Art-Sorb®

High Performance Humidity Control Agent for the Conservation of Art.

Art-Sorb is a moisture-sensitive silica material which absorbs and de-sorbs moisture in order to offset changes in external relative humidity (RH).
By this process Art-Sorb will maintain a sealed climate at a specific RH.

Available in Beads, Sheets and Cassettes for simple incorporation into any container.
Precise humidity control (+/- 5%)
Over five times greater moisture buffering ability than other products.
Typically 1/20 the required amount of ordinary silica gel.
Non-dusting and non-reactive for easy handling.
Affordable.

Technical Information.

High moisture capacity (EMC = Equilibrium Moisture Capacity).

Once Art-Sorb has conditioned its surroundings to be at your set point it is at equilibrium with this climate (EMC). Art-Sorb has a very high moisture capacity throughout the entire RH range, meaning it can absorb or de-sorb a very large percent of its total weight in water without becoming dysfunctional. The larger the capability of water retention the better the ability to buffer change. Also, Art-Sorb does not off-gas and will even take in a small amount of organic volatiles. Please see the chart detailing EMC values for Art-Sorb and other materials.

High M Value.

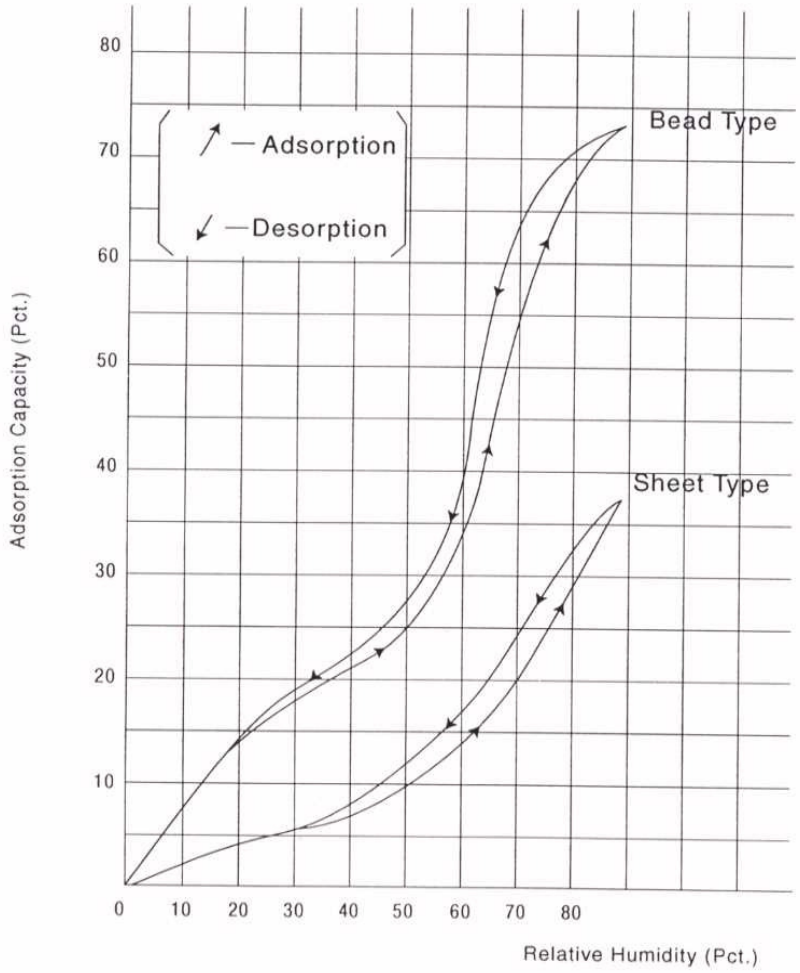
M-value (specific moisture reservoir) can be thought of as the unit by which the buffering ability of a silica gel can be measured. It represents the amount of water in grams that is gained or lost by one kilogram of gel when the RH changes by 1%.
Translation: the more water that can be buffered per 1kg. of gel, the better the performance and the higher the M-value. If you view the table, Art-Sorb outperforms ordinary silica gel by actually increasing its M-Value.

