Universal Classic Cars

Dehumidification Case Study

Corrosion Banished From UCC Storage Facility

Facility

32.000 sq ft building covered with reflective glass, spread over two floors giving 16,990 cubic metres of atmosphere to dehumidify.

Problem

How to dehumidify the building to a 50% humidity, creating the most perfect environment to store classic/super cars.

Bad practice

All classic car owners will always state they never drive their car in wet conditions. Whilst this is good practice the fact remains that you drive your classic for less time than it is left standing still, yet most people have no reel understanding of how to store a car in a perfect environment.

Misconceptions

Dehumidifying a building for storage of classic vehicles is not as straight forward as removing moisture from the environment. In fact, if you were to completely dry out the atmosphere, many of the components and fixtures such as leather, wood and rubber would perish quicker than metal would rust in a moisture rich environment. *To supply dehumidifiers to the area, with the excess moisture being emptied into a bucket is not good enough. The moisture you have removed simply evaporates back into the atmosphere.*

Understanding Relative Humidity RH

Air contains a certain amount of moisture. The ratio of the amount of moisture in the air compared to the maximum that the air can hold at a given temperature is called the “relative humidity” or “RH” and is expressed as a percentage. For a given amount of moisture, the higher the air temperature the lower the RH%. Equally the lower the air temperature the higher the RH%.

It is the cooling of air that causes the problems. As air cools it can hold less and less moisture until a point is reached where the air is fully saturated (100% RH) - known as the dew point. If the car, tools, or anything else in this environment, is at a temperature below the dew point of this air then moisture is given up by the air as condensation. This manifests itself as wet car surfaces, rust on tools, damp paperwork etc. Because the moisture condensed out from the air is pure distilled water it is also the ideal environment to encourage the growth of moulds and fungal spores.

The solution to the problem is to reduce the dew point to a level below the temperature of any part of the environment and its contents AND to keep the RH% within controlled levels.

THE TARGET ENVIRONMENT

The aim is to arrive at a stable environment between 40% and 60% RH independent of outside temperature. Below 60% bare metal can be left out in the open and rust/corrosion all but stops. Below 40% RH leather and wood can dry too much and will become brittle and crack. This target environment can be achieved in several ways:

HEATING

By heating the environment the air becomes warm enough to hold the moisture and condensation stops - well nearly stops - if you bring a cold car in from outside into a nice warm garage then condensation occurs immediately (like taking a milk bottle out of the fridge). Heating also has one other serious drawback - cost. To heat the average garage sufficiently will require several kW of power either as electric heaters or radiators. This heat will need to be continuously applied through cold weather to stop condensation and this will be very expensive to run.

VENTILATION SYSTEMS

This can take the form of natural ventilation built into the garage or forced ventilation by the installation of a suitable extraction or positive pressure device. Ventilation will remove the stale high humidity air from the building at little or no cost. One current commercial system on the market incorporates a small heater to aim to lower the RH% of the incoming air. The reality of these systems is that the air that enters the building from outside to replace the exhausted air will still be high in humidity. Claims that for every 1 degree increase in temperature the RH% will reduce by 5% are frankly inaccurate, as the relationship between temperature and RH% is not constant. Furthermore, any temperature rise has to be sustainable throughout the whole of the storage volume - think how little a 3kW fan heater does to the garage temperature. There is no control over absolute humidity level in the garage - only of the air entering the garage. The average humidity level in the building can still remain above the point where deterioration can occur.

PLASTIC ENCLOSURES

Several manufacturers supply systems that enclose the car completely in a plastic ‘bubble’ and provide low volume ventilation airflow that evens out the humidity within the bag and maintains its shape. These systems stop condensation quite

successfully and are relatively cheap to run. The downside is that the systems make no attempt to control the RH%. The contents of the bubble can still be at a RH% well above safe levels. Another disadvantage is a practical one - these systems are fine if you want to move the car very infrequently. If you use, or work on, the car in the winter then getting it in and out of the bubble can be laborious and adds to the wear and tear of the bag itself. It is also obvious that only the air within the bubble is controlled - everything else within the garage area is unprotected - tools, stored parts etc.

There are two main types of dehumidification equipment - each use a different method to extract moisture from the air.

