BREWERY OPERATIONS BENEFIT FROM CONTROLLED HUMIDITY

Cotes dehumidifier solutions bring humidity under control, so you can do away with condensation and all the problems it brings

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COTES



TACKLING THE CONDENSATION CHALLENGE

Old and new, hot and cold

One of the biggest practical challenges in brewing setups stems from condensation — and all the problems and costs that follow with it.

When warmer air laden with water vapour comes into contact with cooler surfaces (such as metal structures, tanks and pipework), it usually condenses — and then drips, pools and accumulates on surfaces, structures and equipment. This results in environments that're ideal for corrosion,

that affect buildings and structures, where microbial and bacterial growths can flourish, and where there are constant safety hazards.

Cotes dehumidifier solutions enable you to control the dew point of the air so that such condensation simply cannot arise — the laws of physics make it impossible.

Cotes solutions takes care of all these problems by putting you back in control of conditions inside your brewery, so you can focus on what you do best.

Cold pipework and fittings provide a relatively large surface area on which condensation forms easily



Condensation looks harmless, but can have big – expensive – impacts



Invisible, ill-understood

Humidity fluctuates unpredictably, depending on season and weather. The moisture in the air can't be seen (though its effects can). This invisibility has traditionally resulted in humidity— and its many attendant problems — often being poorly understood.

Heating and ventilation are often used in an attempt to deal with the effects of humidity, but the basic laws of physics mean these can never do much more than impacting symptoms – not causes.

WHY CONTROLLING HUMIDITY MATTERS

The confines of history

Modern breweries often involve highly individual mixtures of centuries-old craftsmanship and modern technology, with high-volume consumer beers at one end of the output spectrum and microbreweries' connoisseur specialities at the other.

Production, output and commercial ambitions may grow, but in many cases much of the equipment for orchestrating the brewing magic is tucked into existing buildings and other legacy structures associated with a brewery's historical roots — but not really designed for modern compliance requirements and legislated standards.

Temperature differences, practical problems

Breweries worldwide consistently report one particular set of problems in their buildings — all associated with uncontrolled air-borne moisture inside buildings and structures. Brewing involves many processes that feature significant temperature differences. For example, when the beer is cooled, there are usually big differences between room temperature and the surface temperature of kettles, tanks, pipes, bottles, barrels and cans. For example, the beer is often cooled to below 5°C during fermenting.

Each room or building is full of air that contains unseen moisture — water vapour, or humidity. When this moisture comes into contact with colder surfaces, it condenses.

This has multiple knock-on effects:

- Corrosion in structures and equipment, caused by condensation dripping and pooling
- Brick and concrete building materials suffer damage and deterioration
- Growth of mould and mildew on inner walls, ceilings, etc.
- Microbes and bacterial growths flourish, impacting hygiene and hygiene compliance
- Safety hazards and accidents
- Problems with electrical installations

CONTROLLED CONDITIONS

Combining know-how, controlling conditions

You and your colleagues are experts in the craft of brewing, and all the processes inside the brewing kettles, pipes and tanks.

But we're experts at how to control the humidity that's always present in the air inside your buildings and all around your equipment and processing operations.

Cotes adsorption dehumidifier technology enables you to bring all these conditions under control. Better control means lower costs, less risk, better hygiene and greater - Fewer accidents efficiency.

Controlling the dew point, preventing problems

A Cotes adsorption dehumidifier enables you to maintain any specific dew point below a certain set value, giving full control over humidity conditions in any section of your brewery. The payoffs include:

- Condensation-free structures, with no dripping
- Mould- and mildew-free inner walls, ceilings, etc.
- Dry floors
- Better general hygiene
- Fewer health and safety annotations
- More reliable electrical installations
- Lower maintenance costs for buildings

THE BENEFITS ADD UP

The benefits add up

Effective control of humidity in your brewing operations brings you big practical payoffs:

- Effective prevention of condensation, corrosion and mould all year round
- Avoiding condensation affecting sensitive electrical and electronic equipment
- Lower energy costs because you no longer need ineffective, energy-intensive alternatives such as heating or ventilation units
- None of the usual problems, service requirements or costs associated with using refrigerants



- Better hygiene, ensuring easier compliance with appropriate standards
- Fewer interruptions to normal operations, resulting in less service downtime
- Fewer accidents and better health and safety conditions for staff, contractors, suppliers and visitors

And Cotes adsorption dehumidifiers have the big added advantage - particularly in relation to low-cost, simple condensation dehumidifiers - of being equally effective all year round and over the entire temperature range from -25°C to 40°C.