	Ordinary Silica Gel					
	Regular Density Silica		Intermediate Density Silica		Art-Sorb	
RH%	EMC	M-value	EMC	M-value	EMC	M-value
40	25.0	3.5	5.0	1.5	22.0	4.0
50	28.5	2.0	6.5	1.5	26.0	9.0
60	30.5	1.5	8.0	3.0	35.0	19.0
65					46.0	
70	32.0	1.0	11.0	6.0	54.0	13.0
80	33.0	1.0	17.0	15.5	67.0	7.0

Minimal Hysteresis Problems.

Hysteresis describes the condition where a silica gel's adsorption curve. The greater the difference between the two curves the longer the time needed to switch from taking in water to releasing, as the conditions change. Therefore, a region exists where the gel is not working efficiently. Whereas most ordinary silica products are extremely subject to this problem, Art-Sorbs Hysteresis is almost negligible, as seen by the graph below, giving it the ability to switch functions very quickly from taking in water to releasing it a needed.

Typical Data for Art-Sorb Adsorption/Desorption Curve (at 25°C).



Response Time.

Frequent short-term exposure to non-ideal conditions is a major factor in the damage of artwork over time. Due to Art-Sorb's combined properties of high moisture capacity, large M-value, and virtual lack of hysteresis, the speed of reaction to a change in humidity is maximised and the time until restoration of ideal RD is Minimised.

Complete Inertness/Ease of Handling/Immunity Temperature Changes

Art-Sorb was designed to make the protection of artwork precise and easy. Unlike older methods, Art-Sorb is completely inert: it can be in direct contact with the artwork with absolutely no reaction. Likewise, all the forms of Art-Sorb were designed to be safe and easy to handle, store and use without problems such as dusting or odour.
All of the properties of Art-Sorb are completely temperature independent, unlike many silica materials, which have severe performance variations as the temperature fluctuates.

Economic Efficiency

Because Art-Sorb so greatly outperforms other gels much less is needed. This translates into saving not only on the product itself but also in construction of area to incorporate it into future displays, crates and storage facilities. As it can be reconditioned over and over, its value increases even further.

Recommended Amounts (assuming well sealed case).

Recommending a "standard" amount of Art-Sorb for your application is somewhat difficult due to many factors, such as leaks in the crate/case, sunlight, temperature, extreme humidity etc which can greatly effect the amounts required. The type which is best to use is based on which form is the most convenient to incorporate and the desired RH for the particular media. Additionally, it is recommended that some extra Art-Sorb be kept on site, which can serve as a temporary replacement when a particular case or crate needs to be reconditioned.

On the following page you will find an estimate for calculating how much Art-Sorb is needed per cubic foot. When you factor in some of the examples above which may increase the necessary working amount of Art-Sorb, an additional percentage of Art-Sorb should be used to provide a safety zone.

In actuality each project is different and is treated a such with a complete checklist of prevalent factors outlined.

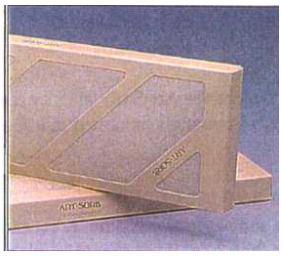
Bead Type

Base recommendation is 1.5 pounds of Art-Sorb in bead form for 16 cubic feet (500g/m3).
Size: 1.5-4.0mm / bead
Weight: 8.0kg / Can
Bulk Density: 0.5kg/ litre

Can be placed in a drawer, in perforated tubes, or spread out at random virtually anywhere in a display case.
Also, larger showcases should use beads since by weight it is more effective than sheet type.

Cassette Type.

