

A BACKYARD, FORCED AERATION, DIGESTER COMPOSTING SYSTEM CONSISTING OF *The CompostAir*® and *The CompostScreen*®

By

Frank T. Smith

Master Gardener Volunteer and Master Composter Recycler Volunteer Instructor
of The University of Tennessee Agricultural Extension Service
Coordinator and Organizer of Two Blount County, Tennessee—Master Composter Recycler Courses
Monthly Composting Columnist for Senior Living Newspapers—Serving Nine Eastern Tennessee Counties
Weekly Composting and Gardening Columnist in The Daily Times Serving Blount County, Tennessee
Maryville, Tennessee

INTRODUCTION

This paper is written in the style I use in my weekly Daily Times column, monthly Senior Living Newspapers column, and in the original literature I furnished to over 250 people who have taken my class in backyard digester composting. All are titled: "IF YOU CAN COOK? YOU CAN COMPOST!" I have found I am teaching and writing mostly for non-technical "senior citizens" who have the inclination and, more important, the time to attend classes, and also the time to compost.

DEFINITION

Digester composting is simply composting by insuring that a constant supply of warm, moist air penetrate the compost mass at all times to provide a supply of oxygen to aerobic (requiring oxygen to live) soil microorganisms. These microorganisms, mainly bacteria, have simple requirements—CARBON from dead and dried out plants and shrubs, NITROGEN from fresh green plant material, WATER from the same fresh green plant material, and OXYGEN from the forced aeration of the mass—to satisfy their voracious appetites. A properly operating digester composter has a environment similar to a "Joe's Diner" in the Thirties—it's warm, muggy and the ceiling fans are running.

BACKGROUND

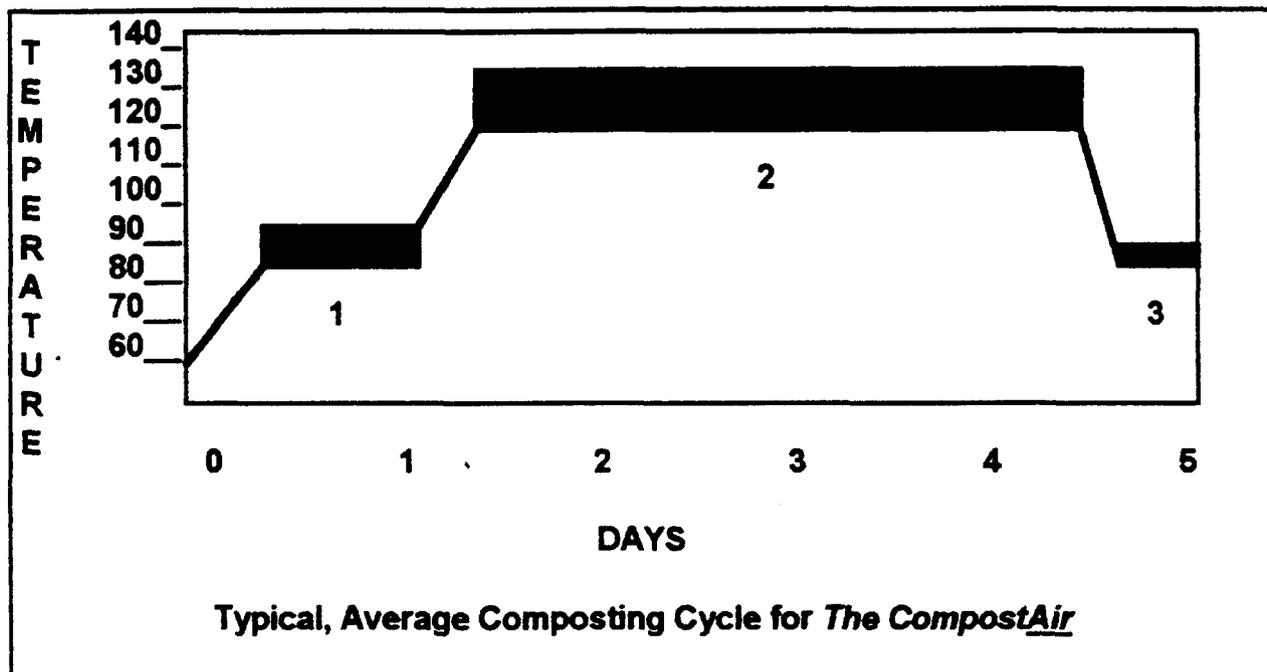
When I left our house in Maryville on a March Saturday in 1995 to attend my first composting class which was sponsored by KEEP BLOUNT BEAUTIFUL, Sue Dawson—Manager, my 82 year old mother had the last word, which was: "Composting smells!". Driving home from the class with my head spinning with bushels and carbon-nitrogen ratios, I decided the first priority would be to eliminate Mom's odor objection to having a composter outside the kitchen door. Thus was eventually born *The CompostAir*, and later *The CompostScreen*.

