Humanure Sanitation

The “no waste, no pollution, nothing to dispose of” toilet system.

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ABSTRACT: Humanure toilets are designed to collect human excreta, including fecal material and urine together without separation, along with a carbon (plant cellulose-based) cover material, for the purpose of achieving an odor-free thermophilic (heat-producing) organic mass. The thermophilic phase renders the organic material hygienically safe by destroying pathogenic organisms, thereby creating a final product, humus, which is suitable for growing food. These toilets are inexpensive and very simple in design and implementation. They do not produce or dispose of waste and they create no environmental pollution. This study looks at various humanure systems in the United States.

KEYWORDS: compost toilet, humanure, Joseph Jenkins, sanitation, thermophilic

Introduction: What is "Humanure Sanitation"?

The humanure sanitation system is a compost toilet system designed and intended to promote the thermophilic composting of human excrement. Human excreta, including fecal material and urine, are not considered waste materials that need to be disposed of. Instead, they are considered resource materials that must be recycled and reclaimed for reuse. When properly used and managed, a humanure toilet system requires virtually no water, produces no waste, creates no environmental pollution, attracts no flies, costs very little, requires no urine diversion, and produces no odor. Instead of waste, the toilet produces humus, a valuable resource that can safely grow food for human beings. It can be constructed for very little money or no money at all if recycled materials are used. The toilet itself can have a small footprint and can therefore be located virtually anywhere outdoors or indoors -- in a bedroom, closet, porch, basement, dormitory, office or apartment. When properly utilized, the toilet produces no unpleasant odor, therefore its presence inside a living area can remain completely unnoticed and discreet. The humanure toilet requires no urine diversion -- all urine, feces, toilet paper and everything that is normally deposited into a flush toilet (not including chemicals) can be deposited into a humanure toilet. The humanure toilet system can also provide the basis for a complete composting system for a home or community, allowing for the recycling of food and other organic materials that are often discarded by people. The humanure toilet requires no pit or hole in the ground, does not allow human excrement to come in contact with soil or water supplies, creates no ground water pollution, and when properly managed, is a pleasant and convenient toilet alternative.

How does a humanure system work?

The humanure toilet system is based on the concepts and principles of thermophilic composting. There are three basic components required for such a system to successfully operate: 1) the toilet itself; 2) the organic cover material; and 3) the compost bins.

Component #1 - The Toilet: The toilet component is simply a collection device. Its purpose is to collect human excrement, both urine and feces, in a waterproof container or "toilet receptacle." The "toilet material" is collected before it comes into contact with the environment -- human excrement does not contact soil or water. The toilet material is not referred to as "human waste" because nothing that goes into a humanure toilet becomes waste. It is all constructively recycled via composting. Hence, the term "humanure" has become popular when referring to human excrement that is recycled through composting systems. The term "waste" is not used, associated with, or appropriate when discussing humanure toilet systems. This is a sanitation system that involves neither waste nor disposal.

The size and type of toilet receptacle can vary from place to place, depending on availability and purpose. For example, in the U.S., 5-gallon (20 liter) plastic receptacles are widely available, both new and used. This size receptacle is attractive for a small-scale system because the receptacle can be easily carried by a single person. They are also inexpensive or free, are water proof, have tight lids, and can last a long time. This system is not to be confused with a “bucket toilet," which is human excrement deposited into a bucket without cover material, then discarded into the environment as waste. Bucket toilets, however, can easily be converted into humanure toilets by adding the other two components of the system (cover materials and compost bins).

Larger toilet receptacles can also be utilized in humanure systems. Experimentation is underway with larger toilet receptacles such as 55 gallon (220 liter) containers that can be maneuvered either by two persons or by machinery. Also, direct deposit humanure toilets eliminate the toilet collection device altogether and are instead designed to deposit the humanure directly into a compost bin.

The purpose of the toilet device is to collect toilet material in such a manner as to prevent unsanitary contact with the environment, allowing for sanitation without environmental pollution. In addition, the toilet allows for the collection of toilet materials in such a manner that the human excrement is primed for thermophilic composting. The purpose of thermophilic composting is to subject the toilet materials to robust microbial activity which produces heat generated by thermophilic microorganisms. This process has been scientifically proven to destroy human pathogens, rendering the toilet material hygienically safe and achieving the true essence of "sanitation."

