

WHAT ARE GREY WATER SYSTEMS?

A grey water system is any system that collects grey water and puts it to use somewhere purified water (white water) is not needed. These applications can be anything from flushing the toilet, rinsing a load of clothes in the washing machine, or watering the lawn.

Grey water is household waste water from all plumbing fixtures except the toilet and garbage disposal. Water that comes in contact with any type of food or human excrement is called black water because of the high concentrations of organic waste. Black water has many difficulties in reusing the water safely.^[1]

Specific examples of grey water are water from the shower, bathtub, bathroom sinks, ect.^[2] Black water is unusable until thorough treatment has been performed to remove all hazardous materials.

Grey water systems vary significantly in their complexity and size from small systems with very simple treatment to large systems with complex treatment processes. However, most have common features such as:

- A tank for storing the treated water
- A pump
- A distribution system for transporting the treated water to where it is needed
- A treatment method

All systems that store grey water have to incorporate some level of treatment, as untreated grey water deteriorates rapidly in storage. This rapid deterioration occurs because grey water is often warm and rich in organic matter such as skin particles, hair, soap and detergents. This warm, nutrient-rich water provides ideal conditions for bacteria to multiply, resulting in odor problems and poor water quality. Grey water may also contain harmful bacteria, which could present a health risk without adequate water treatment or with inappropriate use. The risk of inappropriate use is higher where children have access to the water.

Historical Development of Grey Water Systems:

In the early years of large cities waste water management became a major issue in the day to day lives of the city residents.^[3] Dumping the raw black and grey water straight into the street was not an acceptable method of removing waste from the living areas. Feces borne diseases, terrible smells and general unsightliness were all problems with this method of removing the waste water. Something had to be done to remove the waste more efficiently.

Some people suggest the gathering of waste water started as early as 10,000 BC for use in the agricultural

fields.^[4] People would use this waste primarily for the nutrients suspended in the water. During this time there was no real separation of grey water and black water, it was all used for the agricultural applications. While using the waste water did help, more needed to be done to better manage the waste water.



Figure 1: Roman Sewer

During the apex of The Roman Empire huge advances in waste water systems were made. The Romans developed a maze of open sewers and aqueducts to help carry freshwater into the cities and waste water way from the capital city. The Romans had a better system for collecting grey water and black water one at a time then removing them together, but there was still no real grey water recycling system.^[5]

In 1865 T. Charles Lienur designed a system to remove waste water from Castle Luxembourg in two pipes. One to carry the black water, whilst the other carried all the other grey water.^[6] The black water was sent to be dried and made into a natural fertilizer while the grey water was just dumped into the River Elz.^[7] This system was successful in removing the two waste waters by themselves, but there was still no recycling of the grey water.

In 1997, the state of California approved grey water for commercial, industrial, and multi-family projects. Before then, grey water could be used in single family homes because the sanitary levels could be significantly lower. Some of the exact ways the grey water is recycled are talked about below, but the basic design is to have a reservoir where the grey is stored and filtered then pumped out and used.

Advantages and Disadvantages of Various Grey Water Systems:

Despite the huge variance between systems, there are two main methods of grey water recycling: with out purification and with purification. There is very little difference in the collection and storage for the two types of systems. The true difference is in the quality water output by the two systems. Non-filtered systems produce non-potable water only good for watering grass, trees, etc; while the filtered systems produce potable or near potable water good for showering, drinking and other similar domestic tasks.

