from excessive wear by frequent lubrication and facility dust control (see *Dust Control Strategies for Glass Handling* Best Practice). In the long run, however, sealing bearings from ambient air is best in glass processing facilities.

Drives. Drive mechanisms are always a trade-off between power, flexibility, and cost. Either a variable-speed direct drive or an easily changed belt and pulley drive should be designed into the system. When feedstock changes, components wear, or other modifications are made, the speed of the belt will need to be changed to maintain smooth flow with other parts of the processing system. As with other parts of the system, exposure of moving parts to airborne glass dust should be minimized.

Beds. Slider-bed conveyors may be most appropriate for lightweight applications. With slider beds, the belt is stretched taut on a frame which holds the motor, reducer, belt, and pulleys. The design relies on friction between the belt and pulleys to drive the belt. A motor turns a reducer, which applies torque to the pulleys. The rubber or synthetic belt slides over the frame surface. Slider beds are the most common and least expensive. One problem is that, aside from the weight of the glass, the belt must also overcome the friction

of the frame. Also, dried moisture between the belt and the frame can cause the belt to bind at start-up. In roller bed designs, the belt rides on rollers that turn freely. Roller beds can be built to form a trough in the middle to keep the granular material toward the center of the belt. For heavy-duty applications, chain and sprocket designs use rollers along the entire length of the belt driven by a chain. Exposed chains can have wear problems similar to open bearings. Augers have been tried in place of conveyors in some glass processing systems. The extremely abrasive nature of glass would seem to make augers a poor choice because material slides through an auger instead of being carried, as on a conveyor.

Surfaces. Belt surfaces can be made of metal, laminated rubber, double layered polyurethane, or other flexible materials. Metal is the most expensive but hinge points on the belts can be a wear problem with glass dust. Rubber belts are the most common but also wear out the fastest. Some makers of glass processing systems contend that urethane belts last the longest. However, wedged pieces of glass will cut any flexible material, so laminated rubber belts may be the most economical strategy.

Belt containment. Belts must be contained from lateral movement. Worn belts can walk laterally on pulleys, fraying the edges of the belt and shortening belt life. Using a crowned pulley, wherein the pulley turning the conveyor belt is positioned slightly lower on its ends than the center, can alleviate belt walking in slider-bed conveyors. This adds tension to the belt center so it does not shift easily from side to side.

Details. Side-skirts on the conveyor frame where it overlaps the belt can be used to hold the belt in place and to prevent material from falling beneath the belt. Corrugated belt surfaces may also contain lateral escape of glass residues from the belt. Enclosing the entire length of the belt can help to limit dust emissions when handling dry or finely sized glass. Fluted pulleys can help minimize belt cutting by stray allowing glass pieces to fall out of the pulley mechanism instead of wedging against the belt.

Discharge. Conveyor discharge should be as close as practical to equipment infeeds or screen surfaces to maximize particle control and minimize dust emissions.

Implementation: Designers and prospective purchasers of glass processing systems should consider the issues above early in the design process.

Benefits: An appropriately selected conveyor system will transport glass between system components with maximum efficiency and minimal maintenance. The benefits of well-configured conveyor technologies can be quantified by savings in labor cost, downtime, and replacement parts.

Application Sites: Glass processors, material recovery facilities.

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Issue Date / Update: November 1996