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The Humanure Toilet – An Overview

Simple methods of collecting and composting humanure are sometimes called cartage systems, as the manure is carried to the compost bin in waterproof vessels. People who utilize such simple techniques for composting humanure simply take it for granted that humanure recycling is one of the regular and necessary responsibilities for sustainable human life on this planet.

How it works is a model of simplicity. One begins by depositing one's organic refuse (feces and urine) into a waterproof toilet receptacle with about a five-gallon (20L) capacity. Food scraps should be collected in a separate, covered receptacle to prevent a fruit fly infestation. A five-gallon toilet capacity is recommended because a larger size would be too heavy to carry when full. If a full five-gallon receptacle is still too heavy for someone to carry, it can be emptied when only half full.

The contents of the toilet are *always* kept covered with a clean, organic *cover material* such as rotted sawdust, peat moss, leaf mould, rice hulls or grass clippings, in order to prevent odors, absorb urine, and eliminate any fly nuisance. Urine is deposited into the same receptacle, and as the liquid surface rises, more cover material is added so that a clean layer of organic material covers the toilet contents *at all times*.

A lid is kept on the toilet receptacle when not in use. The lid need not be air-tight; a standard, hinged toilet seat is quite suitable. This lid does not necessarily prevent odor from escaping, and it does not necessarily prevent flies from gaining access to the toilet contents. Instead, *the cover material does*. The cover material acts as an organic lid or a *biofilter*; the physical lid or toilet seat is used primarily for convenience and aesthetics. Therefore, the choice of organic cover material is very important and a material that has some moisture content, such as rotted sawdust, works well. This is not kiln-dried sawdust from a carpenter shop. It is sawdust from a sawmill where trees are cut into boards. Such sawdust is both moist and biologically active and makes a very effective biofilter. Kiln-dried sawdust is too light and airy to be a 100% effective biofilter, unless partially rehydrated. Furthermore, kiln-dried sawdust from wood-working shops may contain hazardous chemical poisons if "pressure-treated" lumber is being used there.

During a cold winter, an outdoor pile of sawdust will freeze solid and should be covered or insulated in some manner. Otherwise, containers filled with sawdust stored in a basement will work as an alternative, as will peat moss and other cover materials stored indoors. A large, plastic refuse container with wheels is great for storing sawdust indoors during winter months.

The system of using an organic cover material in a toilet receptacle works well enough in preventing odors to allow the toilet to be indoors, year round. In fact, a full toilet receptacle with adequate and appropriate cover material, and no lid, can be set on the kitchen table without emitting unpleasant odors (take my word for it). An indoor sawdust toilet should be designed to be warm, cozy, pleasant and as comfortable as possible. A well-lit, private room with a window, a standard toilet seat, a container of

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cover material and some reading material will suffice.

Full toilet receptacles are carried to the composting area and deposited into the pile (not on top of it). You'll know that a receptacle is full enough to empty when you have to stand up to take a shit. Since the material must be moved from the toilet room to an outdoor compost pile, the toilet room should be handy to an outside door. If you are designing a humanure toilet in a new home, situate the toilet room near a door that allows direct access to the outside.

It is best to dig a slight depression in the top center of the compost pile in the outdoor compost bin, then deposit the fresh toilet material there, in order to keep the incoming humanure in the hotter center of the pile. This is easily achieved by raking aside the cover material on top of the pile, depositing the toilet contents into the resulting depression, then raking the cover material back over the fresh deposit. The area is then immediately covered with additional clean, bulky, organic matter such as straw, leaves, or weeds, in order to eliminate odors and to trap air as the pile is built.

The toilet receptacle is then thoroughly scrubbed with a small quantity of water, which can be rain water or graywater, and biodegradable soap, if available or desired. A long-handled toilet brush works well for this purpose. Often, a simple but thorough rinsing will be adequate. Rain water or wastewater is ideal for this purpose as its collection requires no electricity or technology. The soiled water is then poured on the compost pile.

It is imperative that the rinse water not be allowed to pollute the environment. The best way to avoid this is to put the rinse water on the compost pile, as stated. Under no circumstances should the rinse water be flung aside nonchalantly. This can be a weak link in this simple humanure recycling chain and it provides the most likely opportunity for environmental contamination. Such contamination is easy to avoid through considerate, responsible management of a closed system. Finally, never use chlorine to rinse a compost receptacle. Chlorine is a chemical poison that is detrimental to the environment and is totally unnecessary for use in any humanure recycling system. Simple soap and water is adequate.

After rinsing or washing, the bucket is then replaced in the toilet area. The inside of the bucket should then be dusted with sawdust, the bottom of the empty receptacle should be primed with a few inches of sawdust, and it's once again ready for use. Finally, always wash your hands after feeding the compost pile, after using the toilet, and before feeding yourself.