“Urine diversion” is the practice among some compost toilet circles of diverting the urine from the solids inside a toilet. This practice is counter-productive to the humanure system. Urine provides essential moisture and nitrogen required for thermophilic composting. When it is removed from the toilet contents, it creates a resultant organic mass that can be deficient in these two necessary ingredients and therefore can retard the extremely important thermophilic reaction.

In addition, paper products are encouraged to be added to the toilet contents, such as toilet paper, toilet paper center cardboard rolls, etc. There is no reason to separate these into a trash bin when using a humanure toilet. Feminine hygiene products can also be added to human toilets, although the plastic components of these products will have to be manually removed from the finished compost as they do not decompose.

Humanure toilets can easily be designed for household use indoors, for single person or family use, or for group use where many people gather, such as at music festivals, campgrounds, retreats, refugee camps, villages, etc. They can also be used as backup or emergency toilets when flush toilets are not available due to electricity outages, for example.

Figure 1 illustrates a typical humanure toilet. The bucket beside the toilet contains cover materials. Figure 2 shows another humanure toilet with the toilet contents visible. Note that the excrement is covered by the carbon-based cover materials, thereby preventing odors and flies. Figure 3 shows another humanure toilet with the toilet receptacle completely exposed and ready for removal.

Figure 1

Figure 2

[Instructions on how to build a humanure toilet can be found at http://humanurehandbook.com/humanure_toilet.html. Or watch a video showing how these toilets are constructed here: http://humanurehandbook.com/videos.html#loveable_loo]

Component #2 - The Cover Material -- Without carbon-based cover materials, the humanure toilet system will not work. These materials cover the contents inside the toilets as well as the contents of the compost piles. Enough cover material is needed to totally and effectively eliminate odor and/or flies. The correct amount of cover material can be gauged by simply smelling the toilets or the compost piles. If there is any offensive odor, more cover materials must be used. Likewise, if flies can be seen accessing the contents of the toilet or the compost pile, more cover material, or more appropriate materials, must be used.

The cover materials must originate from "carbon based" plant cellulose material in order to promote thermophilic composting. One of the most widely used cover materials, for example, is sawdust from trees. Another is peat moss. Rice hulls seem to be popular where available. Cover materials can be any somewhat dry plant material ground into the correct consistency, such as from coco coir, paper products, cardboard, even junk mail. Availability of appropriate cover material is essential to the successful operation of a humanure toilet system. The cover material must not be too coarse. Wood chips, for example, are inappropriate -- even wood shavings are not ideal and can inhibit thermophilic composting due to the inaccessibility of the carbon to the compost microorganisms because the wood particles are too large. Wood ashes should never be used as a cover material, nor should lime (ground agricultural limestone). These materials inhibit microbial activity, whereas the humanure toilet system is designed to increase microbial activity, not to inhibit it.

When the cover material is from an appropriate source and of appropriate consistency for use in the toilet, the toilet contents can be covered in such a manner that no odor whatsoever escapes from the toilet. This enables the toilet to be located indoors. However, if appropriate cover materials are not available or are not utilized, the toilet can emit unpleasant odors. Therefore, it is imperative to understand that the humanure toilet system is not appropriate for all people in all places and situations. In woodland areas or any location where sawdust is available, the toilet works very well. In areas where appropriate organic materials such as from agricultural operations are collected and stockpiled for use with humanure toilets, such a sanitation system can work very well. The agricultural byproducts that may work in a humanure toilet system could include such things as grain chaff, pine needles, coffee grounds, distillery byproducts, cleanings from woolen mills, paper products ground to the right consistency, etc.

A secondary set of cover materials is also required for the successful functioning of a humanure toilet system. These are the cover materials used on the compost pile; they can be much coarser than the toilet cover materials. Compost pile cover materials can include grasses, hay, straw, pine needles, weeds, leaves, or many other organic plant materials that are odor-free and do not attract flies. Such cover materials can allow for the collection of large quantities of toilet materials in above-ground compost bins without creating unpleasant odor or attracting flies. They also contribute to the aerobic thermophilic microbial reaction by creating tiny interstitial air spaces in the compost piles.

