

Abrasive Wear of Batch Bins

We have become aware of multiple structural failures of glass batch bins caused by excessive abrasive wear. These failures resulted in property damage and fortunately no loss of life. But they point out the importance of taking abrasive wear seriously.

While it is well known that glass batch is a highly abrasive material, how abrasive wear affects storage and handling equipment may not be well understood. Therefore, we want to highlight a few points that should be considered when designing and maintaining batch storage and handling equipment for an abrasive material. Let's start with the basic design requirements of the storage and handling system. Its purpose, of course, is to provide a continuous and consistent mix of batch to the furnace. Beyond this, systems must be cost effective, reliable from a flow standpoint, and capable of achieving the design feed rate and storage capacity.

One of the main problems with many batch feed bins has been funnel flow discharge. This flow pattern exacerbates the potential for segregation, which can result in significant quality problems in the final product. Many glass plants have quality problems caused by a funnel flow pattern in their batch bins that go unnoticed until they establish the correlation between quality and batch bin flow. The way to avoid low quality glass is to ensure a mass flow pattern. This provides significant benefits in terms of improvement of batch quality by minimizing segregation while maintaining a relatively constant feed density.



AR400 Plate - New

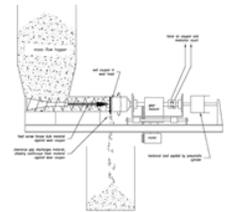


After Wear

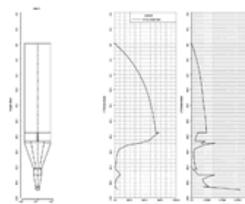
Some abrasive wear is expected when handling an abrasive material such as glass batch in a mass flow bin, since flow along hopper walls is a requirement for mass flow. The rate of wear is a function of the bulk solid, wall surface, solids pressure, and velocity. This rate needs to be accounted for during the detailed design of any equipment. The engineer can then consider the trade-offs between cost, wall thickness, material of construction, and life expectancy. It is important to remember that all equipment has a life expectancy, even bins and chutes.

Wear can also result from a flowing stream impacting a bin wall. This is most often a problem when routinely filling a bin that has a low level of material. When this occurs, its effect, while localized, is usually much more pronounced than the abrasive wear that occurs during discharge. Wear of this type is a concern for all bins; both mass flow and funnel flow. Finally, corrosion can play a significant role in wear, so its effects must be considered.

Once a handling system for such an abrasive material is started up, we strongly recommend routine maintenance inspections of all wall surfaces in with it, as well as a structural evaluation as walls thin. Measurements should focus on areas of



Wear Tester



Wear Analysis

expected maximum wear, which depend on the specific system design. All areas of expected maximum wear as well as those areas with elevated risk must be evaluated in order to provide an adequate risk assessment.

We can't stress enough the imminent danger a plant can be in if an actual hole develops in a bin. Please contact us if we can be of assistance in assessing the potential for flow problems or abrasive wear in your operation.