

## **It's not all hot air... controlled environments for bakery products**

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For those who have not heard of us, Munters are world leaders in humidity control and have been controlling humidity for over 50 years. We have recently formed a dedicated food team to concentrate on your concerns and applications.

I want to talk about your cheapest ingredient - air. In particular I want to talk about the components of this ingredient and its quality and how these components can affect your production processes for the good or for the bad. More of that later.

What do you in the bakery industry use air for? Well, I'm not a baker but I think I'm on safe ground when I say it is used for baking - hot air. It's also used for cooling. Conveying moving ingredients around such as flours and sugars. And storage - unfortunately you can't get away from the fact that the product is surrounded by air, which may not be in the right condition, so adversely affecting your product.

How does air affect products? The two principle functions of air which will affect your product are temperature and humidity.

Temperature is well known with you and its effects on your products I am sure you are very familiar with. Humidity is little understood and this unknown factor which is normally not controlled can seriously affect manufacturing, product quality, and above all profitability.

We spend a lot of time and money and effort controlling temperature during manufacturing. How much do we spend controlling humidity? And why is it necessary to control humidity?

Most materials are unaffected by temperature change in storage. Sugar, flour and salt don't mind being held at 10°C, 20°C, 30°C but are affected if the humidity of the air changes from 50% RH to 60% or 70% RH.

We can have a problem, because the average UK RH is 30% higher than most materials are happy with. It is necessary to know how water vapour acts in air that is, the psychrometrics of air - and how these properties are measured before you can control it to achieve the ideal conditions to suit your product and process. You need to know all this, or in the words of the AA ad, 'know a man who does'.

Let me briefly explain the fundamentals of psychrometrics. You may be familiar with some terms such as RH, wet bulb/dry bulb temperature and dew point. Let me explain:

A chart is made, along the bottom horizontal axis of which we plot temperature (the everyday reading from the thermometer).

However, to determine air condition we must know two attributes of that air to get a fixed point on the chart. Normally the other value given is relative humidity, which may range from 0% to 100%. It is a relative value and is temperature dependent. This is why RH should always be quoted with temperature. The 100% RH value is an important line because it gives a series of temperatures at which the air is saturated. Cooling further will cause condensation to occur.

Let's see how humidity control helps your production and quality concerns.

## **Pneumatic conveying**

Many moisture related problems are associated with storage and conveying.

Most powdered product is vacuum conveyed to prevent product leakage. Where does this air come from? Probably from outside ambient, which varies, or from a process area which could be quite humid.

If air was provided at a constant condition, this would enable the product to be kept in pristine quality and free flowing. This can be achieved by using air that has been dehumidified to supply the conveying system. Consistent air quality gives consistent product quality: no more product blocking, inaccurate batching, production interruptions.

## **Storage**

In storage, temperature is not critical. You do not have to heat a product to keep it dry. However, hygiene inspection is becoming more and more rigorous, and inspection inside the silo at the walls and ceiling.

A simple solution to the problems associated with silo storage is to provide dry dehumidified air to the ullage space at the top of the silo.

## **Packaging**

The food industry often involves high volumes, with products packaged and labelled at extremely high speeds in the hundreds per minute. This requires precision packing with ever tighter tolerances on the packing manufacturers.

Normally, this can be provided. However, packing tends to be stored in warehouses that are the Cinderella of the operation - that is, in areas where there is no control over the environment. This can lead to the packaging absorbing moisture from the air, causing it to lose its strength and rigidity and swell out of tolerance. This deterioration may be noticed by bowed cartons and cases or labels or, quite often, only manifests itself by jamming the high-speed packaging machinery.

In one instance, a leading supplier of cereals had to store three days' worth of packing in a production area to condition its use in the machines. Heating the whole warehouse would have solved the problem, but heating would have been needed all year round - very expensive.

Installation of a D/H unit kept the humidity level constant all year, keeping packing in pristine, ready to use condition - resulting in less downtime and higher productivity.

## **Cooling**

Warm products have a high internal vapour pressure. Moisture loss in the baking industry is waste. Cooling a product under conditions of controlled temperature and humidity can be critical to the final weight or quality of final product.

A major concern in cooling tunnels is speed and condensation control. As ambient air is pulled into the tunnel, condensation can occur on the cold surfaces in the tunnel and drop on to the product. Taking a proportion of this air, dehumidifying it and remixing it to achieve a dew point temperature lower than the coldest surface in the tunnel will eliminate any condensation. It means also that the tunnel can run at a lower temperature, enabling products to be cooled quicker and production to increase.

## **Drying**

Certain products require special drying conditions, such as cakes where quality and weight are paramount. Meringues are a special case in point. Accurate temperature and humidity control is again the key factor.

## **Chilling and freezing**

Many bakeries are now involved in the chilled and frozen domain. The chilled food business is one of the fastest growing sectors in the food industry.

Because of the nature of the product, hygiene is strict and tight process controls are necessary. One of the main concerns in chill rooms is listeria and other airborne bacteria.

Because the refrigeration system is a 'wet' system with condensation drip trays and wet coils, these systems must be regularly cleaned and kept hygienic.

If the moisture content of the air is preremoved, the coil needs to do only sensible cooling, reducing the load and the need to defrost. Dry coils eliminate potential bug traps such as drip trays and provide an environment hostile for their growth.

Eliminating condensation problems is another useful application where air is provided at the correct temperature and dew point below the coldest surface, thus preventing condensation. Munters dew point control equipment is unaffected by temperature.

Condensation can be a major hygiene concern providing the environment for microbiological growth and contamination. It is preventable without the need to heat.

Similarly with mould growth, painting with fungicidal paint only cures the effect. It does not effect a cure.

Providing dry air at below 70% RH will inhibit mould growth. No more antimould painting is needed.

I hope this has given you a brief insight into the benefits of controlling humidity in your manufacturing processes and products.

There are many other applications that you may be able to think of in your own production processes, and the profitability of your business can benefit.

