Pneumatic Conveying & Bulk Storage

DESICAiR® Desiccant Dehumidification

Bulk Material Handling

Moisture absorption by an ingredient being conveyed and condensation inside storage and conveying equipment often cause costly problems with pneumatic conveying systems that transport and store bulk materials. Moisture can affect the quality of the final product, spoil materials, inhibit the smooth transfer of ingredients, corrode equipment, and contribute to maintenance related downtime. Moisture is commonly introduced into these systems by the following:

- The inherent moisture contained in a product.
- Heating up certain dry ingredients causes them to give up additional moisture.
- Humid air introduced into the system during truck or railcar unloading, or by pulse jet collectors and aeration type discharges.
- Humid air drawn into the system during discharge of stored materials

Pneumatic Conveying

Many moisture related problems in pneumatic conveying systems have a toll on production levels, quality, and operating costs:

- The characteristics of certain dry materials change in the presence of moisture. This leads to spoilage or poor quality of the final product.
- Hygroscopic ingredients cling to themselves and the conveying line. Agglomeration of product causes flow problems within the system.
- Humid air is transported to the storage or production areas affecting materials and equipment.

Bulk Storage

Dry ingredients stored in bulk readily absorb moisture and quickly become sticky. The problem often manifests itself in the form of product agglomeration and adhesion to silo walls.

- Moisture can cause products to bridge and prevents smooth discharge from storage silos.
- It can result in mold growth and spoilage in the stored product.
- Condensation inside the silo can lead to corrosion and increased maintenance costs.

Problems associated with moisture inside storage silos and conveying systems often affect productivity, cause poor product quality, contribute to increased labor, lead to spoilage, and ultimately costs money.

Addressing Customer Needs

Introducing DESICAiR desiccant dehumidification. DESICAiR utilizes silica gel desiccant to remove water vapor from air. The amount of water held in the air is actually reduced. The result is dry air supplied to the conveying system and bulk storage system. Old technology hot air systems simply raise air temperature without changing the specific humidity. The amount of water contained in the air remains unchanged. The desiccant dehumidification process does not rely on condensation as in refrigerant systems. Desiccant units are effective year round, even in sub-freezing conditions.

Our systems are designed to supply your process with dry air for pneumatic conveying. By combining the dehumidifiers with cooling coils, a customer can have an air stream that best fits his particular process.

By controlling the temperature and relative humidity inside the silo, we lower the dew point to a temperature that is less than ambient conditions. Since the dew point is never reached, we prevent the buildup of product on the interior of the silo walls,
as well as decrease the likelihood for product lumping and mold growth.

Our dehumidification systems are an efficient and cost effective solution to your humidity and temperature control problems.

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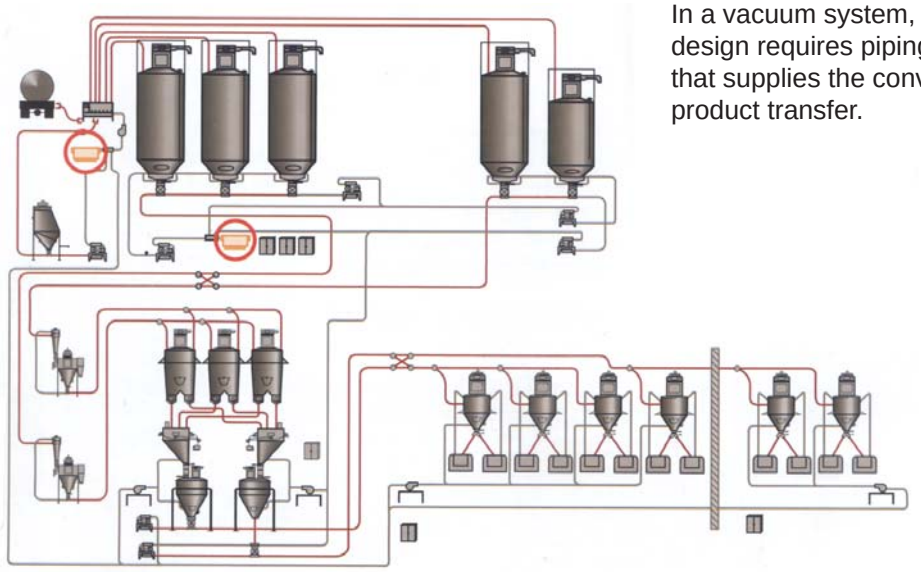
Design Considerations for Dehumidification

Pneumatic Conveying

Total volume requirements for dehumidification are based upon the number of positive displacement blowers required. The dehumidifier scfm must meet the total blower scfm.

When handling certain products, it is advantageous to use pre cooling coils for additional moisture removal. Some applications, however, require post cooling coils due to temperature considerations as the dry material becomes thermally sensitive. Examples of such materials are sugars and polymers.

In a pressure system, a plenum chamber is used when multiple blowers are required. Use of a plenum chamber or manifold allows the dehumidified air to remain at atmospheric pressure for introduction into the blowers' pressure system. Plenum chambers are supplied with a weight loaded swing relief damper that allows excess air to be exhausted when the plant is operating at reduced volume.



In a vacuum system, a similar approach is employed. Here the design requires piping the vacuum inlet to a plenum or header that supplies the conveying system with dehumidified air for product transfer.

Designed for Humidity Control

This pneumatic conveying system at a food processing plant tranports flour, cornstarch and sugar to storage silos and to ingredient mixing and blending lines. The system features two DESICAiR Series 2000 dehumidifier units (circled), one for the bulk unloading silo system and the other for the conveying system that transfers product to ingredient lines.

Bulk Storage

When designing a dehumidification system for a bulk storage facility, there are a number of site factors and conditions to consider:

- Geographic location is one. It is important to know the weather data for the site.
- Product characteristics is another.
- The storage and conveying configuration also influences the design.
- The type of dust collection present is an important factor. Whether the vessels have static filters, cyclones, individual bin vents, or a central dust collection system will impact the size and sequence of the entire system.
- The type of system (mechanical or pneumatic) used to transport the product.

In general, the following formula can be applied when sizing dehumidification systems for bulk storage:

VxNx1/2xC/60 =CFM required

V = volume of the silos
N = number of silos at that volume
C = number of air changes per hour required.
Typically 3 4 air changes per hour is recommended as a starting point

1572 Tilco Drive, Frederick Maryland 21704, USA
Phone: 301.620.2033, Fax: 301.662.5487
www.stulz-ats.com

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Air Technology Systems, Inc.