When first establishing such a toilet system, it's a good idea to acquire at least *four* five-gallon receptacles with lids, that are *exactly the same*, and more if you intend to compost for a large number of people. Use one under the toilet seat and the other three, with lids, set aside in the toilet room, empty and waiting. When the first becomes full, take it out of the toilet, put a lid on it, set it aside, and replace it with one of the empty ones. When the second one fills, take it out, put the other lid on it, set it aside, and replace it with the other empty one. Now you have two full toilet receptacles, which can be emptied at your leisure, while the third is in place and ready to be used. This way, the time you spend emptying compost is cut in half, because it's just as easy to carry two receptacles to the compost pile as

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one. Furthermore, you potentially have a 20-gallon toilet capacity at any one time instead of just five gallons. You may find that extra capacity to come in very handy when inundated with visitors.

Why should all the receptacles be exactly the same? If you build a permanent toilet cabinet, the top of the receptacle should protrude through the cabinet to contact the bottom of a standard toilet seat. This ensures that all organic material goes into the receptacle, not over its edge. Although this is not usually a problem, it *can* be with young children who may urinate over the top of a receptacle when sitting on a toilet. A good design will enable the receptacle to fit tightly through the toilet cabinet. If using plastic buckets for toilet receptacles, remember that many are slightly different in height and diameter, so you should build your toilet cabinet to fit one size bucket. You should have extra identical buckets when backup capacity is needed to accommodate large numbers of people.

The advantages of a humanure toilet system include low financial start-up cost in the creation of the facilities, and low, or no energy consumption in its operation. Also, such a simple system, when the refuse is thermophilically composted, has a low environmental cost as little or no technology is required for the system's operation and the finished compost is as nice and benign a material as humanure can ever hope to be. No composting facilities are necessary in or near one's living space, although the toilet can and should be inside one's home and can be quite comfortably designed and totally odor-free. Also, all urine and fecal material is collected in the toilet, as is all toilet paper. There is no need to segregate urine or paper when using a humanure toilet.

No electricity is needed and no water is required except a small amount for cleaning purposes. One gallon of water can clean two five gallon receptacles. It takes one adult two weeks to fill two five gallon toilet receptacles with humanure and urine, including cover material. This requires one gallon of cleaning water for every two weeks of humanure toilet use as opposed to the standard thirty gallons per person per day used to flush a water toilet.

The compost, if properly managed, will heat sufficiently for sanitation to occur, thereby making it useful for agricultural purposes. The composting process is fast, i.e., the humanure is converted quickly - within a few days if not frozen - into an inoffensive substance that will not attract flies. In cold winter months the compost may simply freeze until the spring thaw, then heat up. If the compost is unmanaged and does not become thermophilic, the compost can simply be left to age for a couple of years before horticultural use. In either case, a complete nutrient cycle is maintained, unbroken.

A humanure toilet requires three components: 1) the toilet receptacle; 2) cover materials; and 3) a compost bin system. The toilet will *not* work without all three of these components. The toilet itself is only the collection stage of the process. Since the composting takes place away from the toilet, the compost bin system is important. Humanure toilets are technically not composting toilets as no composting takes place in the toilet, nor *can* composting occur inside the toilet due to the small mass of the material in the receptacle. Humanure toilets are simply collection devices for bin composting. In a kitchen, one may have a compost receptacle for food scraps. When recycling humanure, one uses a compost receptacle in the toilet room. All of the collected organic materials are fed to microorganisms

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in a compost bin system.

- 1) *Use at least a double-chambered, above-ground compost bin.* A three-chambered bin is recommended. Deposit in one chamber for a period of time (e.g., a year, or until it fills), then switch to another for an equal period of time.
- 2) *Deposit a good mix of organic material into the compost pile,* including kitchen scraps. It's a good idea to put all of your organic material into the same compost bin. Pay no attention to those people who say that humanure compost should be segregated from other compost. They are people who do not compost humanure and don't know what they're talking about.
- 3) *Always cover humanure deposits in the toilet with an organic cover material* such as sawdust, leaf mould, peat moss, rice hulls, ground newsprint, finely shredded paper or what have you. *Always cover fresh deposits on the compost pile with coarse cover materials* such as hay, weeds, straw, grass clippings, leaves, or whatever is available. Make sure that enough cover material is applied so there is neither excess liquid build-up in the toilet nor offensive odors escaping either the toilet or the compost pile. The trick to using cover material is quite simple: if it smells bad or looks bad, cover it until it does neither.
- 4) *Keep good access to the pile* in order to rake the top somewhat flat, to apply bulky cover material when needed, to allow air access to the pile, and to monitor the temperature of the pile. The advantage of aerobic composting, as is typical of an above-ground pile, over relatively anaerobic composting typical of enclosed composting toilets, is that the aerobic compost will generate higher temperatures, thereby ensuring a more rapid and complete destruction of potential human pathogens.

