Optimization of moisture management in beer brewing

Dry process air plays a crucial role in one of Germany's largest breweries

The art of brewing beer requires meticulous precision, with humidity control being a crucial element of the process. Breweries face complex challenges, from effectively managing condensation problems that arise to preventing quality loss. Effective humidity control within the manufacturing process ensures high product quality, strict hygiene standards and optimum operational efficiency.

In the brewing industry, the production of beer requires great attention to detail, as precision and expertise are essential throughout the production process. Beer, a product known for its nuanced flavors, undergoes a complex production process that requires careful attention at every stage of production. A critical but sometimes overlooked aspect of this ancient craft is the control of humidity in the production environment. Effective control of humidity during the production process is vital to ensuring product quality, maintaining hygiene standards, infrastructure and optimizing the efficiency of various brewing processes in the food and beverage sector.

Image 1: Condensation on beer bottles - positive in private, not during bottling © stockfoto

Moisture minimization in breweries

Production usually begins with the careful preparation of the raw ingredients for beer production. This complicated process involves several stages, including mashing, lautering, boiling, fermentation, storage, and packaging. Each step requires precision, expertise, and strict adherence to stringent quality standards to ensure that the final product meets both the desired flavour profiles and quality specifications. Any errors or deviations in this carefully orchestrated sequence can affect the overall beer quality.

Beer's susceptibility to quality degradation underscores the need to pay careful attention to detail throughout the brewing process. Factors such as impurities, inconsistent temperatures or improper process handling can have a negative impact on the taste, texture, and overall quality of the final product. Furthermore, these factors pose a potential risk to the consumer, which underlines the importance of maintaining a clean and controlled atmosphere throughout the production process. Minimizing moisture build-up and maintaining appropriate storage conditions, including temperature and humidity, are critical to ensuring that the beer reaches the consumer in optimal condition.

Uncontrolled room temperatures and dew point temperatures in breweries can lead to the following negative consequences:

- Condensation forms and accumulates on exposed cold surfaces, such as pressure tanks, pipes, fittings, and walls, as well as production areas within the building.
- Corrosion of the building infrastructure.
- Bacterial growth and mold within the building structure pose a risk to hygiene and compliance.
- Increased maintenance and repair costs due to uncontrolled moisture.

Protecting the brewery from unwanted moisture

One of the most renowned beer breweries in northern Germany was facing major challenges. The lack of an adequate air conditioning and ventilation system led to the accumulation of heavy condensation on various surfaces such as pressure vessel tanks, pipes, and fittings within the production building.

The temperature on the surface of the installed uninsulated production units is usually between +4°C and +6°C / 39°F and 43°F. In summer, the humidity inside the production building was sometimes as high as +23°C / 73,5°F at 60% relative humidity. Converted to a dew point temperature, this is approx. +15°C / 59°F (Tp). As a result, this humid ambient air condensed on all exposed cold surfaces inside the building.

Figure 2: Condensation on a pipe in a brewery © stockfoto

The solution

ULT, sales and service partner of the Danish air dryer vendor Cotes in Germany, supplied the North German brewery with a flexible dehumidification system to solve the problems of humidity and therefore condensation within the building. After the thermodynamic design and calculation of the sorption system (air drying system), the Cotes CRT12000E-POC was selected for this application.

After the installation of all supply and exhaust air pipes and the air-drying system outside, the relative humidity in the building fell to 13% RH at +10°C / 50°F and reached a dew point temperature of -15°C / 59°F.

The dehumidification system allows for two air changes per hour of the indoor building volume (approx. 4,000 m³ building volume), which more than effectively solved the condensation problem. In addition, the installation of a Cotes adsorption system showed remarkable effectiveness by eliminating all water droplets on pipes, containers and building structures caused by condensation**.**

This meant that a dry and corrosion-free environment could be created in the brewery.
In addition, the introduction of adjustable temperature and humidity controls provided more flexibility, which has led to a significant increase in energy efficiency. This comprehensive

project, in which a total of approx. 300 m of air ducts were installed, was successfully and sustainably completed within an installation time of around two weeks. This proves the effectiveness of the CRT12000E-POC desiccant dehumidifier from Cotes in overcoming the humidity problems in the brewing industry.