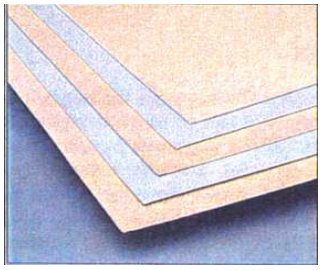
Base recommendation is 1 full cassette for about 26 cubic feet/1m3, (75% of the volume of beads).
Half cassettes are half that at 13 cubic feet/0.7m3.
Constructed of PE/PP sheet packed with beads using an archival quality immersion-type adhesive of polyvinyl chloride acetate polymer base.
Size: 40mm H x 330mm W x 110mm D
Weight: 750 grams / Cassette (bead weight)
The cassette type works best inside a showcase and in storage. It is simple to handle and is serviced easily.



Sheet Type

Constructed of non-woven PE-PP fibre impregnated with Art-Sorb particles.
Requires about 5-10 sheets/ 1m3 volume of air in display case.
Size: 50cm x 50cm x 1.8cm / Sheet
Weight: 160 grams / sheet (100 grams of dry gel/ sheet)

Sheets are ideal for use in small volumes such as framing systems. They should be cut to fit as much of the available backing space as possible for complete protection.



Precaution of Art-Sorb Usage

Art-Sorb is very sensitively preconditioned. Please see the following instructions to use Art-Sorb in an appropriate way.

Air-tight Showcase

Art-Sorb cannot perform with sufficient efficiency when wet or dry air flows into the showcase. It is essential to make cases air-tight.

Preconditioning of Showcase

Before Art-Sorb is placed in the showcase, it is necessary to adjust a relative humidity value in a showcase to the desired level by using a dryer or humidifier.

Appropriate Quantity

Please follow the guidelines stated below when setting up Art-Sorb in an air-tight showcase.

Bead Type	500g/m3<
Full Size Cassette	1 cassette/1.5m3<
Half Size Cassette	1 cassette/0.8m3<
Sheet Type	5 sheets/m3<

Note: Sometimes it is necessary to change Art-Sorb quantity considering of characteristics, and quality of materials exhibited in a showcase.

Note: The amounts suggested are only a rough guide, extremes will greatly effect the amounts required.

Placement

Please keep Art-Sorb with as little air in a showcase as possible for its excellent performance. When using Art-Sorb Beads in a showcase, a layer of beads less than 3 cm thick should be placed in an open container. It is recommendable to place Art-Sorb in a showcase after artwork is displayed. As soon as Art-Sorb is set in a showcase, quickly shut the door and make sure it is completely air-tight.

Handling of Art-Sorb
In order to maintain Art-Sorb performance, place it in a showcase within 10 minutes of unpacking it.

Maximising Efficiency Air-gel Interface
The more contact Art-Sorb has with its sealed environment the better it is able to condition the surroundings with a minimal amount of time. The air-gel interface can be maximised by spreading the bead type out as thoroughly and evenly as possible, such as in shallow flat trays or in porous plastic tubes (maximum depth is 3cm). The old desiccant drawers, which comes as standard on many case type systems, are ideal for this purpose. This same theory applies to all of the Art-Sorb forms, in that the greater the contact with surroundings the better the performance characteristics. Art-sorb moves moisture by the process of diffusion. Most display cases, will have some leaks that circulate air. However, a small fan can be incorporated where appropriate to enhance the performance of Art-Sorb.

Infinite Life Span/ Re-conditionability (temporary method).
Art-Sorb can be re-used any number of times, but even though Art-Sorb is a silica based material, its vastly different properties combine to make a material that will need to be reconditioned very infrequently. This process can easily be done in-house using a humidity controlled room, if available. However, the most popular method of reconditioning is a simple process of directly misting the Art-Sorb with water until the appropriate weight is achieved. The drying process is again designed to be as simple as possible, with the most popular method being the use of an oven.

