HOW TO DRY YOUR SEED-STORAGE ROOM

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Moisture is one of the most subtle and dangerous enemies that seedsmen, plant breeders and anyone concerned with seed preservation, have to fight. The enemy is subtle because he does his worst damage without being seen. Hiding under a cloak of invisibility he leaves a trail of disease and rot and mildew wherever he goes. Moisture causes seed to germinate in storage and robs it of its most precious ingredient - its viability.

Of course, all moisture is not invisible. In its solid state, ice, it is easy to handle and carry and manage. As a liquid, you can pipe it and make it go anywhere you wish. But, as a gas it becomes more difficult to deal with.

All air contains some moisture in the form of vapor. The warmer the air, the more moisture it can hold. A room full of air at 80° F. might be able to hold a gallon of water in the form of vapor. That same room can hold only half that much moisture vapor at 60° F.

And although the air in the room might be able to hold a gallon of moisture at 80° F., it does not follow that there is always that much moisture in the room. The moisture content of air varies widely. It varies from hour to hour in the same location and it varies from location to location. In the desert lands of the West, the air is relatively dry and seldom contains all of the moisture it can hold. That is why a shirt on the line will dry more quickly in Arizona than in New Jersey.

Probably the least understood characteristic of moisture vapor is its ability to move about under its own pressure. It tries to fill every available space and is constantly pushing itself here and there to be sure no spot has been left unoccupied. You can witness this characteristic when a woman enters a room wearing too much perfume. Almost at the instant she walks through the doorway, people across the room catch the fragrance. It was driven there by vapor pressure.

It is this same vapor pressure that forces moisture from a humid area into a dry area. Moisture can come into a room in a steady stream through a keyhole or through cracks around a loosely fitting window or even through wooden or concrete walls.

For this reason, the most important factor to consider when planning a seed storage room is its construction. It should be made as nearly vaporproof or airtight as possible.

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Since most seed storage rooms are either air conditioned or refrigerated, it should be pointed out that insulating and vaporproofing are not necessarily the same thing. A well insulated space can have a high degree of moisture leakage.

So, special attention should be given to vaporproofing the room, over and above whatever thermal insulation may be required.

The ideal vaporproof room is one that is lined with metal, with all seams welded or soldered, and which is equipped with a refrigerator type door. Lining a refrigerated room with seam welded light gauge steel would cost little more than other vaporproofing methods.

If you have lined the room with steel you will have what amounts to a well sealed tin can. If you had a room of that kind, keeping it dry would be relatively simple. The main problem then would be the amount of traffic in and out during the day because every time the door is opened, moisture rushes in. But, even with constant daytime movement in and out, the humidity could be brought down quickly and easily after working hours.

Of course, every new seed storage room cannot be lined with steel. And there are many storage rooms now in use that can be made relatively vaporproof by other means. For example, a lining of polyethylene sheeting is an effective vapor barrier. It might be made a part of the walls when the room is built, or added later, either on the inside or outside of the room. Or, the room might be panelled with one of the newly developed plastic coated panels, again making sure that the seams are vaporproofed.

If your room already is tight, all that may be necessary is a covering of vaporproof paint on all sides. In the case of the floor, wood flooring should be installed over the painted surface to protect it where trucks roll or where there is much movement.

No attempt is made here to list the many vaporproofing materials on the market. New materials are constantly appearing and the best procedure is to check with your local contractors and building supply houses. Also, any paint manufacturer can give you a list of the vaporproof paints that he has available.

After the size and the detailed construction of your room has been decided on, the next step is to determine the temperature and humidity you will maintain and the size of the air conditioner and dehumidifier you will need.

In either case, competent engineers should be consulted, but in this article we will discuss only drying equipment.

We would point out that the ideal situation for storage of seeds, as agreed on by most of our leading agronomists, is a temperature and relative humidity, which when added together, come to a total of ninety or less.

