

## APPLICATION REPORT SUGAR PROCESSING SOLUTIONS



# Sugar Milling

**Powdered sugar is commercially available in several grades. These grades are typically referred to as 4X, 6X, 10X & 12X grade(s). It is made by grinding granulated sugar mixed with cornstarch to the desired particle size. The cornstarch is added to prevent caking and increase shelf life. These varying powdered sugar grades are perfect for a wide range of bakery, confectionery, and pharmaceutical applications.**

### Milling System Design Considerations

Several parameters must be considered when designing a sugar milling system:

1. If the powdered sugar is being stored or packaged before use, an anti-caking (e.g., starch) should be added to prevent agglomeration. Ideally the starch and sugar can be fed simultaneously into the mill in a carefully controlled ratio (typically 3% starch). The mill will act as a highly effective continuous mixer

ensuring a homogeneous product.

2. The air condition within the mill system is important and must be controlled/mitigated due to the hygroscopic nature of Powdered Sugar. The milled sugar will agglomerate and have very poor flow characteristics if the incoming air contains significant moisture.
3. Powdered sugar is explosive, and the mill system must be designed in accordance with NFPA or ATEX regulations to ensure safety.

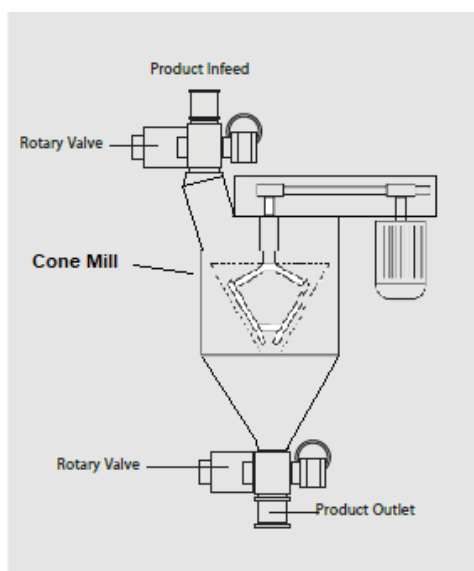
### 4X Sugar

An intermediate grinder like a Kek Cone Mill at a moderate flow rate of <1000 lb/hr produces 4X sugar.

Kek Cone Mills do not generate significant heat or airflow and the following simple setup is a good solution:

- Infeed Rotary Airlock (NFPA / ATEX rated, shallow pocket inverter drive)

- Kek Cone Mill (10 bar / 150psi explosion pressure containment design)
- Discharge Rotary Airlock (NFPA / ATEX rated)



A high-speed impact mill like the Kek Universal Mill should be considered for higher flowrates.

### 6X & 10X Sugar

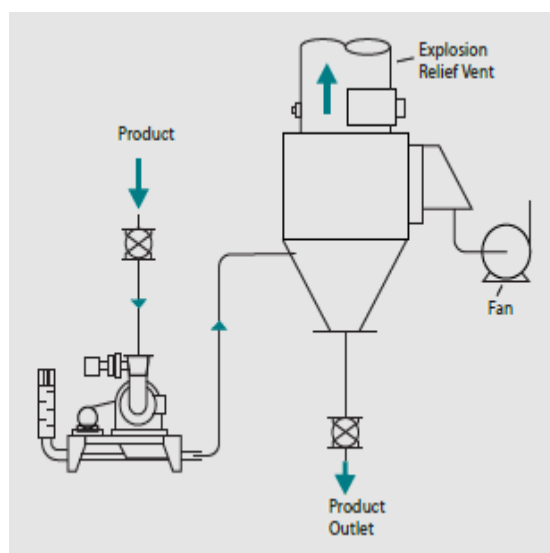
A high-speed impact mill like the Kek Universal Mill either fitted with Pin & Disc or Turbine & Screen grinding media produces 6X and 10X sugar grades.

This type of mill is a high energy machine with tip speeds >400 ft/s which also acts as a fan generating significant airflow.

There are basically two (2) types of Kek Universal Mill systems:

### 1. Open System

This a good choice if the powdered sugar needs to be conveyed a significant distance from the mill to the point of use or packing.

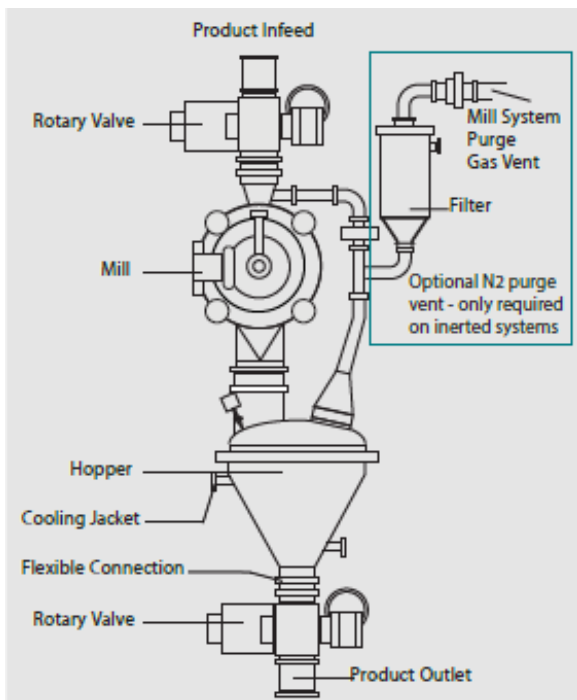


However, the following must be considered:

