

Background

The Centre for Alternative Technology (CAT) is an education and visitor centre in Machynlleth, Wales demonstrating practical solutions for sustainability. Its principal aim is to educate people about living sustainably. They cover all aspects of green living: environmental building, eco-sanitation, woodland management, renewable energy, energy efficiency and organic growing.



Visitor entrance at CAT across the pond

The aim of this case study is to educate people on CAT's solutions to eco-sanitation. They are completely off the 'water grid.'

Water supply at CAT

CAT is blessed with an abundance of rainfall and springs from the hills above its location and is built on top of waste from an old slate quarry. The waste from this quarry was used during the mining to form a small reservoir just above CAT which still exists to this day and is fundamental to serving CAT's water needs. From drinking and showering, to sanitation and hydro everything flows from here.

Drinking and cleaning water

To provide clean water, water is initially piped from the reservoir and naturally feeds down to three tanks filled with layers of sand or a natural water filtration sock. Both the sand and the sock filter dirt from the water as well as crucially combatting anaerobic bacteria. For example the sand filters both microbes and high levels of nutrients.



The sand and sock filtration systems

This then just leaves a system to kill the viruses that remain in the water. For this the water feeds through a UV cleaning system formed of low energy 41W bulbs, which is the only unnatural energy used to this point and no chemicals are added in the whole process. The water is then ready to be piped for drinking or bathing.



UV water cleaning system

Sanitation

There are two separate reed-bed sanitation management systems at CAT, a smaller one for the eco-cabins that sleep roughly 40 people and a larger system for the rest of the centre. There are four stages to the process of the reed beds treating sanitation waste. First all sewage feeds in to a main sorting tank. In this the waste naturally divides in to three layers. The top and bottom smaller layers of solid waste are manually emptied and composted whilst the greater volume liquid layer runs through the reed bed system.

The liquid layer is piped and drained at a slow even rate across the first reed beds. Here the microbes that live within the beds and the reeds themselves filter the waste and bacteria cleaning it. These reed beds are used in cycles so water is only pumped to half of them whilst the other half remain inactive to regenerate.



Second stage of the reed bed system for the eco cabins

Once the waste has passed through the initial reed beds it runs in to another reed system where a similar process continues. From here the last step is for the water to run in to a small pond. Again microbes and vegetation continue the sanitation process. This stage is also a key final visual check to ensure the whole system is working. If there is too much vegetation or algae, there is a chance the sanitation may still be polluted. If this is not the case everything is usually naturally clean and is ready to run down in to the river a little below the system.



Third (front) and fourth (the pond at the back) stage

In addition to the reed bed system dry composting toilets are also in place and the flush water for some of the toilets is from harvested rainwater. Every toilet boasts simple water saving measures and low flush technology.

Hydro power

This case study aims to focus on eco-sanitation but it would not be right to point out the CAT also boasts three hydro-electric systems generating electricity and even a hydro powered train which transports visitors from the car park to the main entrance of the centre. The train works using the aid of gravity by filling a water tank on the top train with water until it becomes slightly heavier than the bottom train. From here gravity takes over and the train gently rolls to the bottom.



Hydro powered train

The challenges and requirements

To be completely off the water grid you need a very good supply of fresh water so even in drier times it does not run out. However this is by no means a requirement to implement even just parts of the above systems. In addition if there is a drop or fall in height across your land this helps the flow of water and is essential in any hydro-electric system.

The reed bed systems will require a small plot of land to develop them and some maintenance throughout the year but once in place the ongoing costs will be less than a traditional mains sanitation system.

A key lesson

When managing water usage CAT believe that the most important thing for people to take away is managing their own use. Water saving measures can be achieved at almost every stage at which people use it. This can be through ensuring taps are turned off when not in use, taking shorter showers or installing simple low flush toilet systems as just three examples of many. Simple impactful guidance signs by water devices are a quick way to educate people and bring about quick wins.

Conclusion

As CAT has demonstrated if you have all the right conditions, or even just some, water can be used for benefit in so many different ways. Their energy consumption throughout the process is greatly reduced, the costs are lower, no chemicals are used and the negative impact on the environment is much less.

For more information on CAT or to arrange a visit to the centre please visit their website
<http://www.cat.org.uk/index.html>

This case study was compiled in January 2016