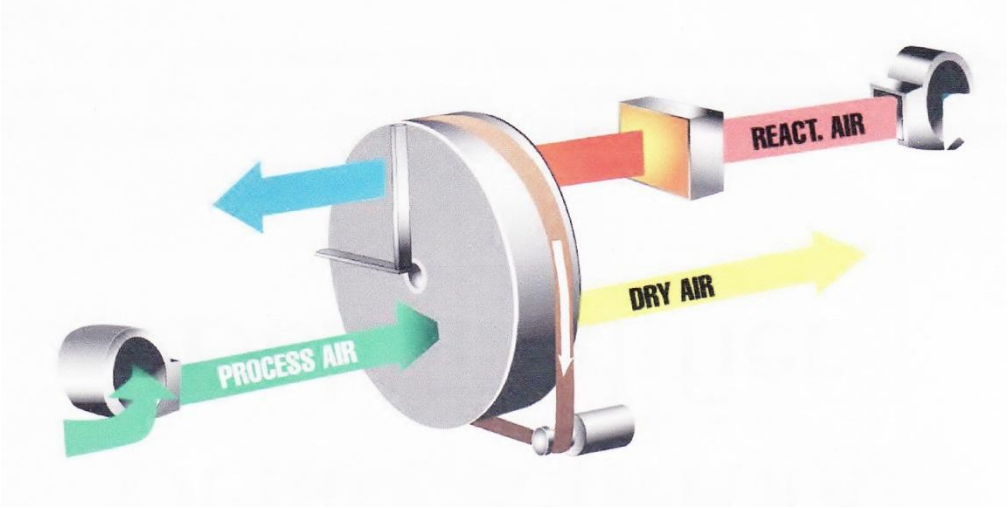
CONDENSATE DEHUMIDIFIERS

By far and away the most popular type of dehumidifier, certainly for domestic applications, is the condensate type. A condensate dehumidifier uses the principle of dew-point to its advantage. Air is passed over a cold coil and is cooled to below dew point thus giving up its moisture as condensation on the coil. This condensation drips from the coil into a collecting tank or open bucket below or is piped away to a drain. The dry air is then passed over a hot coil before exiting the unit. The air coming out of the dehumidifier is a degree or two warmer than that going in.

Domestic dehumidifiers in an unheated environment will not work when the ambient temperature drops below about 10C. The condensing coil becomes so cold that it freezes solid and the dehumidifier stops working. All the machines Dry-it-Out supply have 'Hot Gas Defrost'. Machines with Hot Gas Defrost detect the onset of freezing on the coil and either reverse the flow of refrigerant or vent warm air internally to automatically defrost the condensing coil. A dehumidifier with Hot Gas Defrost will operate at ambient temperatures right down to freezing point and most will stand -5C without machine damage but efficiency is greatly reduced and largely become ineffective in colder months.

ADSORPTION DEHUMIDIFIERS

To control the larger volumes of, for instance, a commercial car store, a different type of dehumidifier has traditionally been used - an adsorption dehumidifier. Adsorption dehumidifiers use a completely different principle to extract the moisture from the air.



Air is passed through a high surface area rotor (rather like a catalytic converter to look at) that is impregnated with silica-gel. As the air passes through the rotor the moisture is adsorbed onto its surface. Part of the rotor is separated off from the main airflow. Through this part a small amount of air is ducted in from outside the building, heated and passed through the rotor. The moisture on the rotor is given up to the hot air which is then exhausted back outside the building as hot wet air. The newly-dried section of the rotor then re-emerges to the main airflow ready to adsorb more moisture. The rotor turns slowly making the operation continuous.

The adsorption principle has important advantages. Firstly, its action is independent of temperature. An adsorption dehumidifier will operate as efficiently at -20C as +30C. Secondly the adsorption principle makes it possible to reduce the humidity levels to lower levels than condensate types.

UCC Solution

Given the size of the facility, the only sure way to create a perfect 50% RH was to invest in an absorption desiccant system controlled by a humidistat. This coupled with building air circulation completely negates the need for bubble/plastic enclosures for all vehicles stored within UCC. This in turn means that every vehicle is dehumidified the way it should be, protecting our clients pride and joy as well as prolonging the life of an important investment.