

DEHUMIDIFIER

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Introduction

- **dehumidify** - make less humid; "The air conditioner dehumidifies the air in the summer"
- dry, dry out - remove the moisture from and make dry; "dry clothes"; "dry hair"
- humidify, moisturise, moisturize - make (more) humid; "We have a machine that humidifies the air in the house"
- To remove moisture.

Dehumidifier

- An apparatus for reducing the content of moisture in the atmosphere.

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- A **dehumidifier** is a household appliance that reduces the level of humidity in the air, usually for health reasons, as humid air can cause mold and mildew to grow inside homes, which has various health risks.
- Relative humidity is preferably 30 to 50%. Very high humidity levels are also unpleasant for human beings, can cause condensation and can make it hard to dry laundry or sleep.

Instrumentation

- Equipment is designed to reduce the amount of water vapor in the atmosphere.
- There are three methods by which water vapor may be removed:
 - (1) the use of sorbent materials.
 - (2) cooling to the required dew point.
 - (3) compression with after cooling.



Automatic Humidity Control



Advanced Coil Design



Thermostatic Expansion Valve (TXV)



Maintenance-Free Internal Blower



Dual Access Panels

Sorbent materials

- Sorbents are materials which are hygroscopic to water vapor. Solid sorbents include silica gels, activated alumina, and aluminum bauxite. Liquid sorbents include halogen salts such as lithium chloride, lithium bromide, and calcium chloride, and organic liquids such as ethylene, diethylene, and triethylene glycols and glycol derivatives.

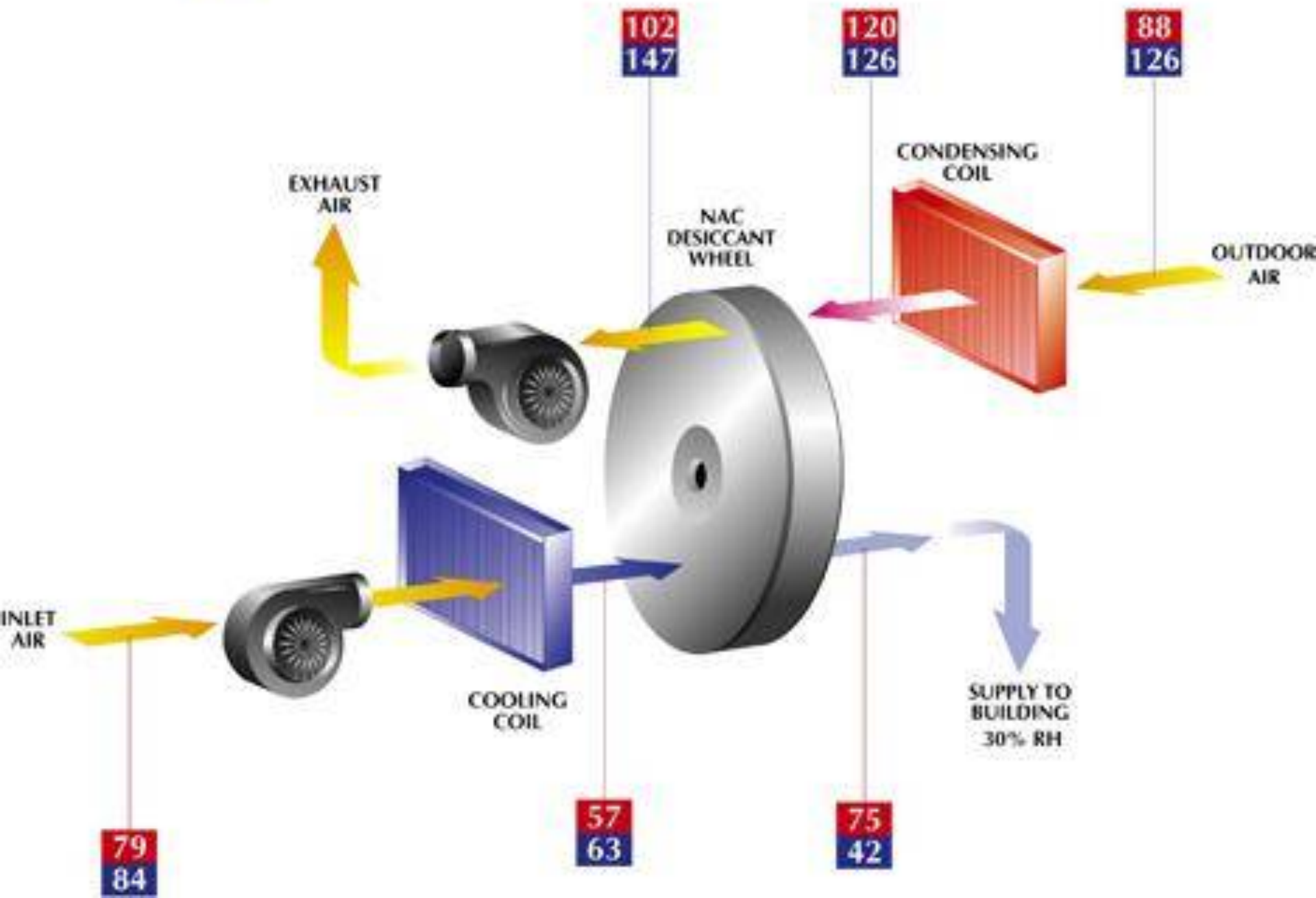
- Solid sorbents may be used in static or dynamic dehumidifiers.
- Bags of solid sorbent materials within packages of machine tools, electronic equipment, and other valuable materials subject to moisture damage constitute static dehumidifiers.
- A dynamic dehumidifier for solid sorbent consists of a main circulating fan, one or more beds of sorbent material, reactivation air fan, heater, mechanism to change from dehumidifying to reactivation, and after cooler.