If both types of appropriate cover materials are not available, the humanure toilet system is not recommended. If the cover materials are available in limited quantities, then humanure toilets can successfully be used in limited numbers only.

The carbon-based cover materials balance the moisture and nitrogen in human excrement. This creates a desired “carbon to nitrogen ratio” that encourages reproduction of heat-producing microorganisms. By using enough cover material of the correct consistency to prevent odors from escaping the humanure toilet system, the correct balance of carbon to nitrogen can be achieved. In addition, all food scraps and other organic materials that may be available from human activity can be added to the humanure compost system to achieve high-quality compost.

[More information about this system can be downloaded free online at http://humanurehandbook.com/downloads/Humanure_Handbook_all.pdf.]

Component #3 - The Compost Bins -- All toilet materials that are collected must be composted in an aerobic, thermophilic manner in order to achieve maximum sanitation. This requires the depositing of the materials into a compost bin of some sort. The purpose of the bin is to allow the piling of the collected material above ground in such a manner that it is not accessible to children, animals or other vermin, or insect vectors. The bins are constructed with a "biological sponge" as the base layer. The sponge consists of plant materials such as straw, hay, weeds, grasses, etc., piled in the bottom of the bin for the purpose of absorbing excess liquids that may collect when the pile is being constructed.

The bins can be located on bare soil with the base shaped into a slightly concave configuration, allowing for the pooling of any excess liquid into the center of the bin (preventing leaching out the bottom). Bins can also be constructed on concrete or other hard surfaces, although a soil base encourages beneficial soil organisms, including earth worms, to migrate into the compost pile. Ideally, sufficient material is used in the biological sponge to absorb any excess liquid. Once the thermophilic phase begins, liquid is rapidly absorbed by the extremely robust biological activity, hence the need for urine and even for rain water or gray water to moisten the compost mass. Proper management of the compost pile is very important, therefore experience and education are strongly recommended. Composting is as much an art as it is a science.

The compost bin walls may be constructed of wood boards (either new or recycled); masonry materials such as bricks, blocks or concrete; straw or hay bales (which can be reused as cover material after their function as side walls is completed); bamboo; poles or logs; wood shipping pallets turned on their sides, etc.

The top of the compost pile is covered at all times with clean cover material of sufficient quantity such that all unpleasant odors are suppressed. Also, the cover material must be appropriate in consistency so that flies cannot access the contents of the pile. Straw or hay scattered loosely, but adequately, over the compost pile, for example, works well for this purpose. Very coarse materials such as pond reeds, for example, may not.

Compost operations can be executed in two basic manners: “batch” compost or “continuous” compost. Batch compost occurs when an entire compost bin is filled all at once or in a short period of time – perhaps in a few days or in a week or two. Continuous compost is when a compost bin is added to continuously for a long period of time such as over a year. In either case, after the bin is filled, the compost should be left undisturbed for approximately a year. Figures 4-8 illustrate a variety of humanure compost bin designs.


Figure 4


Figure 5


Figure 6


Figure 7

How Thermophilic Composting Works

Thermophilic composting is the aerobic decomposition of organic matter that includes a hot stage dominated by heat producing bacteria. The hot stage may last days, weeks or months, depending on such factors as the organic ingredients, the size of the compost mass, ambient temperatures, geographical location and/or time of year, and moisture content, among others. Thermophilic temperatures are generally in the range of 45 degrees C or hotter.

