

Modern Food Processing

Offering protection from moisture damage

Date: 19-02-2010 | Edition: National | Page: 61 | Source: Bureau | Clip size (cm): W: 19 H: 27

Clip: 1 of 3

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Dehumidification system

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Maintaining required humidity is one of the many challenges faced by food processors. Ensuring the correct humidity levels during food production is crucial as excess water or moisture can greatly affect the quality of food. Dehumidifiers can help companies improve quality & shelf life of food products by maintaining required humidity conditions during processing.

Sonali Dutta

India is considered to be the world's second largest producer of food next to China, and has the potential of becoming the biggest. As per industry reports, the total food production in India is likely to double in the next ten years and there is a growing opportunity for large scale investments in food processing technologies, skills and equipment, especially in areas of canning, dairy processing, specialty processing, packaging, frozen food/refrigeration and thermo processing. Fruits & vegetables, fisheries, milk & milk products, meat & poultry, packaged/convenience foods, alcoholic beverages & soft drinks and grains are important sub-sectors of the food processing industry. Health food is another segment, which is rapidly growing.

The Indian food industry, which is estimated at over \$ 182

billion, is predicted to grow to \$ 400 billion by 2025. With growth comes the technology challenges! As the food industry incorporates more sophisticated technologies to maintain the growth fuelled by changing consumer tastes and lifestyles, every processor is endeavouring to ensure that the food product reaches the consumer with the right flavour, perfect shape as well as has a long shelf-life.

Effect of moisture

Food safety is, probably, one of the most important issues that food companies face day-in and day-out. Concern for public health in the case of potentially devastating consequences of contaminated food have driven industry associations, safety experts and watchdog organisations to establish guidelines not only for food handling, but for plant & process line design. Following these recommendations can reduce the possibility of a catastrophe.

Micro-organism growth is one of the main causes of potential food contamination. Moisture results in increased micro-organism growth. Microbial growth and dispersal can be controlled if the food processing facility is kept



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Clip: 2 of 3

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dry. But keeping a plant dry is not easy as water is an essential part of the product and processing in food industry. Ensuring the correct moisture and condensation levels for food production is crucial.

Water or moisture greatly affects the quality of food. Excessive moisture pickup can result in product spoilage due to:

- ❖ Micro-organisms, which need water to dissolve their food. Water allows the food to get into bacterial, yeast and mould cells where it is used for energy and growth
- ❖ Chemical reactions, as the moisture in the food also causes reactions to occur between components in the product

Food spoilage can occur when there are slight changes in relative humidity (RH). Moisture can condense on the surface of a product and this can result in many common food defects. The moulding of grain, soggy cereals and the caking & lumping of dry products like powders and cake mixes can result from excessive moisture. Other defects such as mottling, crystallisation and stickiness have also been observed. Moisture condensing on the surface of food can also provide an environment for bacteria & moulds to grow and multiply. Physical defects such as cracking, splitting and crumbling occur when excessive moisture is lost from food.

Moisture can make a meal of food industry's profits. Moisture or rather uncontrolled humidity during processing, packaging and storage often play spoiler. Moisture control is essential in every segment of the food industry in the spheres of storage, production, processing and low temperature drying.

Moisture can affect the quality in various segments of food such as confectionery, powder processing, meat processing, etc.

Dehumidifier provides the most simple and economic solution to overcome lumping & caking by controlling the relative humidity in the environment

Humidity: A threat to confectionery quality

Chocolates, hard candies, chewing gums, bubble gums, etc contain many ingredients, which are hygroscopic. When the humidity is high, these products regain moisture and become sticky & prone to mould formation. This inhibits the natural flow as it sticks to the high speed processing & packaging machinery and also to the wrapping material. The processing thus slows down and also creates a problem of hygiene, resulting in loss of production as well as loss in the final product quality.

Uncontrolled humidity/moisture during the manufacturing and coating process of confectionery causes:

- ❖ Change in the structure/dimension of the film core interface
- ❖ Grainy and irregular coating
- ❖ Increase in residual moisture content and improper adhesion, ie, degradation of coating quality presence of moisture
- ❖ Sugar bloom and change in flavour

The solution to the problem lies in maintaining required stringent conditions of temperature & humidity and in surrounding the processing, packaging and storage areas with dry air. Chocolates need to be stored at 35 ± 5 per cent RH at 25°C for safe storage in order to retain its original flavour and aroma.

Powder processing: Drying challenges

In processing powdery foods, such as milk powders, the presence of moisture in the air can cause lumping or caking. This affects the free & easy movement of the food & beverage powders in the processing machine and pneumatic conveyors. Due to high humidity, powdery material tends to stick to the hopper conveyors and packing machine, leading to frequent breakdowns in the conveyor drive mechanism. To ensure free flow of powder and avoid sticking of powder on chain conveyor & other machine parts, relative humidity in the packing hall has to be maintained at 40 ± 5 per cent RH and temperature at $22-25^\circ\text{C}$.

The solution to the problem lies in the introduction of a dehumidifier. The dehumidifier provides the most simple and economic solution to overcome lumping & caking by controlling the relative humidity in the environment. It also avoids the sticking of powder on packing machines, hoppers and other parts. Moreover, it ensures an easy, free flow of powder through the packing machine into containers.

Spray/fluidised bed dryers require large quantities of hot air for drying.



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Clip: 3 of 3

The quality of the final product is affected by the quality of air entering the dryer. It should be dry, free from contamination, foreign particles and odourless. With the growing emphasis on limiting production losses and downtime, which impacts final product quality and thus profits, the importance of using dehumidifiers - in conjunction with spray dryer/fluidised bed dryer for quality drying - has become almost mandatory. Moisture hinders the free flow of powders/ granules making many downstream operations (for example, packaging, filtering and handling) difficult and expensive.

Meat processing: Tackling condensation

Water vapours released during slaughtering & processing, cooking processes and temperature differentials contribute to moisture buildup inside a plant. Preventing


fog & condensation build-up by controlling the room temperature and humidity retard microbial growth. Controlling condensation by ensuring management of moisture levels is now an accepted solution, as air-conditioning usually is not sufficient to eliminate condensation. Compared to the typical refrigeration system, desiccants are effective in removing moisture from the air without condensing or at extremely low temperatures.

Summing up

Dehumidifiers have been helping food manufacturers to maintain required humidity conditions in processing, coating and packaging areas. Desiccant dehumidifiers lower the moisture content of the surrounding air maintaining RH as low as 1 per cent at a constant level regardless of the ambient conditions during the production, storage and

packing. This will help improve the quality & retain the freshness of the food and increase the shelf-life.

Desiccant dehumidifier is also ideal for many temperature-sensitive products, which cannot be spray-dried easily at relatively high-inlet temperatures. Use of dehumidifiers also reduces the drying time of the product inside the spray/fluidised bed dryer.

With food safety getting top priority, food processors are increasingly using desiccant dehumidification systems to ensure the right levels of humidity within production facilities. 



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