Professionally, I am a retired Mechanical & Environmental Engineer and Troubleshooter. My definition of correct troubleshooting is: keep your eyes and ears open, mouth shut, and take copious notes—until you know what is going on—so the actual problem may be identified and solved. This approach led me to *The CompostAir*.

If aeration promotes the growth of aerobic bacteria—how could I begin composting, without any odor, using materials around the house? Before I arrived home I decided that my first effort would use: (1) a worn out 32 gallon plastic garbage can that was going to be thrown out; (2) an aquarium vibrator air pump and a 5" diameter air stone (available because of my hobby of raising Tropical fish); and a perforated pizza pan—to both protect the air stone and to distribute the air over the bottom of the garbage can. I began loading and operating *The CompostAir* in June of 1995 using standard composting pile lore by layering dead wood, fresh green plants, sprinkling garden soil over the plants, and watering to almost saturation during the layering.

DIGESTER COMPOSTING THEORY AS IT APPLIES TO *The CompostAir*

At outside air temperatures above 60° F the soil microorganisms become active. Finding themselves surrounded by their favorite meal (small pieces of carbon and nitrogen), and an ample and constant supply of fresh air containing oxygen, they begin eating. Dining on the carbon (dead wood) they create heat and carbon dioxide, which increases by convection the air flow throughout the mass. Snacking on the nitrogen (fresh green plants) they first free-up the water (eliminating the standard lore of adding water to the compost mass) and begin converting the plants into humus. Looking at the TEMPERATURE VS DAY Chart below you see that things happen quite fast!



CONSTRUCTING *The CompostAir*

Recycle an old wheel-less garbage can or purchase a new one. Soak the 5" diameter air stone in a bowl of water and begin construction:

1. Drill a 1/4" diameter hole in the side of the can 1" above the bottom of the can.
2. Drill a 1/2" diameter hole through the center of the lid (to let out the carbon dioxide).
3. Feed the 1/4" air tubing through the hole in the side and pull most of it up to the top on the inside of the can.
4. Connect the air stone to the tubing and then pulling on the tubing outside the can, lower the air stone to the center of the bottom of the can.
5. Connect the air pump to the air stone.
6. Drop in the perforated pizza pan upside down. The pan may be supported by indentations in the bottom of the can or place three 1 1/2" pieces of wooden block into the can. You do not want the pan resting on top of the air stone, restricting air flow only to the center of the can above the air stone.
7. You are now ready to load *The CompostAir*, but see drawing on Page 5 for cautions and details.

LOADING *The CompostAir*

Blend equal amounts of small pieces (1 1/2") of dead wood (carbon) and fresh plants (nitrogen) in a wheelbarrow, similar to the way you would toss a salad. The soil clinging to the plant roots will introduce enough microorganisms provided you do not shake it off when pulling the plants. It will require three 5-gallon pails of each to fill *The CompostAir*. Place the lid on the can and plug in the air pump. Once a day, beginning the 2nd day, poke into the

mass through the hole in the lid, to the bottom of the can with a 1/4" diameter bamboo stake to insure the air penetrates up through the mass.