Much scientific research has been conducted regarding the efficacy of thermophilic compost in destroying such human pathogens as viruses, protozoa, intestinal worms, and bacteria. Research has shown that human pathogens find the thermophilic environment hostile and that they will rapidly die off in such an environment. Finished compost that has been subjected to adequate and well-managed thermophilic conditions typically contains "no detectable pathogens," regardless of the initial pathogen load. When human excrement can be rendered hygienically safe through the elimination of pathogenic organisms, the true essence of sanitation can be achieved. For example, refer to Figure 9 for a list of pathogen thermal death points. This has been excerpted from The Humanure Handbook, 3rd edition, which can be downloaded free at:

[http://humanurehandbook.com/downloads/Humanure_Handbook_all.pdf]

Figure 9

Table 7.14

PATHOGEN SURVIVAL BY COMPOSTING OR SOIL APPLICATION

Pathogen	Soil Application	Unheated Anaerobic Digestion	Composting Toilet (Three mo. min. retention time)	Thermophilic Composting
Enteric viruses	May survive 5 mo	Over 3 mo.	Probably elim.	Killed rapidly at 60C
Salmonellae	3 mo. to 1 yr.	Several wks.	Few may surv.	Dead in 20 hrs. at 60C
Shigellae	Up to 3 mo.	A few days	Prob. elim.	Killed in 1 hr. at 55C or in 10 days at 40C
E. coli	Several mo.	Several wks.	Prob. elim.	Killed rapidly above 60C
Cholera vibrio	1 wk. or less	1 or 2 wks.	Prob. elim.	Killed rapidly above 55C
Leptospires	Up to 15 days	2 days or less	Eliminated	Killed in 10 min. at 55C
Entamoeba histolytica cysts	1 wk. or less	3 wks or less	Eliminated	Killed in 5 min. at 50C or 1 day at 40° C
Hookworm eggs	20 weeks	Will survive	May survive	Killed in 5 min. at 50C or 1 hr. at 45C
Roundworm (*Ascaris*) eggs	Several yrs.	Many mo.	Survive well	Killed in 2 hrs. at 55C, 20 hrs. at 50C, 200 hrs. at 45°C
Schistosome eggs	One mo.	One mo.	Eliminated	Killed in 1 hr. at 50°C
Taenia eggs	Over 1 year	A few mo.	May survive	Killed in 10 min. at 59°C, over 4 hrs. at 45°C

Source: Feachem et al., 1980

Table 7.15

THERMAL DEATH POINTS FOR COMMON PARASITES AND PATHOGENS

PATHOGEN	THERMAL DEATH
Ascaris lumbricoides eggs	Within 1 hour at temps over 50°C
Brucella abortus or *B. suis*	Within 1 hour at 55°C
Corynebacterium diptheriae	Within 45 minutes at 55°C
Entamoeba histolytica cysts	Within a few minutes at 45°C
Escherichia coli	One hr at 55°C or 15-20 min. at 60°C
Micrococcus pyogenes var. *aureus*	Within 10 minutes at 50°C
Mycobacterium tuberculosis var. *hominis*	Within 15 to 20 minutes at 66°C
Necator americanus	Within 50 minutes at 45°C
Salmonella spp.	Within 1 hr at 55C; 15-20 min. at 60°C
Salmonella typhosa	No growth past 46C; death in 30 min. 55C
Shigella spp.	Within one hour at 55°C
Streptococcus pyogenes	Within 10 minutes at 54°C
Taenia saginata	Within a few minutes at 55°C
Trichinella spiralis larvae	Quickly killed at 55°C

Source: Gotaas, Harold B. (1956). Composting - Sanitary Disposal and Reclamation of Organic Wastes . p.81. World Health Organization, Monograph Series Number 31. Geneva.

Humanure compost piles will undergo several stages of decomposition in addition to the initial thermophilic stage. After the hot phase has ended, the organic material will continue the process of biological degradation and transformation into humus aided by non-thermophilic microorganisms, macroorganisms such as earthworms and other insects, and fungi. These additional stages allow for the further decomposition of the organic material to produce a plant-friendly and agriculturally beneficial final product. The composting process therefore incorporates both the element of temperature and the element of time. Combined, they produce an end product that is safe, sanitary, pleasant smelling, stable, can be stored indefinitely and can be used for growing human food. This is the result of a sanitation system that does not depend on water, does not pollute the environment, does not produce waste, is inexpensive and, when properly managed, is odor-free, fly-free and pleasant to use.

