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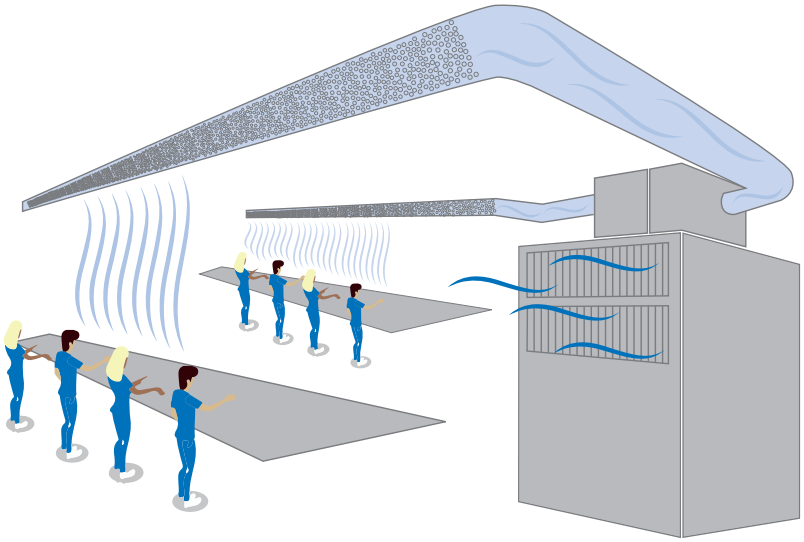
Das Community-Portal

Problem Created by Air Conditioning System - Dry Product Obtained by Air Dehumidification

Air conditioning systems run at full power in the summertime - in cleanrooms, too. A medical supplier was faced, however, with excess moisture produced by the air conditioning system. The solution was an alternative approach to dehumidification.

16 May 2022 | Guest contribution by Petra Schlachter



Ganz sanft, ohne Zugluft wird sehr trockene Luft aus den perforierten Textilschläuchen an die Arbeitsplätze ausgebracht, um die Feuchte dort zu reduzieren und die Produktion von Dialysatoren sicherzustellen. (Bild: Harter)

The sun is shining brightly and temperatures are soaring. Something to enjoy for many people. Yet, a challenge for an air conditioning system that inherently induces too much moisture into a production hall thus jeopardizing the production of millions of items.

The operator of the cleanroom is global market leader specialized in the development and manufacture of innovative dialysers. Dialysers are used to purify the blood of patients suffering from kidney or liver diseases. Cleanroom regulations require the installation of a ventilation system to constantly replace 30 percent of the body of air by fresh ambient air. This constitutes a big problem in the summertime, a time when excessive moisture is induced in the production hall. The hall is used, among others, to manufacture fibres for filter elements. These fibres absorb too much moisture contained in the large amount of fresh ambient air - 60,000 cubic metres an hour - introduced so that they may not be properly sealed by the potting compound.

Suboptimal potting results in entrapment of tiny air bubbles, and the fibre bundles become rejects. The perfect production of fibres is part of the company's responsibility and is, at the same time, vital for their intended use on humans. Excessive reject rates in the summer months were no longer tolerable for the global market leader. Yet, the situation was even more complex. The production runs for 364 days a year interrupted by only one day for annual maintenance. A production outage of several weeks was out of the question. This alone was the hurdle that several solution approaches failed to clear.

Dehumidification Modules Resolve the Problem

The operator learned about drying system manufacturer Harter. After mutual discussion it became clear that Harter did not intend to modify the ventilation system but rather to dehumidify the cleanroom air where needed. „Once I understood the alternative solution approach and how this kind of drying worked I had no more doubt that this could be the way to finally resolve our problem", says the responsible department manager of the medical supplier.

Harter manufactured two so-called AIRGENEX®med dehumidification modules in their production shop. They are 3,000 mm long, 2,300 mm wide, and 3,000 mm high, made from corrosion resistant steel, and meet cleanroom requirements. Each dehumidification module houses a heat exchanger system and special air recirculation fans. The air outlets have class H4 HEPA (= High-Efficiency Particulate Air/ Arrestance) filters installed. In preparation for the installation of the system, heat exchangers to dissipate excess heat and the associated piping to the cleanroom ceiling were installed on the roof of the workshop. As the process temperature is only 20 °C, excess heat accumulates as in any refrigeration system.

Air Entrapment and Resulting Rejects Are a Thing of the Past

The whole installation was completed within three days: The two AIRGENEX®med modules were transported into the workshop using a crane and installed. The final piping work was also done. At the same time, special textile hoses were installed in the hall to form a distribution system for the dry air. The two dehumidification modules serve four production areas, each. Extremely dry air is funnelled through the textile hoses to the eight production areas where the fibres are manufactured and potted. The process air is introduced in very fine streams to prevent any draught and to dehumidify the workshop air in a gentle way. The water extraction rate of the dehumidification modules is 75 l/hour approx.

„For us, this is the perfect solution. There is no more air entrapment and resulting rejects", summarizes the department manager contentedly. Further projects in co-operation with Harter are in the pipeline.

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Dry Air Routed Exactly to the Right Place

The success of this drying method rests on two pillars – efficient heat pump assisted air dehumidification and accurate air routeing. To accomplish this, Harter uses an alternative physical approach. Inside the dehumidification module, the required process air is largely stripped of any moisture. This extremely dry and, thus, unsaturated air is normally passed into the dryer and over or through the items to be dried – in this case into the special cleanroom area. In this process, the air absorbs any moisture present. Once returned to the dehumidification module, the air is cooled and the moisture condenses to form water. The process air is then reheated using the energy recuperated and passed into the cleanroom, again. Drying may basically be accomplished at temperatures varying between 15 °C and 75 °C.

Combining air dehumidification with accurate air routeing is crucial. The driest air is of no avail unless directed to the place where it is supposed to absorb humidity. Harter has a treasure trove of experience in designing appropriate air routeing provisions. Where excess heat is accumulated it may be dissipated through a plate heat exchanger. This heat may be used for other purposes, for example to heat water in other production processes. Harter's innovative closed air system which uses carbon-saving heat pump technology has meanwhile been classified eligible for government subsidy so that customers in Germany, Austria and Switzerland may obtain grants.