Calculating Appropriate (RE) Conditioning Needs
For Cassette Type – Refer to the appropriate humidity/weight graph for full-size or half-size cassettes.
Weigh the cassette and add or take out water until the desired weight/RH is attained.
Then, if possible, place the cassette in a humidity-controlled area for a few days to assure precise conditioning. A sealable, impermeable plastic bag works well in this application.

For Bead Type – Refer to the "Art-Sorb Ad-Desorption Curve" graph.
Note that the weight values are in terms of percentage of dry base weight. Therefore, in order to determine current RH simply by weighing the material, one must know its weight as dry base. Then, assuming dry base weight is known, to judge the current RH the following procedure should be followed: measure total weight, subtract the original dry base weight, and divide by the dry base weight. This number, expressed as a percentage, can then be referred to the Ad-Desorption isotherm graph to discover the current RH. Adjust the total weight appropriately.

For Sheet Type – The rules are the same as for bead type, however, the sheet portion of the Ad-Desorption graph should be referred to (since, as a percentage of the original weight, beads and sheets have different ad-sorption capacities due to the relatively heavy PE/PP content of the sheets).Sheets also must be weighed at dry weight since, as opposed to cassettes, the total weight and actual weight of Art-Sorb within each sheet varies to some degree.

Note: Current RH of Art-Sorb can also be measured with a hygrometer.

Simple (Re) Conditioning Procedures

To Increase Equilibrium RH
A humidity chamber can be used. A quicker method, however, is direct application of water to the Art-Sorb with a fine mist sprayer. It should be noted, however, that direct contact of dry base Art-Sorb with water may cause the beads to crack. Cracking in no way hinders Art-Sorb's performance; it simply means the Art-Sorb may be more cumbersome to handle. If applying to bead type, spray, pause and stir for ad-sorption in a cycle until the Art-Sorb reaches its desired weight. If sheet type, apply water and pause for adsorption in a cycle. If cassette type, one can either empty the cassette and treat it like bead type, or water can be applied directly to the cassette. When applying water to the cassette, apply as much of the desired water content to the PE/PP portion as possible while taking appropriate time for ad-sorption – saturation of the cardboard will weaken the cassette and may lead to handling problems.

Another method for simple reconditioning when insertion of moisture is needed: simply place a dish of water within the case containing the Art-Sorb until a sufficient amount has been ad-sorbed. This method takes longer but is easier to perform and usually is sufficient since Art-Sorb's equilibrium RH changes very little over period of time.
Of course, this method requires a hygrometer.

To Decrease RH

A humidity chamber can be used. However, perhaps the easiest way to lower Art-Sorb's RH is by placement in an oven. Bead type is safe in extremely high temperatures.
180°C can be used as a general rule. The PE/PP within sheet-type Art-Sorb will become soft at around 70°C, so temperatures of between 50°C and 60°C should be used. The paper of the cassette-type's box is not in danger until around 80°C, so the same guidelines as for sheets type are applicable.
Otherwise, at least three simple possibilities exist which can be used for all 3 types of Art-Sorb. One is placement in sunlight. The second is used of a blow dryer. The third, which is one that is easily performed within the exhibition case, is placement of a pouch of regular silica gel within the case until the desired amount of moisture has been adsorbed from the Art-Sorb. This method requires use of a hygrometer.
Once it has reached the targeted RH, placement of the Art-Sorb in a sealed area for a few days will assure thorough and even conditioning.
Remember that Art-Sorb is inert and has an infinite life span.
While it can be reconditioned any number of times, and though it is entirely safe to handle, its large capacity means that reconditioning only seldomly needs to be done.

Methods of Incorporating Art-Sorb Into Display, Storage & Crating

When using Art-Sorb some preliminary steps can be taken to ensure even better performance. For example, the closer your case or crate is to being completely sealed the better Art-Sorb will work on the environment within. Attempts to further seal any type of storage system will be of benefit.

