

The Ventilated Arborloo

A version for children living in the rural areas.



Prototype versions of the ventilated Arborloo designed for children.

The *Arborloo* is a simple toilet that was designed to recycle human waste within a shallow pit where the contents were transformed from a vile and disease forming material into a product in which trees could grow and thrive without the user having to be in contact with the material. As has been described many times before the toilet (structure, slab and sometimes the ring beam) are moved from place to place. The contents of the pit change over time due to the action of soil, soil bacteria, leaves and fungi and the action of fungi on the leaves to form leaf mould. Soil bacteria and fungi mycelia actually invade and digest the excreta. The changing contents of the pit remain where they are. When nearly full the pit is topped up with soil, preferably fertile, and a tree is planted. The pit contents now form a fertile “organic plug” within the surrounding soil. The old toilet site becomes the site of a new tree which can provide fruit, timber, shade and beauty. This article describes the evolution and testing of a smaller version designed for children living in the rural areas. It uses the same principles as the larger versions which have already been described elsewhere.

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Introduction

The ventilated *Arborloo* is an important addition to the variety of ecological toilets available for people living in the rural areas of the country. It is a hybrid between the Blair VIP toilet and the *Arborloo*. The original *Arborloo* controlled odours and fly breeding by the regular addition to the pit of soil, wood ash and leaves. The pit varied in depth from 1m to 2m depending on soil conditions. The subject is well documented elsewhere. This version is slightly smaller, but uses the same principle as the larger version. But some interesting features are described here.

It is designed for children living in the rural areas. The cost must be relatively low, easy to make and convenient to use and the slab and structure easy to move from one location to another. Our children represent the future generation of our nation and it is wise for them to learn the basics of good sanitation, recycling, good personal hygiene and the value of using local skills in design and construction. The other aim is to stop the practice of open defecation and introduce a method which is simple, uses natural principles and converts foul and dangerous excreta into a valuable product - all by natural principles. All this happens without the user being aware of what is taking place under the ground.

The presence of a screened vent pipe assists in keep the toilet odour and fly free. But to reduce cost the vent has been made smaller (63mm PVC). Local 20% shade cloth has been used as fly screen. In another version 75mm PVC has been used as a vent pipe. In both these cases it is important to cover the squat hole or pedestal with a loose fitting cover as the interior of the structure is not semi dark. The pit must remain in darkness. Tests have been made to establish whether the smaller pipes can indeed control flies which are readily attracted to standard unventilated pit toilets. Also the roof has been made by using an umbrella. The pedestal can be locally made or commercially purchased. It can be upgraded over time. Cement and sand are required to make the slab and ring beam. The walls of the structure can vary. These include grass, reeds and shade cloth. These are mounted on a set of “king posts.”

In addition “leaf mould” a type of composted leaf material processed by fungi has been added to the pit first and leaves have been added during the pit filling process. Leaves are considerably reduced in volume during the filling process. It has been established in other experiments carried out by the writer that the mycelia of fungi can invade and break down faecal matter. In fact the human faces are converted both by bacteria present in the soil and the leaf material processed by fungi into a material which the roots of trees can not only tolerate but thrive in.

The methods of construction have varied during the evolution of this smaller but effective version of the *Arborloo*. But it follows the principles laid down in earlier versions. The presentation below describes this.

The construction



In this case the “ring beam” also supported the structure of the toilet. In this case a rusty end of a 44 gall drum 60cm in diameter was used as an internal mould. A 1 meter steel mould was used for the outer mould (bricks could be also used). Ally cans were distributed as shown between the inner and outer moulds with an opening for the entrance.



The toilet slab was made with outer diameter of 65cm with a hole for a pedestal of 30cm and a PVC connector for a 63mm PVC vent pipe. The inner hole and the PVC connector would both fit within the 60cm hole in the ring beam.



A home made pedestal was made (see the book “Toilets that make compost.” But the hole diameter in the slab could accept several types of pedestal. There can be much variation in the size of the slab and ring beam and structure.



The pit was dug down inside the opening of the ring beam. Leaves and leaf mold were added to the shallow pit. The pit could be dug down to a meter or even more in suitable soil.



The slab was laid over the ring beam and sealed with a weak mix of cement.



The pedestal was added to the slab. Lengths of reeds about 1.7m long were found and cemented into short lengths of 63mm PVC pipe. This work was experimental all the way. In fact the allow cans were removed but had left holes in the ring beam which were used in the next stage.



The reeds with PVC bases were placed in the holes left in the ring beam after the alloy cans had been removed. A suitable circle of HDPE (poly pipe) was made to match the circle of reeds. The reeds and poly pipe were joined with gardener twine and /or thin steel wire (see later).