ISSUES AND BENEFITS

Breweries encounter problems with humidity in many different places – all of which have to be dealt with.

Buildings and structures

Older breweries are often housed in buildings that a key part of their identity and heritage. In the case of many smaller operations, this can be important for maintaining brand value and a distinctive market position.

Such buildings are sometimes several hundred years old, built of bricks or other materials with no cavity walls or insulation. When outdoor temperatures and humidity rise in early spring, the walls are still cold and the relative humidity therefore easily gets to above 70%, the point at which mould and fungus begin to flourish.

It is normally very difficult to remove such mould from brick– and–mortar surfaces without having to re-plaster the wall and apply a special mineral-based paint (at costs that can often amount to approx. €20 per square metre).

Mould and fungus growths of any kind place heavy burdens on cleaning and maintenance budgets, as well as often making it difficult to comply with modern health and safety requirements.

Tank facilities

The surface of any tank or pipe containing beer will be cold – often 5°C or less. Any moisture in the air will therefore tend to condense on these cold surfaces.

It can then drip and collect, leading to corrosion of brewery structures made of virtually any metal other than stainless steel. Over time, such corrosion will make metal structures and equipment lose their viability and strength.

Condensation also leads to droplets of moisture that might end in electrical systems and other sensitive, operationscritical equipment.

Certain breweries make a point of using open tanks for fermentation. Unfortunately, this means any condensation, mould or other growths on the ceiling could end up in the beer in the open tanks.

Cold rooms

In cold rooms, uncontrolled levels of moisture in the air have a big effect on operating efficiency and energy consumption. It is very common for such air-borne moisture to form as deposits of ice on the surfaces of the evaporators, which are below freezing point (0°C).

When ice forms on an evaporator, its thermal efficiency drops dramatically. Any ice formation impacts operating costs as well as reliability.

Storage facilities

When the beer is filled into bottles, the beer is normally at about 6°C or below, whereas the surface temperature on the bottles is normally 12–14°C.

Moisture in the air then tends to condense on the bottles, leading to many kinds of practical problems:

- Mould and fungus start to grow on the edge of the label where there's glue residue. Bottles whose appearance and labels are affected by mould and fungus are usually unsaleable.
- High humidity can make labels start to wrinkle and peel off – and even fall off – because the glue doesn't dry properly. Bottles without labels are not saleable due to foodstuff legislation.
- Bottles get dirty because dust and particles from inside the building and from fork lift trucks, etc. settle on the wet surfaces of the bottles.

AN EXAMPLE OF HOW IT WORKS

An outside temperature and relative humidity of (for example) 24°C and 60% relative humidity (point 1) results in a dew point of 15,8°C (point 2).

This means airborne moisture will condense on any surface with a temperature below this 15,8°C.

Bottles leaving the filling room usually have surface temperatures of 12–14°C.

Moisture will condense on such bottles as long as the dew point in the storage room is higher than their surface temperature.

Heating up the room does not help. To reduce the dew point, you have to remove humidity (water vapour) from the air inside the space. 44° 42° 1.12 kg/m 38° 1.14 kg/m 36° 1.14 kg/m 32° 1.16 kg/m 32° 24° 24° 24° 22° 24° 24° 22° 20° 18° 16° 14° 12° 10° 8° 6° 4° 22°

Any remaining water in and on any crates will add to the moisture load, and make problems worse.

Breweries try to deal with all this by ventilating with outside air. But there will be condensation on the bottles as long as the dew point in the storage room is higher than their surface temperature, and the problems listed above will remain.

This problem is often thought to arise from the fact that the bottles are rinsed after filling. Some breweries try (unsuccessfully) to tackle these condensation issues by blowing air on the bottles just before they leave the bottling plant. But — as described above — the problem really stems from placing cold beer inside storage rooms where the temperature is higher, so that the water vapour in the air condenses on the colder bottles.





THE COTES ADVANTAGE

The energy advantage

Cotes dehumidifiers provide you with substantial energy savings compared with traditional air conditioning or conventional secondgeneration industrial evaporative cooling systems — which don't really deal with humidity issues at all.