This same 1/4" diameter bamboo stake, when left sticking into the mass through the hole in the lid, also serves as a "manual" thermometer. Referring to the AVERAGE CYCLE CHART ABOVE, if the stake feels cool to the touch the soil microorganisms in the compost mass are either in the range of warming up (1), or ready for harvest (3), and if it is warm (hot) they are actively feeding (2). Since that is all you really care about then there is actually no real reason to invest 15 to 20 dollars in a compost thermometer!

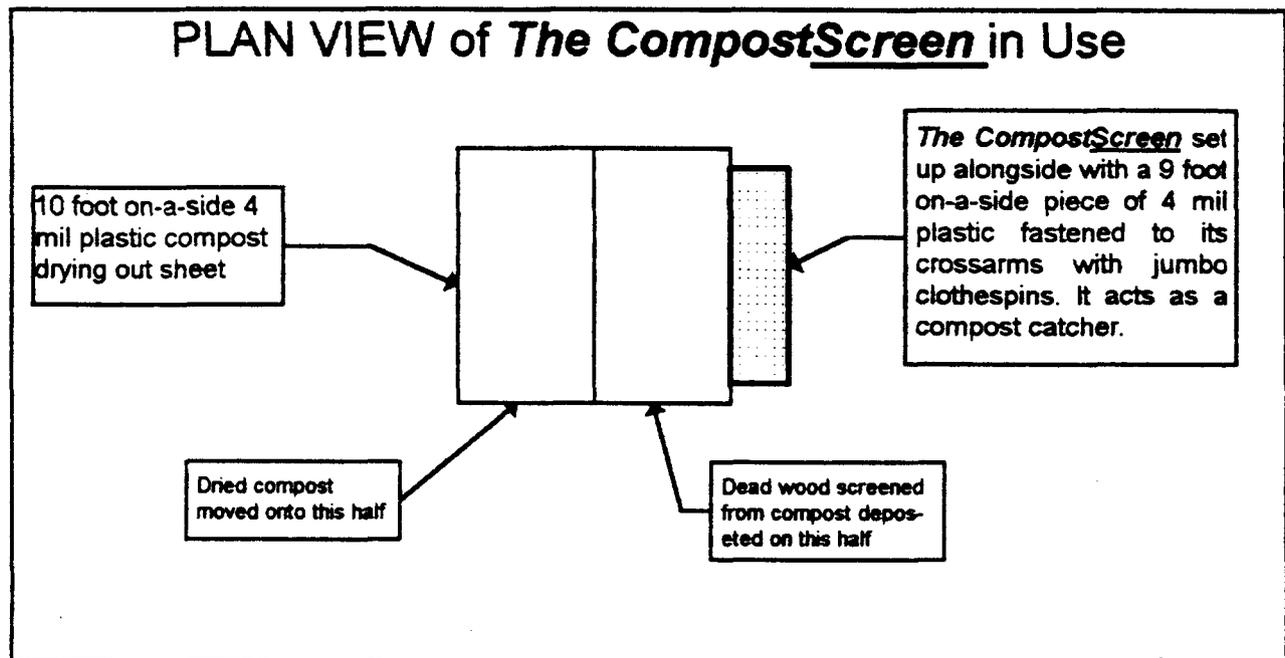
The 4th or 5th day you will find that the mass has pulled away from the side of the can, and dropped halfway down the can. The bamboo stake will feel cool to the touch, meaning the temperature has dropped back down to the 90° range (3). What you now have is about 16 gallons of sopping wet mass containing uneaten dead wood and digested green plants. The fresh green plants have become very wet, mineral rich humus (since none of the water has escaped from the mass), harvested by drying and screening—using *The CompostScreen*.