Fly screen and smoke test



A 2m length of 63mm PVC pipe was secured as a vent pipe. So, 3 pipes could be made from a standard 6m length of PVC pipe. A 63mm PVC pipe connector was fitted the top of the pipe and 20% shade cloth glued to the top with contact adhesive as a fly screen. A smoke test was carried out with a lid placed over the pedestal and a smoky fire with dried leaves and paper made in the pit. Smoke coming from the pipe indicates the airflow through the system – down through the pedestal and pit and up through the pipe. This concept controls flies and odours.

The roof



A standard umbrella was used as a roof. Note the upper section of the vent pipe in the left photo. Another 63mm connector was used along the vent pipe just below the umbrella when fitted. A hole was made in the appropriate place in the opened umbrella fabric. A circle of stronger material was cut and contact adhesive used to connect them together. 2 circles were made for strength. After the umbrella roof has been fitted it rests on the poly pipe ring and is secured with gardeners twine.



The umbrella was attached to the HDPE (poly pipe) ring with garden twine. Small holes were made in the umbrella fabric through which the twine passed. Note the position of the 63mm PVC connector below the roof. For ease of fitting the upper and lower section of the vent (2 parts) are connected by a third PVC connector. The upper connector (fitted with fly screen) increases the diameter of the screen which improves air flow.

The door



The initial prototype.

One version of the door was also made with a piece of shade cloth. 5 short rings of 63mm PVC were made and cut so they would open up. The shade cloth was cut to a suitable size and cuts made in the upper end and the PVC rings fitted through. The rings would open up and fitted around the poly pipe. They act as curtain riders. Right photo – fitted with reed walls and a door the early version of the small vented *Arborloo*.

Moving on

The first structure and ring beam were constructed as shown above. The so called “king posts” were also made of reeds mounted in short PVC pipes filled with concrete supporting the reed inside. However these were unstable, so modifications were made to use stronger “king posts” made of PVC pipe which is more stable and has a long working life. At first reeds were also used as walling, but in my backyard I could not find enough to fully line the walls. So I purchased some shade cloth from a hardware shop and used this. The PVC pipe and shade cloth have a very long life. It is a good investment. In fact the method of construction reveals that the whole assembly can be taken apart and rebuilt with ease – making it portable. The slab is small and easily carried and even the ring beam can be moved with some “human power” to a new location.

Upgrade with PVC “king posts” and reeds then shade cloth walling.

“King posts” refer to the main posts which hold up the superstructure. They need to be strong and long lasting. They can be made of steel, but in a portable structure my experience has shown that they can also be made of PVC pipe. An earlier example used 32mm class 16PVC pipe. This version also use 32mm PVC class 10.



On the left a ventilated *Arborloo* structure using 32mm class 16 pipe as “king posts” and shade cloth as walling. An umbrella has been used as a roof and covered with a stronger material. The door in this case was made from a series of alloy cans suspended on gardeners twine. The construction of this version of the vented *Arborloo* has been described in an earlier report. On the right the smaller ventilated *Arborloo* structure designed for children being described in this article used reeds at first as “king posts” and walling, but this was changed to use 32mm class 10 as king posts (6 X 1.7m) and 80% shade cloth as walling shown on the right photo.

Alterations made to the “ring beam”



The original structure was dismantled and the diameter of the ring beam extended from 1m to 1.2m. A steel mould was used but bricks could have been used.



In this case 6 king posts were used of 32mm class 10 pipe, each 1.7m long. 2 X 6m lengths of pipe were purchased from the hardware. 6 X 1.8m lengths might have been better. The gap between the original ring beam and the extended ring beam was filled with concrete and inside this at about 50cm intervals plastic bottles cut to size and the shorter alloy which fitted smoothly and tightly inside were also filled with concrete with the 32mm pipe mounted inside the alloy can. By using this method the PVC pipe was secure but could be removed when required. Once set the system stabilizes the “ring posts.” In some cases, when tested, the plastic and alloy cans came out as one and in other cases the alloy can came out leaving the plastic bottle in the ring beam. The upper end of each “king post” was fixed to the 25mm HDPE ring made to suit the position of the “king posts.” At first the “king posts” were held temporarily with tape then with wire.



The plastic bottle with alloy can insert combination used as an anchor the plastic bottle surrounded by concrete in the ring beam and the can filled with concrete around the PVC pipe. On the right steel wire has been used to secure the PVC pipe to the poly pipe. It is possible to remove each “king post” separately, make a hole with a hot nail through the upper end of the pipe through which the wire can pass.

Fitting the roof and reed walling



The umbrella roof was fitted and held to the HDPE (poly pipe) ring with gardeners twine. Small holes were made in the umbrella material through which the twine was threaded and tied around the poly pipe. However whilst I grow reeds in my garden there was not enough to complete the walling. So I chose to use shade cloth. 2m of 80% shade cloth were chosen – the standard width is 3m.



The reed wall was replaced with shade cloth walling. Each end of the shade cloth(which measured 1.7m high and cut to suit with length (about 1.8m) was wrapped around the “ring posts” and lied at each end. The top of the shade cloth was attached to the HDPE ring at each “king post” with gardeners twine.