For example, if you were maintaining a temperature in your seed storage room of 70° F., you would want to hold a relative humidity of 20%. Or, if your temperature is set at 50° F., the relative humidity should not go over 40%.

The correct size of the dehumidifier can be determined by figuring the amount of moisture you must remove from your room to bring the humidity down to the desired percentage. This can be done by a bit of simple arithmetic and the use of a psychometric chart. (Figure 1.)

If you wish to figure the amount of moisture you must remove to maintain the proper humidity in your room, refer to the chart and follow the directions given on the next page.

There are two important factors that must be considered when figuring the size of the dehumidifier. The first is the amount of moisture that comes into a room. An open door in a medium sized storage room can give you a complete change of air as quickly as one minute. A crack under the door can let moisture flow into the room at an amazing rate.

In figuring the total 24 hour moisture load of a dry storage room, it is well to figure on a minimum of ten to fifteen air changes a day. Therefore, if you figure that four pounds of moisture must be removed from the air to give you the desired humidity, you should install a dehumidifier that will remove ten to fifteen times that amount of moisture in a twenty-four hour period.

The second factor to consider is the limit to the moisture removing capabilities of your air conditioning or refrigerator unit. Any unit that removes moisture from the air by condensation becomes ineffective at temperatures below 35° to 40° F.

This is quickly discernable when you refer to the chart again. (Figure 1.) Note that the figures on the extreme left of the chart indicate the dew point under various conditions. The refrigerator unit can only operate as low as 35° to 40° F., because the condensed moisture will begin to freeze on the coil. This means that no relative humidity which falls below that dew point, can be reached by condensation.

To illustrate this, a heavy line has been drawn on the chart showing the point below which refrigerant-type dryers will not work. Note for example, that if you want to maintain your seed room at 50° F. and 40% relative humidity, this point comes below the dewpoint that can be reached by refrigeration.

The only drying unit that will bring the humidity lower is a desiccant dehumidifier. In this type of dehumidifier, moisture is adsorbed from the air by a dry desiccant, of which silica gel is a typical example.

Silica gel is non-toxic and non-corrosive and has no adverse effect on the seeds in storage. It does not get sticky or messy, and if the air flowing through it is properly filtered to remove dust and foreign particles in the air, it will function for years.

By quickly plotting on the chart the conditions that you want to reach in your seed storage room, you can determine whether your air conditioner or refrigerator unit can do the job.

Desiccant dehumidifiers are being used more and more in the seed industry. When they are properly sized and installed, they operate efficiently and relatively trouble-free and give you the protection against humidity that you need.

As an example, take a room with a volume of 4,000 cubic feet. The temperature of the summertime air that comes into your room from outside is 90° F. and the relative humidity is 80%. The temperature of your storage room is 50° F. and you want to maintain a relative humidity of 40%. Problem: How much moisture must you remove from ONE ROOM FULL OF AIR in order to bring the humidity in the room down to 40%?