More information about this system is available on the internet via The Humanure Handbook, 3rd edition, which can be read or downloaded in English free at humanurehandbook.com. The same website has a number of instructional video clips showing humanure composting toilets and bins in use, both at a single family scale and on larger scales. Video clips also show humanure toilet receptacles being emptied into a compost bin, humanure compost being used for gardening and for planting trials, etc. There is also a message board open to the public where people from around the world can discuss issues and exchange information regarding humanure toilet systems. The site also has instructions on building a personal humanure toilet.

Household Small-Scale Systems

Much of this data is derived from the author's experience with his own household humanure sanitation system in northwestern Pennsylvania, USA.

Many American humanure toilet systems utilize 20 liter toilet receptacles which are often made from nothing more than simple 5-gallon plastic buckets. The toilet cabinets are built to fit the receptacle. Several toilet receptacles may be used, one at a time. As each one fills with toilet material (fecal material, urine, toilet paper and cover material), they are set aside with lids. The set-aside receptacles (with lids) after they're removed from the toilet, can also be used for depositing food scraps. It is not advisable to add food scraps to a humanure toilet in use as it can promote the breeding of fruit flies. When enough full toilet receptacles have collected, with lids, they are taken to a compost site and the contents deposited into a compost bin. Since it is easier for most people to carry two receptacles at once, rather than one, at least two receptacles are allowed to fill before they are emptied. If the receptacles are being collected by a collection service, then any number of full toilet receptacles may accumulate and be stored until collection time.

After emptying the receptacles, they are rinsed -- about 2 liters of water are required to clean a 20-liter receptacle. A tiny amount of dish soap and a long-handled toilet brush aid in cleaning the receptacle. The rinse water is added to the compost pile, soap included. Alternatively, the receptacles can utilize "biodegradable plastic" bag inserts, which may entirely eliminate the need for cleaning inside the receptacle after emptying it. [You can view a video showing toilet receptacles being emptied here: http://humanurehandbook.com/videos.html#adding.]

In general, one 20-liter toilet receptacle can provide enough toilet capacity to service one adult for one week if the correct cover material is used. Bulky cover materials inside the toilet, such as wood *shavings*, do not mask odor effectively and a greater quantity of cover material is therefore needed, which fills the toilet more rapidly. Sawdust has the ideal consistency for toilet cover material. Not only does a finer cover material mask odor more effectively, but it also promotes better composting as the woody particles are smaller and easier to break down by microorganisms.

In a family of four, using appropriate cover materials, four 20-liter receptacles may be needed per week. If the compost bin is conveniently close to the toilet and the toilet receptacles are not allowed to freeze, the weekly emptying and cleaning of four receptacles takes about 20 minutes. Alternatively, the toilet receptacles may be filled, set aside with lids, then collected by a humanure recycling service and composted at a central location by trained and experienced composters.

The author’s humanure toilet system has been continually in use in the same location for 30 years. During that time, all household toilet material, along with all kitchen scraps, garden weeds and other organic materials have been recycled through the humanure sanitation system.

Humanure compost bins benefit from a minimum of two chambers, although three are recommended. This is because many household compost systems tend to be “continuous” compost systems – organic material is added to the bins on a daily or regular basis over a period of time. It is recommended to collect compost for one year when building a continuous compost pile, then allow that pile to age for an additional year while a second pile is built -- hence the need for two bin sections. A third, middle section with a roof or covering allows for the storage of dry cover material handy to the active compost bins. Cover material must be kept dry in cold climates to prevent it from freezing. Figure 4 shows the author’s three section compost bin with cover material being stored in the center bin.

The active compost bins should have four walls or at least be completely surrounded in order to keep out dogs, goats, children, chickens, etc. One wall should be removable to allow for access to the finished compost. A piece of wire fencing laid over the top of the active compost pile will prevent animals from digging into the pile or scratching the cover material off the compost.

