A Consideration on the Dehumidification Methods for Designing the Dry Room

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1. Introduction

Pyro-process researches are performed in a salt environment. Because salt causes corrosion, moisture in air must be removed. Therefore, in a small-scale research, a glove box is prepared. However, in medium- and large-scale research, dry room is required because worker access must be considered. In this study, the dehumidification methods for the dry room construction were reviewed and the contents are described below.

2. General Dry Room System

2.1 Clean Room

A clean rooms are typically used in manufacturing, including of pharmaceutical products or scientific research, as well as aerospace semiconductor engineering applications with a low level of environmental pollutants such as dust, airborne microbes, aerosol particles, and chemical vapors.

2.2 Constant Temperature and Humidity Room

These rooms are widely used in the temperature variation tests, cold resistance tests and storage with low-temperature in the fields of aerospace, aviation, electronics, instrument, electric products, materials, parts and components and equipment to analyze and evaluate the property and performance of the samples under the simulated conditions.

2.3 Dry Room

A dry rooms are typically controlled at much lower humidity than clean rooms and constant temperature/ humidity rooms. To better control the humidity in the lithium ion battery processing areas, dry rooms are hermetically sealed to maintain very low humidity levels.

3. Dehumidification Methods

Two procedures are primarily used for dehumidification: dehumidification through condensation, drying through sorption. The accompanying diagram shows the operating characteristics of both systems:

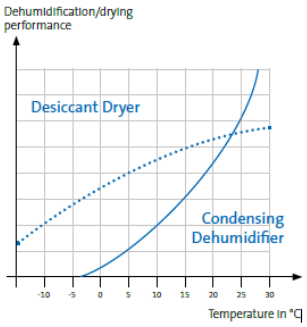

Fig. 1. Operating Characteristics of Desiccant Dryer and Condensing Dehumidifier.

3.1 Condensing Dehumidifier

As shown in Fig. 2, this process involves cooling the humid air below the dew point by conducting the air stream across the cold surface of a heat exchanger (evaporator of a cooling circuit).

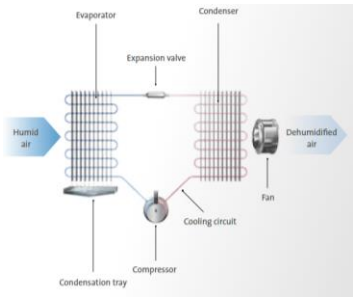

Fig. 2. Condensing Dehumidifier.

3.2 Desiccant Dehumidifier

Desiccant dryers are used wherever condensing dehumidifiers physically reach their limits and compliance with minimum absolute humidity or water vapor levels is required. Fig. 3 and 4 show discontinuous dehumidifiers and a continuous dehumidifier.

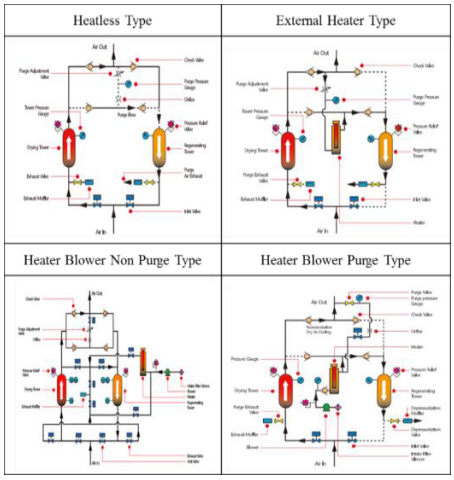

Fig. 3. Dehumidifiers of Discontinuous Type.

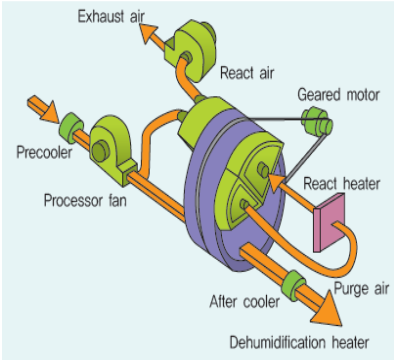

Fig. 4. Continuous Dehumidifier.

4. Adsorbent Type and Properties

Adsorption refers to the phenomenon that a gas powder adheres to a surface of solid. Thus, gases or liquids can be selectively removed using adsorbent. Table 1 shows the properties of adsorbents.

Table 1. Adsorbent Properties

	Alumina Gel	Silica Gel	Molecular Sieves
Size	2 – 6.4	2 - 5	1.5 – 5
Al_2O_2	93%	0.3%	-
SiO_2	0.02%	99%	-
RH 50%	18 wt%	26 wt%	20 wt%
RH 90%	40 wt%	43 wt%	21 wt%
Regen. Temp.	175 – 250℃	150 – 180℃	200 – 300℃

5. Conclusion

In this paper, various dehumidification methods used in the industry have been reviewed, and the results of this review will be used to construct the drying system in the future.

REFERENCES

[1] Lewis G. Harriman III, “The Dehumidification Handbook”, MUNTERS CORPORATION, 2002.