Direct use Systems (No Treatment):

This is the most basic method of recycling grey water. Typically this is cooled bath water that is pumped out of a window using a garden hose and hand pump. Other methods have the drain from the shower or bathtub divert out to where the grey water is to be used. Many frugal gardeners will use this type of recycling to keep their garden alive during periods of sever drought.^[8]



Figure 2: Direct Use Hand Pump

Advantages:

- No storage tanks
- Simple to construct
- Very little maintenance

Disadvantages:

- No water reserve capabilities
- Low Volume

Short Retention Systems:

Short retention systems collect the water for a short period of time and apply some very basic treatment methods like skimming for debris and letting the particles settle to the bottom of the tank. These filters are typically sand or fine gravel used to strain out the larger suspended materials. This type of system requires slightly more complicated equipment, but is still relatively simple. Collection methods for this type of system are very similar to the previous system. The drains coming out of the sinks, bathtubs, showers, ect diver the grey water through the basic treatment systems then deposits the water into the holding tank. ^[9]

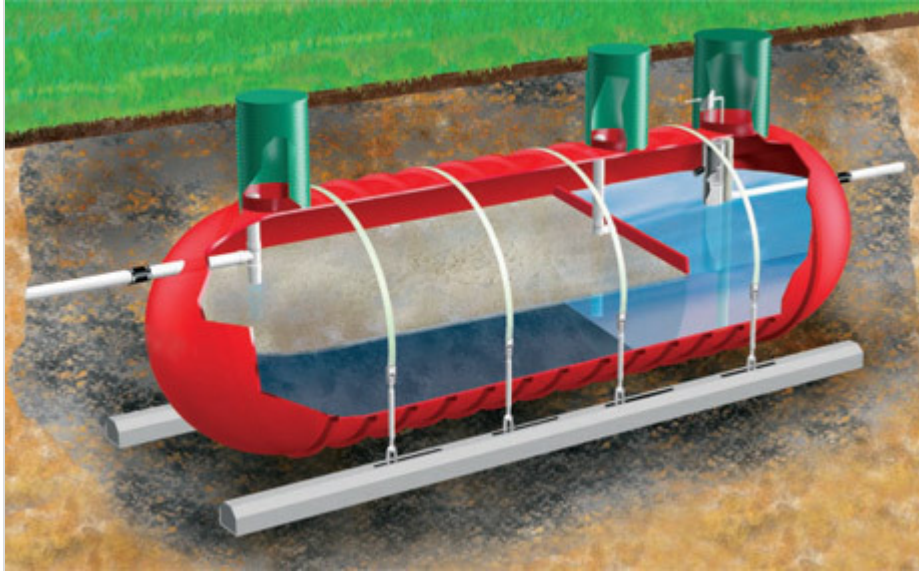


Figure 3: Short Retention System

Advantages:

- Water reserve capabilities
- Higher quality water
- Low maintenance

Disadvantages:

- More mechanical parts which could fail
- Low storage times in tank
- Relatively low quality water

Basic Physical and Chemical Systems:

Some systems use a filter to remove debris from grey water before storing and use chemical disinfectants like chlorine or bromine to stop bacterial growth during storage. This is one of the more complex systems due to the nature of filtering then adding the chemicals in the right proportions. This does produce a decent quality water when everything is working correctly. These pumps do seem to have more difficulty giving a consistent water quality however. This is simply due to the mechanical part of this system. ^[10]

Advantages:

- Higher quality water
- Longer storage times

Disadvantages:

- Lots of mechanical parts that can break
- High maintenance costs

How Grey Water Systems fit into Construction:

Grey water systems fit today's construction methods well because it is a "green " way to help reduce the amount of water going into the local septic system or the city sewer system. There are some special construction processes needed to place the below ground tanks but other than that most any house now days can be fitted with a grey water system.

Having a grey water system can help a building by decreasing the amount of white water needed for things like flushing toilets when grey water can be recycled from the sinks instead of using white water. By decreasing the amount of freshwater needed, the water infrastructure leading up the building can be designed to handle less flow. This will also help reduce the cost and time in constructing a building.

Future Improvement in the Sustainability of Grey Water Systems:

Future improvement in this field are almost endless. As technology increases and becomes "smarter" these grey water systems will become more efficient and more reliable. When these systems become more consistent, they will increase the sustainability tremendously because the systems will be able to efficiently take dirty water and make clean water on location. Being able to make clean water on location is a huge step up in sustainability for a building.

Source : <http://letu-cefs.wikispaces.com/Grey+Water+Systems>