The heat recovery advantage

You can also choose Cotes dehumidifiers fitted with a highly efficient aluminium cross-flow heat exchanger to recover heat from the regeneration air leaving the unit. This valuable thermal energy – already generated and paid for - can then be reused to preheat incoming regeneration air. This heat recovery can save you an additional 18% (sometimes more) on your humidity management energy bills. This brings you surprisingly quick payback on any initial outlay. Cotes adsorption dehumidifiers are the only units on the market that comply with the latest generation of energy consumption requirements, because of this energy-saving, cost-reducing heat recovery capability.





The control advantage

In modern brewing facilities, you can achieve big practical benefits by installing modern digital control systems and sensors so you always know what's happening with humidity conditions — and are kept informed about any fluctuations taking place.

Cotes C35 and C65 dehumidifiers are available equipped with combinations of sensors and PLC controllers that automatically turn the dehumidifier on and off as the dew point changes. You can also choose smaller units (such as C30 dehumidifiers and certain models in the C35 and C65 range) equipped with DA20 or DH24 control units. Cotes dehumidifiers fitted with PLC controllers communicate easily with your building management system using the industry-standard Modbus protocol.

The modular advantage

With the larger models of Cotes dehumidifiers, you can also opt for key additional capabilities in the form of easy-to-integrate plug-in modules for pre- and postheating/cooling, energy recovery and closed-circuit condensation.

The LK water condensation module, for example, doesn't require any ducting. This means you can easily install Cotes dehumidifiers in brewery spaces with only limited, difficult access to free air – or no access at all.

GETTING PRACTICAL

What exactly is humidity?

Humidity is the amount of moisture present in the air. Absolute humidity is the amount of moisture present in a particular volume of air, and is normally measured in grams/ kilograms.

Relative humidity, on the other hand, is the relationship between the actual amount of moisture present and the maximum amount that the air could contain. Relative humidity is always measured in percentages.

Inappropriate levels of relative humidity give rise to a wide range of potential problems in industrial processes and commercial operations of virtually all kinds.

Uncertainty and lack of control are never a good thing in business – so Cotes humidity management capabilities are designed to help you establish full control over humidity conditions in important structures, equipment and processes.

How to measure humidity

There are special tools used in monitoring humidity and its interaction with other key parameters.

A Mollier diagram, for example, is a design and configuration tool that building engineers and designers the world over use to represent and analyse the relationship between air temperature, moisture content and enthalpy.

How to find a solution

You can't see humidity, and there are lots of old wives' tales and pseudo-science about how to deal with it.

Cotes has more than 30 years of specialist experience in helping customers combat uncontrolled humidity and its many undesirable effects, in virtually every industry and in pretty much every part of the world. Our experts are here to help.

ARE THERE ANY OTHER WAYS OF TACKLING HUMIDITY?	
VENTILATION	Simple ventilation doesn't do anything to alter the dew point or relative humidity of the air — you're just swapping one volume of air with another, with pretty much the same specifications and humidity problems. As long as the dew point of any volume of air is higher than surface temperatures, condensation will still always form on cold surfaces.
CLEANING	Cleaning is manpower-intensive and expensive, must be done regularly, and is only a stopgap that doesn't deal with the real source of the condensation problem. Furthermore, cleaning usually adds to the airborne moisture present – which is actually the source of the problem. The most effective cleaning agents (especially for getting rid of mildew and mould) often contain chlorine and other chemicals that involve using costly protection equipment.
PAINTING WITH MINERAL PAINTS	A very expensive solution (approx. € 20/sq. metre for walls and ceilings) way of trying to deal with the some of the results of condensation, without addressing the cause. This kind of approach is not effective for very long (normally less than 2 years).
CONDENSATION DEHUMIDIFIERS	Temperatures in cold spaces in a brewery are normally between 1°C and 10°C – but the basic laws of physics dictate that condensing dehumidifiers can never be effective at such low temperatures.
COTES ADSORPTION DEHUMIDIFIERS	A Cotes adsorption dehumidifier means you can keep relative humidity under full control below 70% and a dew point below the temperature of the coldest surface in the room — round the clock, all year round — at any temperature between -25°C and 40°C.

Ordinary condensing dehumidifiers

Get real

The specs given for ordinary condensing dehumidifiers can be deceiving.

A unit with high capacity at high temperatures is often much less effective at low temperatures.

At Cotes, we recommend the greater efficiency and operating benefits available with a Cotes adsorption dehumidifier that's effective and stable all year round, and at all temperatures.