Tip: Clear aquarium PVC tubing is a very inexpensive and nearly invisible method of sealing gaps in sliding glass doors or edges of storage vehicles/cases.

Before inserting Art-Sorb into the case it is advised to bring the humidity to a level which is in the general area of where the Art-Sorb will be maintaining it. By doing so, the Art-Sorb is not unnecessarily exposed to extreme conditions at the onset and the amount of time that Art-Sorb can be used before re-conditioning is extended. Once this is achieved, a minimum amount of exposure time outside the packaging, before sealing Art-Sorb within the case/crate, is recommended: maximum time unsealed should be no more than 5-10 minutes. If you have to break open a package and need to re-seal the remaining Art-Sorb, heat sealing into a heavy gauge PE tubing is one method to store for later use.
You could also use some of the 2 gallon size Zip lock type bags (double bagging is recommended). If you are going to store Art-Sorb for any significant time outside of its factory packaging you should set up a schedule to check the Art-Sorb by hygrometer periodically.

Incorporating Art-Sorb in display cases, common methods include:

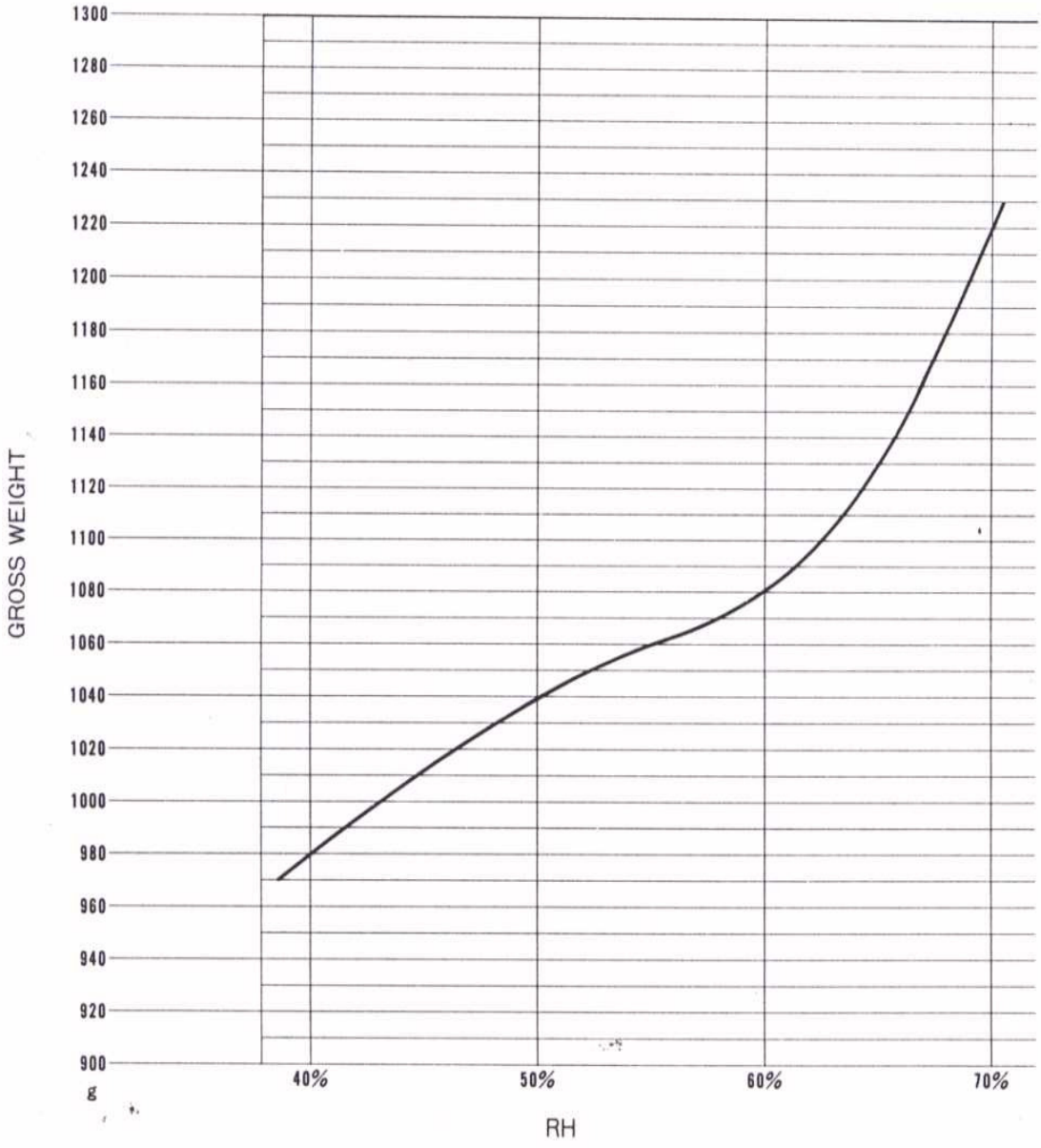
Crating a recessed area, such as a trap door in the bottom, covered by peg-board and then fabric to hide the Art-Sorb. Also, an elevated platform on the bottom of the display case with the Art-Sorb underneath is a good method. By placing Art-Sorb beads in cotton bags or inside flexible tubing (with slits or holes in it) you have a few more methods. There really are numerous ways to include Art-Sorb into your situation. In the case of storage or shipping, where aesthetics are unimportant, the only real concern (which applies as well to display situation) is the need to use Art-Sorb and then hide it in a false floor with only the one air exchange portal.
Finally, when using the sheets in a frame, the sheet must be sealed completely within the frame both in the back and front. Think of it as a mini display case.