Examining the first “dropping”

Since part of the interest of the *Arborloo* and vented *Arborloo* is what goes on underground and also the effectiveness of the smaller vent pipe on fly and odour control, I decided to place one dropping into the shallow pit. This dropping sat on a bed of leaf mould.



Photo of the “dropping” close up. Not a nice sight!

Note that when the lid of the pedestal was removed and the vent at that stage had not been fitted with a screen, the odour emanating from the dropping immediately attracted flies which can be seen in this photo. Flies are strongly attracted to human faeces, And they breed like flies.



Once the photo was taken. The cover was placed back on the pedestal and the top end of the vent pipe (fitted with screen - see earlier) was fitted back. Earlier photos in this report of a “smoke test” where smoke is made in the pit with paper and dried leaves reveal smoke coming out of the vent which is an indication of the air flow through the system. The pipe draws air through the system. The photo on the right was taken a few days after the dropping was made. Note the white covering on the dropping which are the mycelia and hyphae of the fungus within the leaf mould. Note also the absence of flies. Leaves are added to the pit during the filling process and the fungus invades the leaves. Soil bacteria from the side walls of the pit also invade the excreta and help the process of conversion. All the processes are natural and occurring in Nature all the time.

Alternative structures.

This type of superstructure is only one of a number of locally designed structures which can be used with the ventilated *Arborloo*. Since this system uses a vent pipe which must pass through the roof, it is easiest to use an umbrella as a roof and a poly pipe ring on which the roof can be attached. Since these simple structures are not semi dark insider, the pedestal or squat hole must be covered with a loose fitting cover to ensure the pit is dark, apart from light falling down the vent pipe.

Several potential structures designed and made by local communities have been shown on earlier descriptions. And have great merit. A portable steel structure, as shown in earlier reports is another option. And local welders would be able to make these.

Hand washing is vital – attaching a simple hand washer

An alloy can make an excellent simple hand washer. This has been described in earlier reports. Since hand washing is so important, especially after visiting the toilet, one has been included here. The designed and concept is simple and costs almost nothing.



Three holes are punched with a hammer and nail in an alloy can. Two holes at the top and one at the bottom of the can. Thin wires are threaded through the holes at the top. These wires are made with a circle at the top from which the can hangs. Look at the photo. In this case the can is mounted on a length of PVC pipe caste in a small block of concrete, but it can hang on a nearby tree or be fixed to the toilet in some way. In this case 2 holes have been made with a hot nail near the top of the PVC pipe. Some slightly thicker wire has passed through the holes and around the pipe with a U shaped part on which the alloy can hangs.



The hand washer and support have been placed next to the toilet and a bucket with a lid has been place next to this.



The alloy can is dipped into the water in the bucket and hung on the supporting wire. Water then drains from the can through the lower hole in the can and the hands can be washed. Soap can be mounted nearby or some washing liquid (and even some disinfectant) can be added to the water in the bucket. The washing water can drain into the ground or into a pot with a plant or flower planted in it for decoration.



Conclusions.

This type of simple toilet system has merit in many ways. Like its slightly larger version it is a safe method of disposing of human excreta, which also includes urine which has a high nitrogen content. The system is odourless and fly free. Or should be if built properly. Underground and out of site a remarkable process of conversion is taking place, turning the smelly and potentially disease ridden material into a pleasant material which trees can tolerate and thrive in. Since the pit is small compared to the Blair VIP toilet it will fill up more quickly and the structure, slab and ring beam (with the “king posts” and walling removed) are moved to a new site nearby. Since the children’s version is smaller the ring beam with its removable “king posts” is smaller and more easily moved from one site to the next, so no extra cement is required. Obviously space is required but in the rural areas there is plenty of space. During the pit filling process, leaves can be added and also some soil and water to keep new droppings covered and level. The pit mix should be damp but not flooded. Since the sides of the pit are not brick lined or only partly brick lined the pit should drain easily. When the pit is nearly full the structure, slab and ring beam can be moved to a new site and rebuilt. The pit is topped up with soil and a young tree planted and watered.

So questions will be asked. What if my yard does not have trees? Well a good time to start making trees that produce leaves. And look for leaves. Put them in bags and keep them moist. Make compost. Start an orchard of fruit trees or a woodlot of trees for fuel or construction or shade. Or just simply to beautify the garden. Learn about the processes which occur in the Natural World. And the costs are not great, A bag of good cement may cost 11.USD, pit sand 1.USD, river sand 1.5.USD 2 lengths of 52mm class 10 PVC 10.37.USD, 2m X 3m 80% shade cloth 24.64.USD. Of course the costs may vary. Umbrellas are popular and not expensive. Use traditional materials and techniques as much as possible. For a system that provides good sanitation and the potential to grow trees - not a bad investment. Try it!

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