- The liquid-sorbent dehumidifier consists of a main circulating fan, sorbent-air contactor, sorbent pump, and reactivator including contactor, fan, heater, and cooler.
- This unit will control the effluent dew point at a constant level because dehumidification and reactivation are continuous operations with a small part of the sorbent constantly bled off from the main circulating system and reactivated to the concentration required for the desired effluent dew point.

Cooling to the required dew point

- A system employing the use of cooling for dehumidifying consists of a circulating fan and cooling coil. The cooling coil may use cold water obtained from wells or a refrigeration plant, or may be a direct-expansion refrigeration coil. In place of a coil, a spray washer may be used in which the air passes through two or more banks of sprays of cold water or brine, depending upon the dew-point temperature required.

Dry Bulb Temperature in °F
Absolute Humidity in gr/lb



Compression with after cooling

- Dehumidifying by compression and after cooling is used when the reduction of water vapor in a compressed-air system is required.
- This is particularly important, for example, if the air is used for automatic control instruments or cleaning of delicate machined parts.
- The power required for compression systems is so high compared to power requirements for dehumidifying by either the sorbent or refrigeration method that the compression system is not an economical one if dehumidifying is the only end result required.

Desiccative

- A desiccant dehumidifier is a device that employs a desiccant material to produce a dehumidification effect. As they are more effective for low-temperature and low (relative) humidity levels, they are generally used for these conditions instead of mechanical/refrigerative dehumidifiers - are used in tandem with them.
- Desiccant materials have a high affinity for water vapor. An example of desiccant material is **silica gel**.

INDUSTRIAL DESICANT DEHUMIDIFIER



In general a desiccant dehumidifier comprises four major components

- the **component that holds the desiccant**, of which there are several types;
- a **fan** to move the air to be dehumidified (process air) through the desiccant holder;
- a **heater** to heat the air that will be used to dry the desiccant (regeneration air);
- a **fan** to move the low humidity air for drying the desiccant through the desiccant holder.

Air conditioners

- Air conditioners automatically act as dehumidifiers when they chill the air and thus need to handle the accumulated water as well.
- Newer window units use the condensing coil and fan to evaporate the accumulated water into the outdoor air, while older units simply allow the water to drip outside.
- Central air conditioning units need to be connected to a drain.



Collection

- Most dehumidifiers can be adapted to connect the drip output directly to a drain via a garden hose, though they usually also come with a collection receptacle.
- There are usually sensors to detect when the collection device is full, and shut off the dehumidifier.
- These buckets will generally fill with water in 8-12 hours and will need to be emptied and replaced.
- Some dehumidifiers can tie into plumbing or use a water pump to drain themselves as they collect moisture.

Potability

- General dehumidifier water is considered a rather clean kind of greywater: not suitable for drinking, but acceptable for watering plants, though not garden vegetables. The concerns are:-
- the water may contain trace metal from the solder, most significantly lead (which is quite damaging), but also copper, aluminium, and zinc;
- various pathogens accumulate in the water, particularly due to its stagnancy, including fungal spores; unlike in distilled water, the water is not boiled, which would kill pathogens (including bacteria); as with distilled water, minerals are largely absent, hence it is somewhat flat tasting.

Contd...

- The trace metal poses a danger if used on edible plants, as they can accumulate; however, the water is otherwise usable for irrigation.
- One can make food-grade dehumidifiers (avoiding toxic metal and keeping the collection tank clean), which are called atmospheric water generators.

Capacity

- Dehumidifier capacity is usually measured in pints per 24 hours and is determined by **two factors**:-
- The size of the space that needs to be dehumidified.
- The conditions that exist in the space before dehumidification.

Placement

- Most dehumidifiers have top-mounted air discharge and can be placed against walls, but if you do not have top-mounted discharge, make sure the dehumidifier is located away from walls and furniture, so that air can circulate freely around the unit. This will result in better operation of the product.
- Doors and windows to the space being dehumidified should be closed while the unit is running. This will ensure that the space is dehumidified as efficiently as possible.

Advantages

- Storage of powder
- Drying
- Tablet compression
- Film coating
- Sugar coating
- Blister packaging
- Storage of finished products

- Dehumidifiers are extensively used by the pharmaceutical industry in a number of processes right from powder mixing to tablet forming.
- Controlled humidity in many pharmaceutical-manufacturing processes improves accuracy, economy and hygiene. Dehumidifying equipment allows essential processes to be carried out with certainty and confidence to maintain essential quality standards.
- These machines use the proven air drying technology to solve humidity problem.
- The machines use silica gel rotor for more effective drying and dehumidification.
- Cabinets are made of stainless steel and normally use electric or steam heaters for the regeneration process.





HEAVY DUTY INDUSTRIAL DEHUMIDIFIER



MISTUBSI ELECTRIC DEHUMIDIFIER



PORTABLE DEHUMIDIFIER



SWIMMING POOL DEHUMIDIFIER



THANK YOU



Dr. Pradip Shinde