Tip: When using cassette style, keep their axis flat versus positioning the cassette vertically against gravity. When hung vertically the beads pack densely into the bottom, creating a poor amount of bead/air contact. Also you can create smaller cassettes by cutting into halves or thirds. Once you cut the cassette you will need to reinforce the weak side (the one which was cut) with some piece of archival materials of your

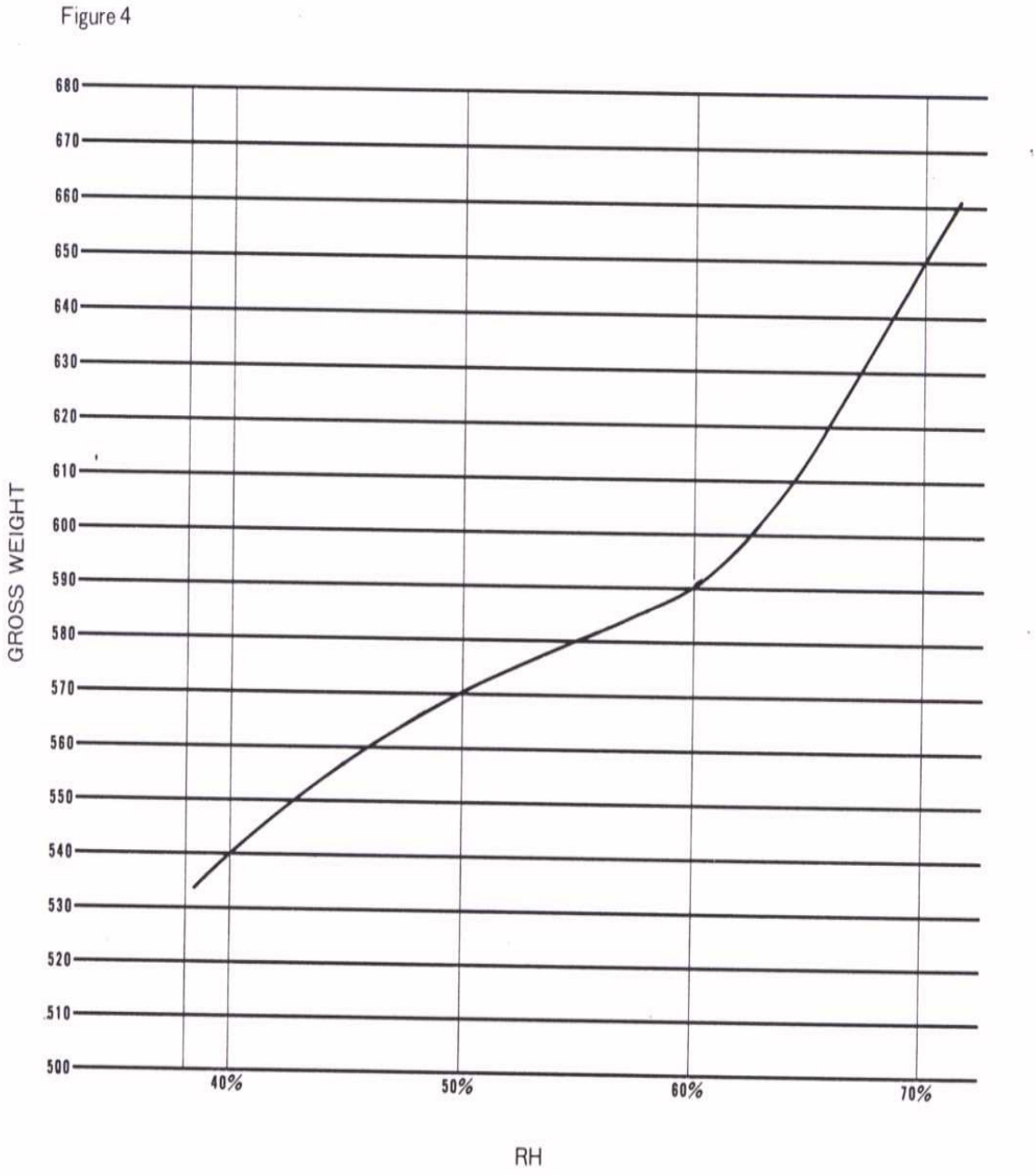
choice which seals the entire open edge of the cassette. You could take the beads out and put them in a mesh or cotton bag as well. Just remember to calculate the correct amount of beads for the cubic volume that you have.

ART-SORB HUMIDITY/WEIGHT GRAPH FOR FULL-SIZE CASSETTE

Figure 3



ART-SORB HUMIDITY/WEIGHT GRAPH FOR HALF-SIZE CASSETTE



Calculation Table for Required Amounts