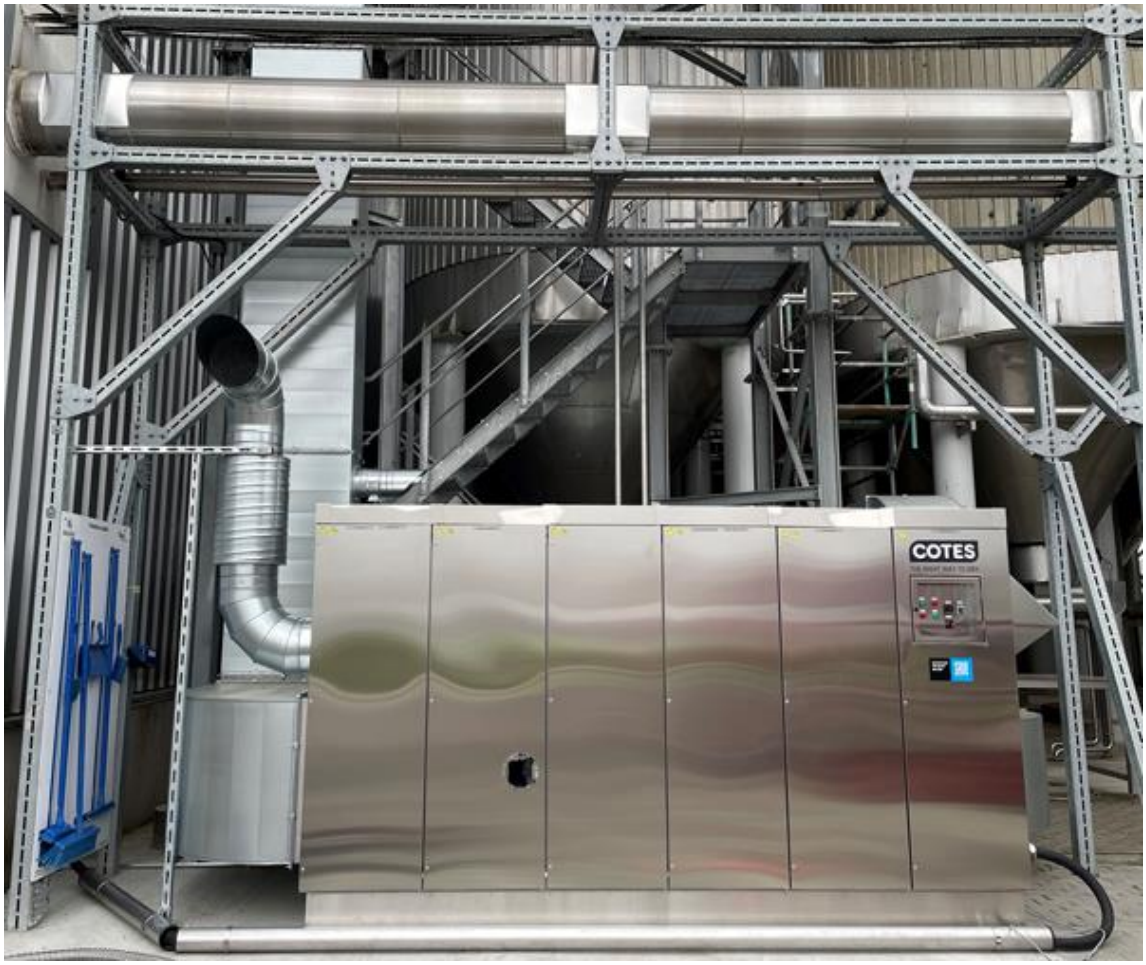

Bild 3: Cotes-Flex-Line-Lufttrocknungsanlage CRT12000E-POC © ULT

Cotes adsorption dehumidifier

Cotes flexible dehumidifiers are designed for comprehensive moisture management in conjunction with process drying requirements - when exceptionally dry air (deep drying, high ΔX) or exceptional amounts of process air are required.

These dehumidifiers have been carefully designed for optimum effectiveness, versatility, and reliability. They are robustly built and designed for energy efficiency, ensuring ease of use, maintenance, and operation in industries such as the food and beverage, pharmaceutical and chemical industries, and general industrial dry air supply.

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Additional information:
Adsorption drying systems from Cotes
Process air drying solutions from ULT