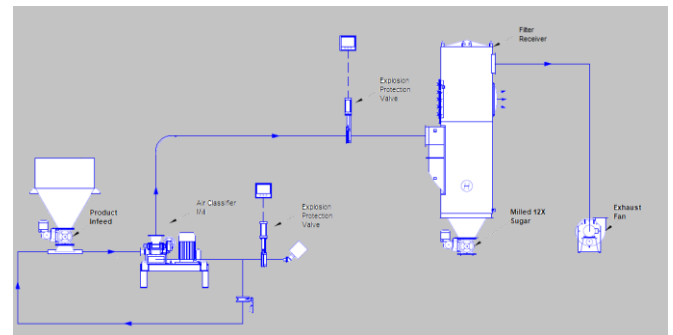
- The inlet air must be conditioned to control humidity
- The powdered sugar needs to be separated from the air flow by a filter receiver
- Explosion protection equipment such as isolation valve and explosion burst panels are required

### 2. Closed Loop System

Rather than inducing airflow into the milling chamber, this design incorporates a recycle loop around the mill system which results in a much smaller mill system and negates the need for conditioned air or dust filtration.



The operator simply selects the sugar grade and the mill automatically adjusts settings delivering the desired powdered sugar.



This system is good choice if the powdered sugar needs to be conveyed a significant distance from the mill to the point of use or packing.

Benefits of this process are:

- Filtration for the mill process air is unnecessary because there is no net airflow through the system
- Much simpler explosion hazard protection through inertion or containment
- Compact installation
- Minimal moisture induced into the mill, resulting in a drier product

## 12X Sugar

The PPS Air Classifier Mill produces 12X Sugar grade. This type of mill is an ultra-fine and controlled particle size grinder. The PPS Air Classifier Mill incorporates an internal air-classifying wheel with an independent drive, giving precise control over “particle cut point” selection.

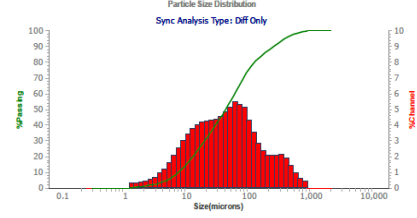
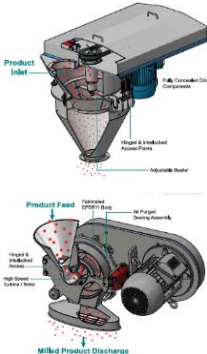
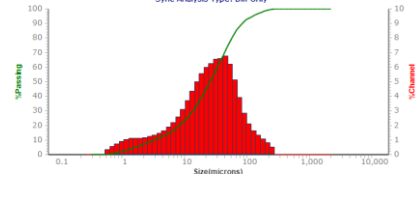
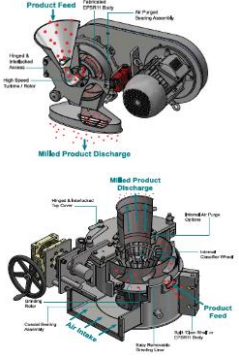
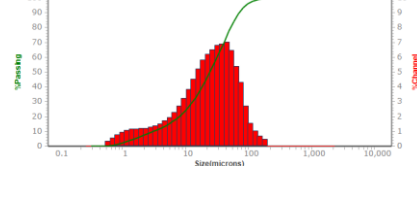
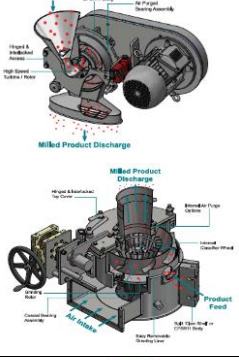
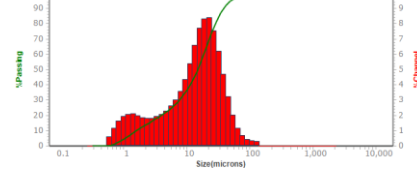
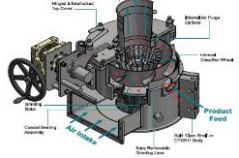
This PPS Air Classifier Mill produces 6X, 10X or 12X Sugar grades. The system is controlled by a touch screen HMI control panel, featuring a recipe-based system.

However, the following must be considered:

- This is typically an open system and the inlet air needs to be conditioned to control humidity.
- The powdered sugar must be separated from the air flow with a filter receiver.
- Explosion protection equipment such as isolation valve and explosion burst panels will be required.

## Summary

Schenck Process provides a complete turnkey Powdered Sugar Milling Solution complying with every applicable safety regulation for all grades of powdered sugar.

| Grade | Description                  | Particle Size Distribution   | Uses   | Schenck Mill Type  |
|-------|------------------------------|--|--|--|
| 4X    | Coarse Powdered Sugar        | D90 = 250µ/60 mesh<br>    | Baking<br>Peanut butter                        | Kek Cone Mill<br><1000 lb/hr<br><br>Kek Universal Mill<br>>1000 lb/hr<br> |
| 6X    | Standard Confectioners Sugar | D90 = 75µ/200 mesh<br>    | Icing<br>Dusting<br>Candy<br>Pharmaceuticals   | Kek Universal Mill<br><br>PPS Air Classifier Mill<br>                    |
| 10X   | Fine Confectioners Sugar     | D95+ = 75µ/200 mesh<br> | Icing<br>Dusting<br>Candy<br>Pharmaceuticals   | Kek Universal Mill<br><br>PPS Air Classifier Mill<br>                   |
| 12X   | Fondant / Ultrafine sugar    | D95+ = 45µ/325 mesh<br> | Fondant<br>Icing<br>Dusting<br>Pharmaceuticals | PPS Air Classifier Mill<br>   |



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