Odorous organic materials should never be put “on” a continuous compost pile. They should always be put “into” the pile. This means moving the cover material aside using a compost tool, such as a hay fork, digging a depression into the top center of the pile, and then adding the organic material, which may be toilet material or kitchen material or even animal mortalities. Clean materials such as weeds, leaves, grass, etc., can be used as cover materials. However, any substance that may attract flies or emit odor should always be fed *into* continuous compost piles and should never deposited on top of the pile. When these simple rules are followed, all food scrap materials can be added to the humanure compost, including all meat, bones, fat and animal mortalities (entire small dead animals such as chickens, ducks, etc. – larger animals may require special treatment prior to composting). There is absolutely no need to segregate meat or any animal material from a humanure compost system.

Figure 10 shows the author’s garden in Pennsylvania, USA – it has benefited from humanure compost for 30 continuous years. This location receives slightly more than one meter of precipitation per year with seasonal temperatures ranging from a low of -34 degrees C to a high of 40 degrees C. This garden fed a family with six children over three decades. Primary cover materials used in this humanure compost system included local sawdust from sawmills where trees are cut into boards, plus straw, leaves, weeds, and grass. All household food scraps are included in the compost system, as is all urine, toilet paper, and animal byproducts including small dead animals (ducks, chickens, possums). Temperatures in this compost system, measured by Reotemp compost thermometers, reach 45-55 degrees C and continuously maintain that range, except during cold winter months, as long as fresh material continues to be added to the compost at least weekly.

Figure 10

Austin, Texas, Direct Deposit System

In July, 2009, the city of Austin, Texas, approved a direct-deposit humanure toilet for residential purposes. This type of humanure toilet has a larger footprint than those already illustrated in this paper. It is not portable because the toilet material is deposited directly into a compost bin underneath the toilet, which limits where the toilet can be located. The double bin system allows one bin to fill for a period of time, then age while the second bin fills up. Again, a carbon-based cover material (in this case, sawdust) is used to balance the nitrogen and the moisture in the toilet. Presumably, thermophilic conditions will develop, although this has yet to be confirmed in this new project. Figure 11 shows the Austin toilet.

Figure 11

New York Pallet Bin System

Humanure sanitation has been utilized in the state of New York, USA, at a natural building conference for the past few years. The collection system utilizes 20-liter plastic toilet receptacles and the compost bins are made from wood shipping pallets turned on their sides. Cover materials include local sawdust in the toilet and local hay or straw in the bins. Thermophilic conditions have been consistently observed in the compost, based on compost thermometer readings. About 100-150 people are served by this system over a period of a week at a time. Figure 12 shows the compost bins used in this system.

California Hay Bale System

A group in California, USA, has experimented with humanure sanitation servicing 500 people at a time at a 10-day music festival. This process filled approximately (125) 20-liter toilet receptacles per day, which were collected twice a day and managed by a dedicated team of six people. The toilet materials were manually emptied inside a compost bin made from straw bale walls (Figure 13). All festival food scraps were collected in separate, color-coded containers and added to the compost pile along with the toilet material. Each time the toilet material and food scraps were added to the bin, the bin contents were covered with fresh straw thick enough to eliminate odors and flies. The odor-free and fly-free system was well received by the festival participants who found the humanure toilets to be preferable to the chemical toilets that had previously been used. A 10-minute video clip of the system is available at:

http://humanurehandbook.com/videos.html#festival1.

The compost pile temperatures were monitored with a 36" Reotemp compost thermometer at 6 locations and two depths inside the pile (45 cm and 91 cm). After 7 ½ weeks, the temperatures were still averaging 62.7 degrees C. After four months, the temperatures were still averaging 57.7 degrees C.

Kentucky "Wheelie Bin" System

"Wheelie bins" (plastic garbage cans with wheels) were used to collect humanure at a music festival in 2008 in Kentucky, USA (Figure 14 shows the toilet building). The humanure was collected with sawdust and then simply left inside the wheelie bins for an entire year. The temperature was not monitored, and it is unlikely that thermophilic conditions occurred. After a year, the toilet materials were dumped into a compost pile. Whatever excess moisture (urine) had initially been in the wheelie bins had become absorbed by the sawdust by that time, and odor had largely disappeared. This process was not intentional, but was the result of a lack of planning and little understanding of how compost works. In the end however, there was no waste, no flies, little odor and no pollution. All of the organic material was recycled.