# of lbs of beads or # of cassette/half cassette	Beads	Cassette	½ Cassette	
1	16ft ^{3}	26ft^3	13 ft^3	Example A cm^3
2	32	52	26	
3	48	78	39	
4	64	104	52	
5	80	130	65	
6	96	156	78	
7	112	182	91	
8	128	208	104	
9	144	234	117	
10	160	260	130	
11	176	286	143	
12	192	312	156	
13	208	338	169	
14	224	264	182	
15	240	290	195	
16	256	416	208	
17	272	442	221	
18	288	468	234	
19	304	494	247	
20	320	520	260	
21	336	546	273	
22	352	572	286	
23	368	598	299	
24	384	624	312	
25	400	650	325	
26	416	676	338	
27	432	702	351	
28	448	728	364	
29	464	754	377	
30	480	780	390	
31	496	806	403	
32	512	832	416	Example B
Example A	1 lb beads =	16 ft^3 =	1/32 of 1 case	
	1 cassette =	26 ft^3 =	¼ of 1 case	
	1 half cassette =	13 ft^3 =	1/8 of 1 case	
Example B	32 lbs beads =	512 ft^3 =	1 case of beads (2 tins)	
	32 cassettes =	832 ft^3 =	8 cases	
	32 half cassettes =	416 ft^3 =	4 cases	