The Enemy Within

DAMP SPELLS DISASTER ACROSS A BREADTH OF WAREHOUSE AND STORAGE APPLICATIONS

Packaging itself is extremely vulnerable to dampness. Cardboard starts to weaken at around 60% relative humidity.

Britain's notoriously wet climate brings with it worrying headaches for the UK warehousing sector and a broad spectrum of markets that involve the storage of goods.

With spiralling costs incurred through moisture damage, damp can spell disaster for an otherwise efficient business.

"Even if a building appears to be dry during the day, at night, when the temperature falls, the humidity rises and the condensation process begins," explains Tony Bowen, managing director of Calorex Heat Pumps, leading experts in heat and energy.

"High humidity is a serious enemy, creating adverse conditions for the storage of many items. A controlled environment is vital to prevent damage and deterioration."

All materials and foodstuffs have a state where they are in equilibrium with their surroundings, humidity variations being the most important factor causing instability.

"Even the presence of a comparatively small amount of water vapour in the warehouse and storeroom atmosphere can quickly lead to corrosion, mould growth and rotting," emphasises Bowen.

"It is quite a problem to achieve ideal atmospheric storage conditions in high humidity climates like ours, as when the air cools the relative humidity increases."

Because it can be a continuous process 365 days a year, particularly for large areas, heating is a difficult and very costly task.

"Careful study of ventilation can make a valuable contribution to achieving an equable storage environment," Bowen explains. "But irrespective of the amount of outside air involved, this rarely produces internal temperature and humidity conditions lower than that of outdoors.

"Heat pump dehumidification, on the other hand, is a highly cost effective and efficient solution."

Basic heating will only warm the structure of a building and its stored items to prevent dew-point condensation. Unlike dehumidification, it can never maintain a constant relative humidity throughout the warehouse.

"Dehumidifiers can be the most economic answer to the safe storage of a wide range of items," explains Bowen. "In a nutshell, dehumidification is a way of making air dryer, without significantly heating it. Although there are several methods available, the basic principles remain the same."

As Bowen points out: "Although there is huge scope for increased use, dehumidification systems are already in common use protecting products during storage."

ENERGY EFFICIENT

Cheaper and simpler to install dehumidification operates on a COP (coefficient of performance) of around 2.5 to 1, for every unit of energy consumed 2.5 are generated. Dehumidification uses less than a third of the energy for the same effort as heating.

VAPOUR VALUES

Relative humidity (RH) is the expression used to define how much water vapour can be held in the air at a given temperature as a percentage of what it could contain at saturation (100% RH). That is when the relative humidity reaches the level at which air can hold no more moisture. The amount can vary according to its temperature – warm air holds more moisture, cold less.

Vital Role

Dehumidification is commonplace in the storage and maintenance of furniture, archives, flower bulbs, timber, paper, electronic and electrical components, military plant and equipment, chemicals and vintage cars.

Dehumidification also plays a vital role in protecting steel and other metal parts for everything from the automotive to defence industries.

The air-drying system comes into its own in the storage of hydroscopic substances such as salt, flour, sugar, coffee, cocoa, herbs, tea, grain cereals, and fruit.

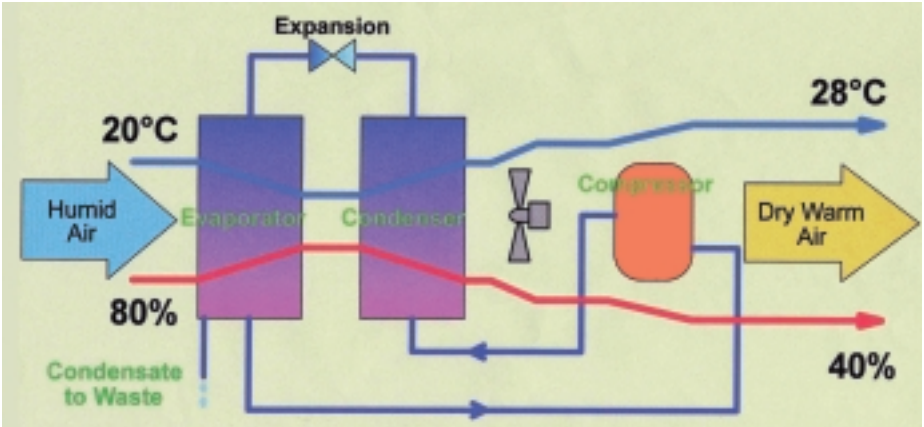
How Dehumidification Works

The process of dehumidification involves moisture-laden air being drawn into a dehumidifier that passes the air across a refrigerated coil. The air is rapidly cooled below its dew point, the water vapour condenses out and is led away to waste, and the latent energy is recovered for re-use. The cooled air is then passed through the condenser where it is reheated and returned to the served area at the required lower relative humidity.

Of the various dehumidification methods, the most advanced employs state of the art heat pump technology, a system developed by market leaders Calorex Heat Pumps, since 1980. This system removes and maintains the correct proportion of moisture in the air, at a fraction of the cost of heating.

Ferrous materials start to rust at above 50% RH, and electrical insulation values begin to downgrade. Mould growth in grain is kept to a minimum when stored below 50% RH, and pests remain dormant. Most fungi will not grow below 70%.

Hydroscopic materials, including chemicals, fertilisers, flour, coffee and cocoa, are best stored between 45% and 50% RH. Raw metal stocks such as weapons, vehicles and machine tools are best kept at 50/55% RH, depending on the variety and storage temperature. Fruits should be stored at RH between 55 to 95%.



Principles of operation – air to air dehumidifier

High Flyers

Helicopters and light aircraft will retain their mint condition when stored in a dehumidified hangar.

High-flying businessman, Simon Jeffs, sold his first helicopter for more than the purchase price, despite clocking up an additional 100 flying hours in his two-seater Robinson R22.

Simon used two DH150AX dehumidification Calorex units to maintain perfect conditions in a barn housing his helicopter when heating costs would have been prohibitive and potentially damaging.

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Sensitive Storage Solutions

A warehouse storing sensitive electronic items, packed in cardboard boxes, needs to maintain a constant 20ºC temperature and a relative humidity not exceeding 50%. If fuel costs are calculated at 1.5 p/kW/hr for natural gas and 7.2 p/kW/hr for electricity, a 10 x 10 x 5 metre warehouse would cost £1,368 annually when heated by natural gas compared to just £450 by dehumidification.

Body Parts

The vehicle body panels warehouse area at the Jaguar car plant at Castle Bromwich, near Birmingham, is sealed and dehumidified using three Calorex DH600 high capacity dehumidifiers. Typically, the DH 600 is capable of removing up to 600 litres of water in a 24-hour period, playing a vital role in protecting products that are likely to corrode.

CUSTOM BUILT

The Operations Divison of Glaxo Wellcome at Ware, Hertfordshire, is using a Calorex DH600 heat pump dehumidifier to control humidity in its quarantine store where filled aerosol cans are stored before packaging.

A relative humidity of below 50% with an air temperature of under 21ºC is required within the store.

A specially modified model includes an outside condenser because Glaxo Wellcome required a neutral air temperature arrangement. The latent heat recovered by the DH refrigeration circuit is normally used to re-heat the dried air before it returns to the room, but with the outdoor condensing unit, extra heat is rejected to the outside air.