DISCUSSION OF *The CompostScreen*

Most current screening methods are completely ludicrous because one is either using a box hung on chains (How do you empty the box without becoming a chiropractor's customer?) or doing the "Chubby Checker Twist" with a hand held box (supporting the weight of the box and material with your back). The drawing for *The CompostScreen* on page 6 is self-explanatory, however: (1) Flatten one end of each post, (2) Tighten cable ties with pliers.

OPERATION OF *The CompostScreen*

In the "LOADING *The CompostAir*" paragraph I stated you had soaking wet material. On a sunny day the material (all 100 plus pounds) is emptied from *The CompostAir* onto the center of a section of 4 mil plastic, 10 feet on-a-side, which is then dragged over alongside *The CompostScreen*, and the material is raked out to dry.



The support structure for the screening box may be temporarily set up within five minutes anywhere on your property. The user is never supporting the weight of the box either while screening or dumping the screened-out deadwood onto the adjacent plastic sheet. In the plan view above you just position the box between the vertical poles and "dump" to the left, at no time supporting any weight. While *The CompostAir* will cycle in approximately five days it does not make sense to go through the drying out and screening process unless there are more plants to load for composting.

DISCUSSION OF THE VIBRATOR AIR PUMP— AIR QUANTITY TESTING

Eighty-five percent of the vibrator air pumps manufactured for the aquarium hobby are made by one manufacturer and distributed under various trade names. They use a "small", "medium" and occasionally a "large" diaphragm. They are not rated in cubic inches per minute, but in the number of air stones they will support in different size aquariums. Very unscientific! With over 20 years in the hobby I found that the Challenger 1 and Penn Plex five inch diameter air stone combination gave me the most "bang for the buck" with respect to the amount of air introduced into an aquarium. Since this was combination available at home it is what I tried using in *The CompostAir*. Larger capacity piston and verylarge diaphragm air pumps only reduced the temperature of the compost mass by evaporative cooling, sending the soil microorganisms back into dormancy. The Challenger 1 aquarium air pump coincidentally provided the optimum air flow through the Penn Plax ASD-L for this application.

ADVANTAGES OF *The CompostAir*

1. Since it is the fastest device available to the home composter it also has the largest capacity by volume to process fresh live garden plant material. My barber's 72 year old mother operates two of them all summer long to process her garden and kitchen waste from a much larger garden than mine.
2. Since *The CompostAir* is a closed system and not subject to the drying effect of winds or the over watering of rain, the soil microorganisms eating at their "Joe's Diner" completely digest all of the green plant material. You are not digging for "black gold" just at the center of the pile, as is the case in most composters.
3. Absolutely nothing produces humus richer in minerals since there is no leachate being wasted to the ground as is the case with a standard compost pile.
4. No turning over of the material is required.
5. The weight of material is manageable for senior citizens because it is never lifted
6. Low cost—it can be built in half an hour by anyone for about \$30.00. Nothing else on the market comes even close.
7. If you load on a Saturday you can, if it doesn't rain the next Friday and Saturday, spread to dry on Friday and then screen out the humus with *The Compost Screen* and reload on Saturday (providing you have fresh plant material to load).