What do I need? What's the right size?

These are some of the key metrics you probably need to take into consideration to work out what size/kind of dehumidifier would work best in your particular brewery.

- Weather conditions in the area
- Volume of room/space/building
- How much moisture-laden air enters from outside through gates, doors, windows and ventilation ducts (normal air ingress is 0.2 x room volume)
- Desired room temperature _
- _ Temperature on the coldest surface
- _ Floor area (30 g per sq metre is normally left behind after floor cleaning using water)

The PLC controller is able to handle two set points. In this example th RH is set to 60% and the dew point is set to 11°C.

At a temperature above 19°C the dew point controller is in charge. Below 19°C the RH controller is in charge.

This can be usefull in a brewery where mould and condensation is unwanted.

19°C

The set point should be 60% relative humidity and the dew point should be 1–2°C below the temperature of the coldest surface.

You can also, of course, get any help you need from Cotes humidity management experts, and benefit from their comprehensive practical experience with installations designed to tackle breweries' humidity problems all over the world.

Control and automation

Many Cotes dehumidifier models are available with PLC control systems that do away with manual operation and instead switch on automatically when needed. This helps reduce manpower requirements and the elements of uncertainty often associated with human operator involvement. Installing appropriate sensors and PLC controllers helps you

ensure maximum dehumidification efficiency and the lowest possible energy consumption.



HOW DO I KNOW IT'LL WORK?

Cotes dehumidifiers are built to be robust and durable, with high-quality, standard components that are easily available virtually anywhere. This means they're extremely reliable, and any service work is quick and easy.

Specialist service teams can help you with commissioning ing costs low. Cotes dehumidifiers anywhere in Europe.

We deliver all Cotes dehumidifiers with a 2-year guarantee, and each unit is backed by online or phone support from our HQ in Denmark.

How much will I save?

Cotes dehumidifiers provide a remarkably good return on investment. They're energy-efficient and can use virtually any source of heat available, which will keep the operat-

The real question, however, is not so much the cost but the size and impact of the savings and benefits you can achieve in your brewery by installing a Cotes dehumidification solution.

HOW AN ADSORPTION DEHUMIDIFIER WORKS

The effect of Cotes adsorption dehumidifiers stems from the action of two separate flows of air.

Process air – drying the air flow

The incoming moisture-laden flow of air (process air) en-The second air flow (the regeneration air) – also driven by a ters one side of the cabinet — driven by a fan – and passes fan - is also filtered, and heated by heating elements. through a filter. On its way through the rotor, this heat evaporates the mois-The air then passes through a slowly turning rotor whose inture previously adsorbed by the silica in the rotor. The resultner surfaces are coated with an amorphous silica gel mateing water vapour now leaves the dehumidifier in the outgorial that attracts the water molecules passing through. ing regeneration air.

When the moist air passes through the rotor, water molecules are adsorbed and lodge in the pores on the surface of the silica gel.

This means the air leaves the rotor containing less moisture (humidity) than when it entered.



PROCESS AIR FLOW

LK-MODULE FOR CONDENSATION OF REGENERATION AIRFLOW



Regeneration air - drying the rotor with warmer air

A TYPICAL SOLUTION

Depending on the room size and volume in each particular brewery or brewery building, standard C35 and C65 adsorption dehumidifiers have proved ideal for dealing with most breweries' humidity-combatting requirements.



YOUR NEEDS - OUR ANSWERS

No cookie-cutter solutions

them - are different in every brewery.

Your particular operating profile and commercial parame- the humidity problems in one particular brewery ters, the equipment you use and the buildings you operate inside are unique. So, too, are the climate and weather Get in touch conditions you have to deal with outside.

of getting the best results from humidity management. have in your brewery. Specialist know-how and practical experience with tackling similar sets of problems are the big decider in how big +45 5819 6322 the benefits for you and your brewery will be.





More info

The humidity-associated problems – and the solutions to There's more info in the breweries section at cotes.com Scan this QR code to watch a film about how Cotes solved

Get in touch with Cotes experts about how best to deal That's why the right dehumidifier hardware is only part with the particular humidity-associated problems you may

CLOSE TO YOU

We have a worldwide network of Cotes experts ready to provide you with solutions to virtually any humidity management requirement.

TALK TO US ABOUT WHAT'S POSSIBLE

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