The disadvantages of a collection system requiring the regular transporting of humanure to a compost pile are obvious. They include the inconvenience of: 1) carrying the material to the compost pile; 2) keeping a supply of organic cover material available and handy to the toilet; and 3) maintaining and managing the compost pile itself. If one can handle these simple tasks, then one need never worry about having a functioning, environmentally friendly toilet.

It's very important to understand that *two* factors are involved in destroying potential pathogens in humanure. Along with heat, the *time* factor is important. Once the organic material in a compost pile has been heated by either mesophilic or thermophilic microorganisms, it should be left to age or "season." This part of the process allows for the final decomposition to take place, decomposition that may be dominated by fungi and macroorganisms such as earthworms and sowbugs. Therefore, a good compost system will utilize at least two composting bins, one to fill and leave to age, and another to fill while the first is aging. A three-binned composting system is even better, as the third bin provides a place to store cover materials, and separates the two active bins so there is no possible accidental transfer of fresh material to an aging bin.

When composting humanure, fill one bin first. Make sure the bottom of the bin has been slightly dished

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out like a bowl and the excess dirt placed around the inside edges of the bin. Should there ever be an excess of liquid in the compost bin, this simple technique will make sure it remains inside the bin. Start the compost pile by establishing a thick layer of coarse and absorbent organic material on the bottom of the bin. This is called a "biological sponge." Its purpose is to act as a leachate absorption barrier. The sponge may be an 18 inch *or more* layer of hay, straw, grass clippings, leaves, and/or weeds. Place the first container of the humanure/cover material mix from the toilet directly on the top center of the sponge. Cover immediately with more straw, hay, weeds, or leaves - the cover acts as a "biofilter" for odor prevention, and it causes air to become trapped in the developing compost pile, making physical turning of the pile for aeration unnecessary. A standard bin size for a family of four with an active garden is about 5 feet square and 4 feet high (1.6 m² x 1.3m tall). Smaller bins may be necessary for smaller families or for individuals. If the bin is too small, however, the compost will not develop enough mass to heat up.

Continue in this manner until the bin is full, which is quite likely to take a year when used by four adults, being sure to add to this bin as much of the other organic material you produce as is practical. There is no need to have any other compost piles - one is enough for everything produced by the humans in your household. If you have small animals such as chickens or rabbits, their manure can go into the same compost pile. Small dead animals can also be added.

You need do nothing special to prepare material for adding to the compost pile. You do not need to chop up vegetables, for example. Just chuck it all in there. Most of the things compost educators tell you cannot be composted *can* be composted in a humanure compost pile (such as meats, fats, oils, citrus fruits, animal mortalities, etc.). Add it all to the same compost pile. Anything smelly that may attract flies should be dug into the top center of the pile. Keep a shovel or pitchfork handy for this purpose and use the tool only for the compost. Keep a clean cover material over the compost at all times and don't let your compost pile become shaped like a Matterhorn - keep it somewhat flattened so nothing rolls off.

When you have a sudden large quantity of cover material available, such as an influx of grass clippings when the lawn is mowed, weeds from the garden, or leaves in the fall, place them in the center bin for storage and use them to cover humanure deposits as you need them. It is assumed that you do not use any poisonous chemicals on your lawn. If you do, bag the lawn clippings, take them to a toxic waste dump, and on the way, reflect upon the folly of such behavior. Do not put poisoned grass clippings in your compost pile.

Filling the first bin should take a year - that's how long it takes us [Joe Jenkins and family], usually four, with a lot of visitors. We have used this system continuously for 28 years (as of 2007), and every year at the summer solstice we start a new compost pile. During March, April, and May, the pile always *looks* like it is already full and can't take any more material, but it always does. This is due to the constant shrinkage of the compost pile that takes place as summer approaches. When the pile is finally completed, it is covered with a thick layer of straw, leaves, grass clippings or other clean material (without weed seeds) to insulate it and to act as a biofilter; then it is left to age.

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At this time, the second bin is started following the same procedure as the first - starting with an empty bin and a biological sponge. When the second chamber is nearly full (a year later), the first one can begin to be used for agricultural purposes. If you're not comfortable using your compost for gardening purposes for whatever reason, use it for flowers, trees, or berries.

An active compost pile can accept a huge amount of refuse, and even though the pile may seem to be full, as soon as you turn your back it will shrink down and leave room for more material. One common concern among neophyte humanure composters is the pile looking like it's filling up too fast. More than likely, the compost pile will keep taking the material as you add it because the pile is continually shrinking, especially if it's heating up. If, for some reason, your compost pile does suddenly fill up and you have no where to deposit the compost material, then you will simply have to start a new compost bin. Four wooden pallets on edge will make a quick compost bin in an emergency. When using pallets, however, be careful to stuff clean cover material around the outer edges of the pile to prevent anything falling through the slats.

The system outlined above should not yield any compost until about two years after the process has started (one year to build the first pile and an additional year for it to age). However, after the initial two year start-up period, an ample amount of compost will be available on an annual basis.

Happy crappin'!