Figure 14

Texas 20-Liter System

A group collected humanure at a building conference in Texas, USA from about 150 people over a week's time. Six humanure toilets were used, each different and each equipped with 20-liter receptacles. The collected toilet material was trucked to a neighboring farm where it was deposited into compost bins made from pallets (Figure 15 shows a bamboo toilet and some of the toilet receptacles used at this event, as well as a compost bin). Two bins were filled and compost temperatures in the 55 degree C range were recorded.

Figure 15

Additional Projects

Other humanure projects in a village in Missouri, USA and in Mongolia were also used to collect data and information, but space limitations prevent their review in this paper. More information can be found at humanurehandbook.com.

Problems

Lack of information, training, understanding and knowledge can make humanure sanitation systems problematic. This is compounded by fear of fecal material. People who are not comfortable with alternative sanitation and who do not have a solid understanding of compost should not be managing humanure toilet systems. For example, a small village in Missouri, USA, is requiring all members to participate in group humanure sanitation by taking turns collecting and composting the toilet materials. This is a mistake. There should be a dedicated humanure crew who knows what they're doing when collective composting is undertaken.

Correct and adequate cover materials must be used. A Mongolian family moved their humanure toilet outdoors because of bad odor. The simple addition of more cover material in the toilet would have been the correct solution. Some people simply expect toilets to smell bad and they cannot imagine that a toilet can be odor-free – a result easily obtained by humanure toilets when correct cover materials are used in adequate quantities. Cover materials that are too coarse, such as wood shavings, will not mask odor adequately. This causes the user to deposit too much material into the toilet, causing the toilet to fill too quickly and throwing the carbon/nitrogen ratio off balance with too much carbon, thereby making thermophilic composting unlikely. Sawdust works much better than shavings because of smaller particles.

Pond reeds were used as a cover material in a large humanure compost pile in California. The material was too coarse and flies could get through to access the compost. Odor could escape. A switch to straw as a cover material completely eliminated odor and flies. Reeds had been selected as cover material because it was believed that large air spaces were necessary in the compost pile. This is not true. Visible air spaces are not necessary when the compost is piled above ground.

It is important that humanure toilets be kept indoors in a heated area during cold weather; otherwise the contents of the receptacles will freeze and will not be able to be emptied. Frozen receptacles can also crack and leak. A Missouri community refused to keep the full toilet receptacles indoors for fear of odor. However, when a full toilet receptacle is covered with appropriate and adequate cover material, there is no odor. Tight lids on the receptacles allow them to be stacked, requiring little room. The full receptacles were incorrectly placed outdoors where they froze, cracked and were impossible to empty. This constitutes gross mismanagement of a humanure toilet system.

Compost bins can be located too far from the toilet area. This can make the job of emptying toilet receptacles burdensome and unpleasant if the toilet receptacles must be moved by hand. There is no reason to situate the compost bins far away. If they are adequately managed and covered, there is no odor. People who fear human excrement assume the compost bins will stink and will put them so far away from the toilet as to be impractical. This is a recipe for failure. The solution is to use enough cover material in the bins to prevent odors from escaping no matter where the bins are located.

The Future of Humanure

Humanure toilets are not for everyone. They are limited to situations where adequate and appropriate cover materials are available. They are a knowledge-based sanitation system and are sometimes referred to as the “thinking person’s toilet.” When properly executed and managed, however, they provide a low-cost, hygienically safe, environmentally friendly, waste-free and pleasant sanitation alternative that produces a wealth of soil fertility.

About the Author

Joseph Jenkins is best known for authoring the Humanure Handbook — A Guide to Composting Human Manure — first published in 1995 and now in its 3rd edition. The book has been sold worldwide and published in foreign editions on four continents. He has been a compost practitioner in the United States since 1975 and has grown his family’s food with humanure compost for the past 30 years. His web site at humanurehandbook.com offers videos, instructions and the complete Humanure Handbook free of charge. Jenkins also provides humanure sanitation consulting services internationally. More information about the author can be found at http://www.josephjenkins.com.