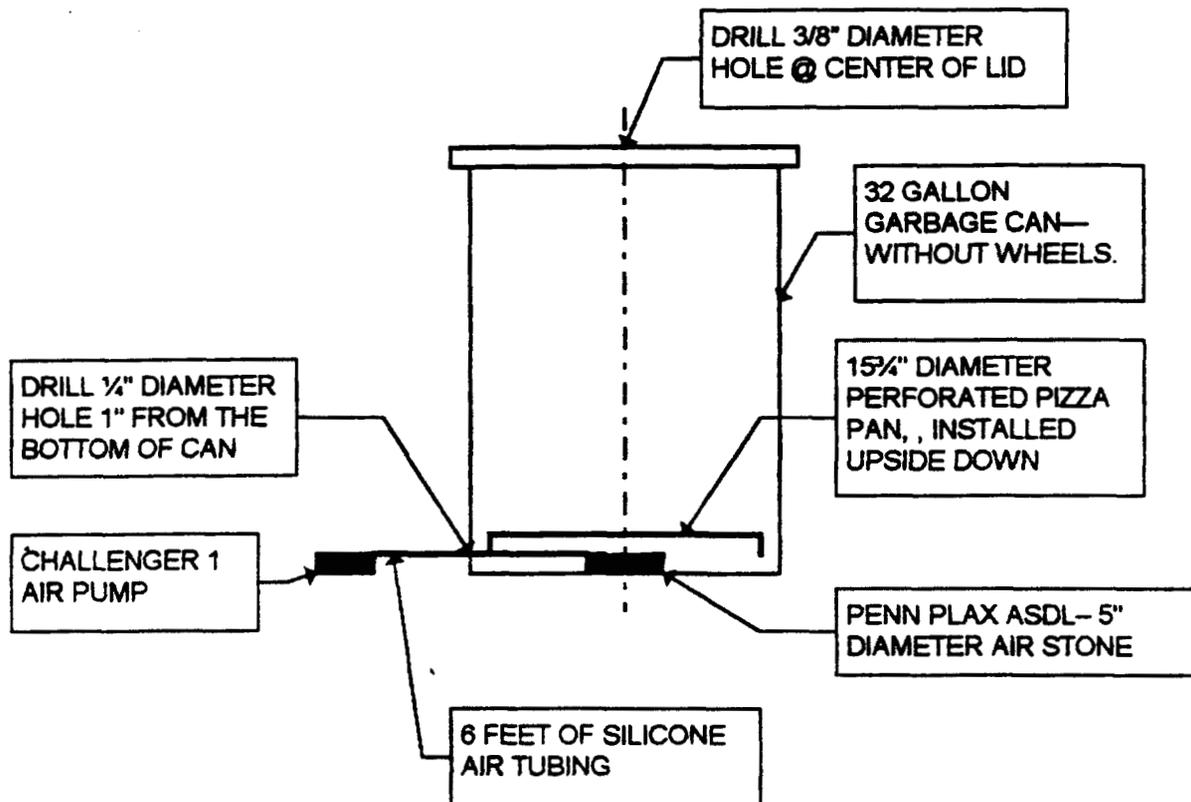
DISADVANTAGES OF *The CompostAir*

1. Because of its short cycle it does not reduce the volume of the carbon materials. I am currently running an experiment that does reduce that volume. I actually do not want to, since my property does not produce enough dead wood in the first place. I usually must supplement using pine bark mini-nuggets.
2. Even if blended in with the dead wood, grass clippings still have a tendency to mat together, shutting off the air flow..
3. It will not short cycle leaves, even when shredded, although as noted in (1) above I am possibly getting there.

SUMMATION

Over 100 of *The CompostAir* systems are in use in the Knoxville, TN Metro area. Try it! You'll like it!

Outline Drawing for *The CompostAir*

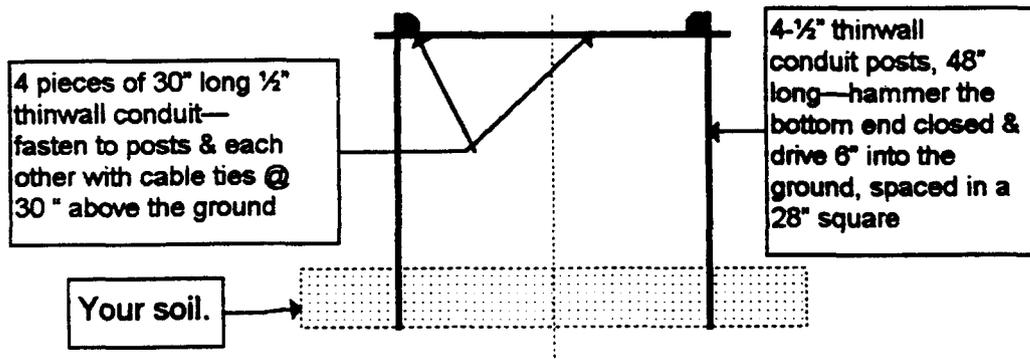


MATERIAL SOURCES—The aquarium items are available from THE MAIL ORDER PET SHOP @ 1-800-366-7387 as:

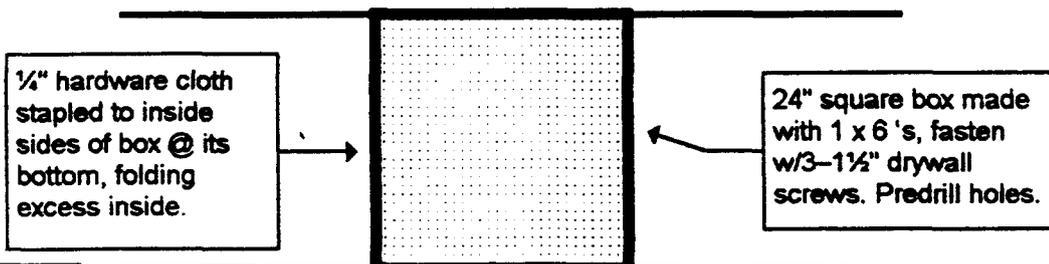
1. PENN PLAX ASD-L – 5" DIAMETER AIR STONE – ITEM A2818
2. 6 FEET OF SILICONE AIR TUBING – ITEM A5945
3. CHALLENGER 1 AIR PUMP – ITEM A0360
4. EXTRA DIAPHRAGM FOR CHALLENGER 1 – ITEM A0387
5. THE 15 1/4" DIAMETER PERFORATED PIZZA PAN – AT YOUR LOCAL DISCOUNT STORE.

NOTES

1. No substitutions permitted on aquarium items. Your local store may offer an "it's just the same" item. It's most often not!
2. Normal aquarium air tubing will bend and crimp.
3. My item number is correct on Item 4 above—their catalog has an error.
4. **CAUTION**—Unplug the air pump at its wall outlet before working on *The CompostAir*. THE AIR PUMP IS NOT U.L. LISTED FOR OUTDOOR USE.
5. The vibrator diaphragm on the Challenger 1 air pump will eventually wear out. I recommend ordering a spare.

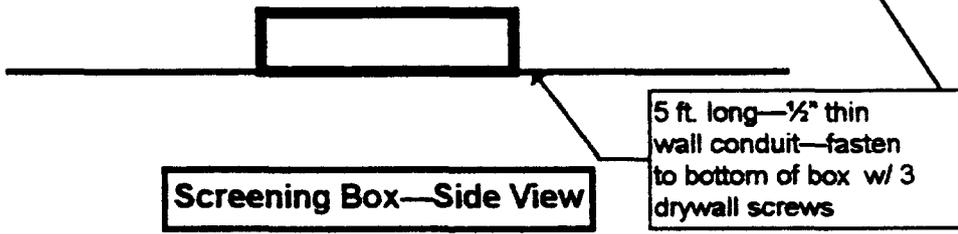


Compost Screening Support Frame—Side View



Screening Box—Top View

If you have allergies or suffer from asthma it is sensible to cover your mouth and nose with at least a paper air filter while you are screening compost.



Screening Box—Side View

<u>QTY</u>	<u>ITEM</u>
4	10 foot lengths of 1/2" diameter thinwall conduit
4	24" pieces of 1" x 6" lumber (1" x 8" would be even better)
24	1 1/2" drywall screws
1	bag of 100— 8" nylon cable ties
1	36" square piece of 1/4" hardware cloth—staple inside of the box @ bottom,

Outline Drawing of *The CompostScreen*