



Natural Wastewater Treatment Systems

Imagine that you are the mayor of a town showing around a group of visitors. Your tour includes the brand new municipal building, the historic district with beautiful old houses, a commercial enterprise zone and ends up at the town park. Imagine that you proudly point to a wetland in a corner of the park, and say "this is our sewage treatment plant".

Sound implausible and perhaps uninviting? The fact is that natural wastewater systems are found across the country and in a variety of places where you wouldn't expect them. They range from constructed wetlands, irrigation of farms, woods and golf courses to greenhouses growing plants and saplings. When done right these systems are both aesthetically pleasing and highly efficient treatment systems. Additionally, they offer society benefits such as low-cost fertilizer, wildlife habitat and open space preservation.

Impacts of the Clean Water Act

Since the passage of the Clean Water Act and its amendments in the 1970's, there has been a strong effort in the United States to improve wastewater treatment, through tighter regulation of treated effluent and with federal funds to communities to build or improve wastewater treatment facilities. In this context, the EPA gave special funding considerations to facilities that used "innovative or alternative" technologies. This incentive spurred new and improved natural treatment systems.

As the 1980's came to a close, however, treatment funding began to dry up and communities have increasingly had to rely on state and local sources. This, coupled with stricter discharge standards and a growing environmental awareness about the need to protect water quality, has created a situation that is especially hard on smaller municipalities. For these communities, natural treatment systems offer a viable economic alternative.

How the Systems Function

The EPA defines natural treatment systems as those having minimal dependence on mechanical elements to support the wastewater treatment process. Instead, the systems use plants and bacteria to break down and neutralize pollutants in wastewater. Natural systems use, rather than "dispose of", waste; and because they use natural processes, they minimize the use of chemicals and require little energy to operate.

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Types of Systems and Overall Features

There are four main types of natural wastewater systems:

- Spray irrigation
- Overland flow
- Rapid infiltration - also known as community sand mounds
- Aquaculture - artificial wetlands & greenhouses

Although each type has its own distinct way to process the waste, they have many advantages in common. Because the systems are generally simpler than traditional systems they cost less to construct, and once built, are very economical to operate because they have lower energy consumption, need fewer skilled staff on hand and produce less sludge. Economic benefit can also be derived from marketable by-products such as crops or energy.

From an environmental viewpoint the systems are preferable because they are very effective at recycling or reducing the nutrient load in the wastewater, obtaining results that are superior to many traditional systems. In many instances, natural treatment systems return the cleansed water close to its source of origin, keeping the water within the watershed. And, converting land to a natural wastewater system may assist or create recreational settings such as parks and golf courses, and often contributes to the preservation of open space by preserving farms or buffer zones.

Finding the system that best fits an individual community does require some research, and several conditions are important to consider before a system is built. Spray irrigation, for example, may require a large piece of land. This can cause difficulties in locating a site that is close enough to the wastewater source, and can increase the initial investment. Underlying soils and geology are prime considerations in preventing contamination of ground or surface waters. Some systems work better in warmer climates because ice and cold temperatures slow down the natural processes. This can reduce the amount of waste the system can process in the winter and may require holding tanks or ponds for the wastewater that accumulates.

Conclusion

Despite these limitations, the systems work well in a variety of applications and geographic areas. In fact, considering their advantages and the number of different types to choose from, it is surprising that their usage is not more widespread. One reason for this is lack of knowledge about the systems (how they function, their performance, and costs,) causing decision makers to choose a traditional "off the shelf" system, and avoid the unfamiliar.

Another reason is financial disincentives within the private sector, where engineers' fees are based on a percentage of the construction cost. Further, alternative facilities often require more time to design and tailor to local conditions than traditional systems. On top of this, a municipality must deal with state and local codes written with conventional systems in mind and therefore not always friendly to an alternative system. Fortunately, the number of firms expert in natural systems has grown and this expertise can avoid unnecessary costs and compliance delays.

Also, many states are updating their codes to make them more flexible. On the federal level, a new Environmental Technology Initiative program has been established by the Clinton administration, which has already funded several new alternative wastewater projects. The grant program seeks to speed the development of innovative environmental technologies and to act as a catalyst for innovations within wastewater treatment.

For fact sheets on specific natural wastewater systems call: (215) 369-1188.

For more information on grants and wastewater treatment systems in general call the National Small Flows Clearinghouse at 1(800) 624-8301.