LOW HUMIDITY STORAGE ROOMS

David L. Watson

I would like to thank Dr. H. Dean Bunch and the organization here at Mississippi State for the honor and the opportunity of speaking to you today about some of the problems of dry seed storage rooms.

I am sure there isn't a person in this room who hasn't come face to face with the problem of damp air in the storage of seeds. You all know that high humidity causes loss of viability, disease and germination in storage. Also, damp air and, therefore, damp seeds tend to invite insects. Boxes, bags and packaging materials tend to crush, discolor and rot. High humidity adds up to loss in your storage program -- while humidity control can mean dollars in your pocket.

I have talked to one corn breeder who estimates his foundation and breeding stock to be worth a penny a grain. This company found that a dry room for foundation, breeding and carry-over stock was a financially sound investment. They are raising a large crop of foundation seed which they plan to hold for as long as ten years and thereby eliminate annual small crops. A properly controlled dry room makes this possible.

Let's talk for a few minutes about the costs and consideration in building and drying a room for your seed storage program.

First of all, we must realize that we are not dealing with liquid water. Too often we can't get away from this concept. We know that water exists in three forms -- a solid, a liquid and a gas. We are dealing with a gas which we cannot see and which we cannot feel. This gas pushes itself from place to place by its own pressure. Therefore, when the air surrounding seed is dry, the seed gets dry, and, if the air is damp, then the seed gets damp. If you have ever tried to shave in Arizona, you will get the idea. You find that before you can shave, the lather gets dry. You might say that the air in Arizona is thirsty. It dries things up fast. You have to lather a little and shave a little to get the job done. Herb Shriner of television fame once said it was so dry they put on postage stamps with safety pins.

Let's consider for a moment the moisture in this room. I am quite positive that we have at least 70 to 100 grains of moisture per pound of air here now. What does this mean? We can't see it and we can't feel it. I am pretty sure we have this much moisture because each person while just sitting here will add about 1/4 of a pound of water to the atmosphere during the hour. We

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1/ Mr. Watson is President of Universal Dynamics Corporation, Alexandria, Virginia.
do this by breathing and by evaporation from our skin surfaces. If we cooled
this room down to 50°F we would begin to see this moisture because it would
condense all over every object in the room. The relative humidity would increase
to 100% and seeds stored here would germinate and rot.

We have all seen those small mechanical refrigeration-type house-hold
dehumidifiers. We could place one of these in the corner and after it ran for a
day it would collect a bucket of water. We would get something we could see
and feel. It would be tangible, and we as humans tend to like this sort of thing.
As we dump out a bucket full a day, we feel accomplishment. If we measured the
relative humidity before and after collecting a bucket of water, we would find the
measurements to be very nearly the same -- and we ask why? Simply because,
as we dehumidify, the air moisture by its own pressure comes in through the
plaster, cement, wood, bricks and around the cracks in the doors and windows.
We would find that to effectively dehumidify this room, we would have to have
a very large and very expensive dehumidifier indeed.

What are we saying? Simply this -- in order to have a dry storage room,
first you have to have a storage room which is capable of being dried. We have
said "we are dealing with a gas". We don't find gas delivered to laboratories
and homes in a "wooden" keg! Water can be kept in a keg but gas must be con­
tained in a metal tank or a glass jar. Gas can only be contained in an enclosure
that is gas-proof or in this case, vapor-proof.

A dry storage room must be constructed so that it approaches the state
of being gas tight (not water-proof). If it is an existing room, then we must
make it as vapor-tight as possible by the use of vapor-proof coatings or by
lining it with an effective vapor barrier. Remember! A good thermal barrier is
not necessarily a good vapor barrier and a waterproof material is not necessarily
vapor proof. We are not talking about selecting an insulation with a vapor barrier
on one side and tacking and stapling it here and there; we are not talking about
sealing the walls and letting the ceiling go; we are not talking about doing a good
job on the walls, floor and ceiling and then installing a door that leaks all the
way around. We are talking about fanatically sealing every crack in the entire
structure. This is the most satisfactory and least costly way. It is worth dollars
and it must be done.

Perhaps it's because I am in the metal fabricating business but if I
were doing it, I would build the entire room of sheet steel or sheet metal. I would
weld every joint or I would seal it with a positive gasket and I would use a com­
mercial ice-box door that seals. Perhaps this sounds too costly but let's con­
sider a moment. In my home town, they are building 1500 aluminum houses. Pre­
fabricated metal buildings are for sale nationwide. Steel quonset huts have been
in use for many years. Actually, this is a very practical way to build a dry stor­
age room. After you have overcome the vapor proofing job, you can use any good
waterproof thermal insulation you choose, depending on what temperature you in­
tend to maintain.
I strongly suggest that you go back and read again the 1960 Short Course Proceedings. On page 162, John S. Rogers states the ultimate importance of low humidity and I quote, "while reduction from 12 to 11% (seed content) will double the period before substantial loss of vigor, reduction from 12 to 10% will increase it by 4 times." If this is true, then it is plain common sense that we should seal the storage room to hold the humidity to a low level during all seasons of the year.

Again I say, if you are planning to use an existing room, be practical and do the very best sealing job possible.

Our next problem is to select a dehumidifier which will maintain low humidity. We are not talking about just a reduction in humidity, and we are not talking about how many buckets of water we can collect. Our problem is to keep the air dry to a much greater degree than we might attempt in our basement at home. We are talking about Arizona-dry and Egyptian-tomb dry. This is one reason why a lot of people are in trouble today. The actual degree of dryness required was not really faced in the first place. So let's talk about 50°F, 20% r.h., or 40°F, 30% r.h. to start with. It is very difficult to accomplish this degree of dryness with refrigeration equipment alone.

The most practical known method of drying to this extent is with a desiccant dehumidifier.

Please don't be alarmed by the word "desiccant". Too often people think this is a chemical like calcium chloride which is consumed as it dries, is corrosive and messy to handle. Desiccants are not like this. I brought several samples with me which you can examine if you would like to. These are dry chemicals, non-toxic and non-corrosive. They will last for years without losing effectiveness. You could use them in your salt shaker without danger. It will not hurt your hands or sting your eyes and it will not harm your seed.

The machine blows air from your storage room through a bed of desiccant. The desiccant takes out the moisture and the dry air goes back into the room. After the desiccant collects a quantity of water, the machine automatically switches the air stream to a fresh bed of desiccant to continue drying while the first bed is reactivated by blowing hot air through it. The moisture, still in vapor form, is blown outside the room and you never see any water. Thus, while one bed is always drying, the other is always regenerating. This is done simply and automatically and the machine can be left alone to run for many months without attention.

The machine can be mounted inside or outside the storage room. A humidistat can be installed in the room to cut the machine on and off, thereby maintaining a constant condition for your seeds and saving power.

A desiccant dryer has to contain the air that passes through it and, therefore, should be constructed so that it is vapor-tight. It must withstand the effect of condensation. For this reason, it should be made of heavy gauge steel, (14 ga. minimum), and should be continuously seam-welded. Some
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