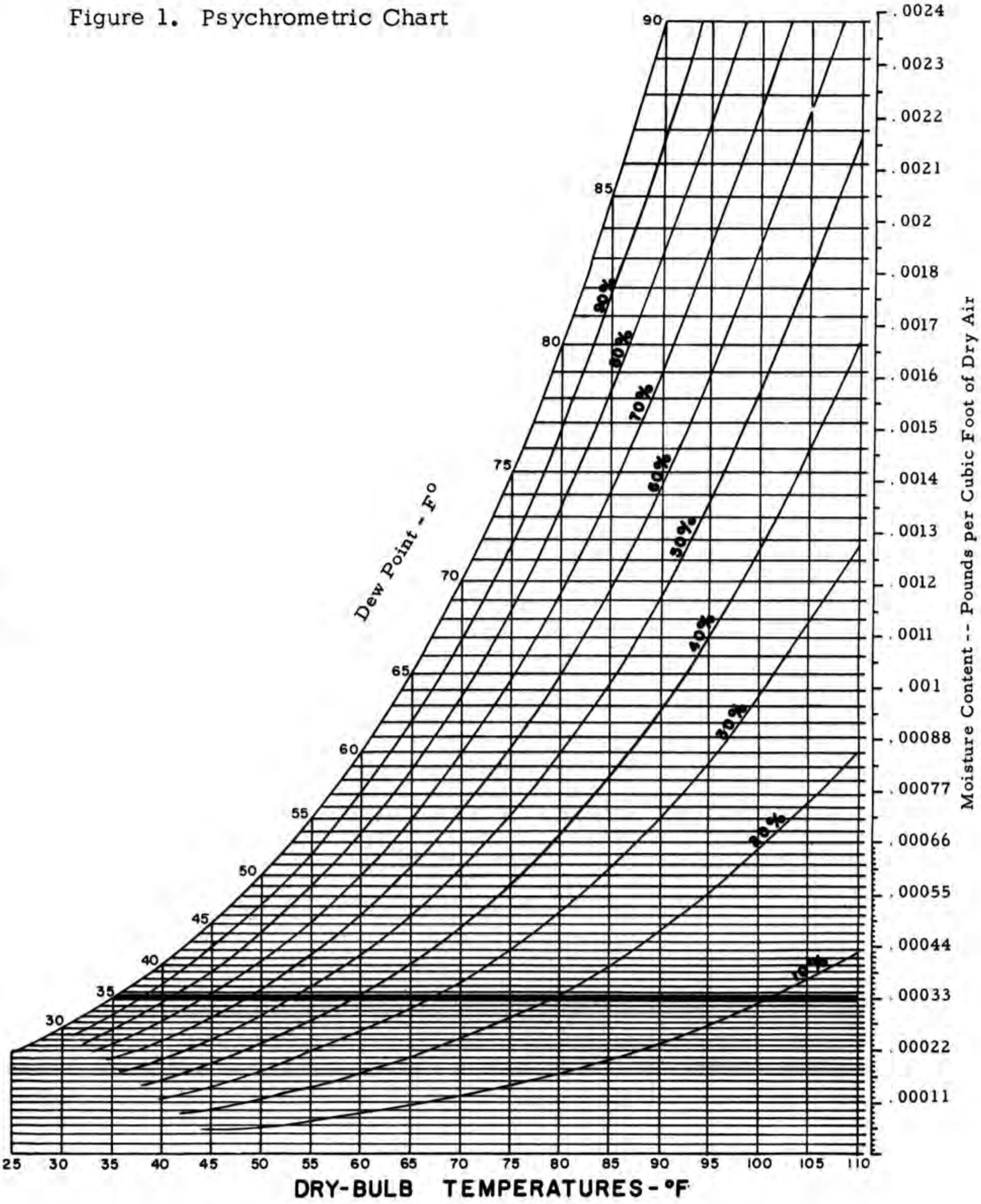
First, plot the point where 90° dry bulb temperature and 80% relative humidity curve meet. Follow the straight line from there to the extreme right of the chart. This will show you the amount of moisture in each cubic foot of air under these conditions. It is .0018 pounds.

Second, plot the temperature and humidity as you want them to be, 50° F. and 40%. By drawing your line to the extreme right you find that at these conditions the air will contain .00022 pounds of moisture per cubic foot.

The amount of moisture that you must remove per cubic foot is the difference between these two figures, or .00158. Therefore, the amount of water you would have to remove from your room under these conditions would be 4,000 times .00158 or 6.3 pounds. If you have as high as 15 air changes a day, you must remove up to 94.5 pounds or approximately 12 gallons of water a day.

It is easy to see that the biggest problem is to keep moisture from coming into the room, both by building it as near vapor-proof as possible and by limiting the amount of time that moisture is allowed to rush in through an open door.

Figure 1. Psychrometric Chart

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