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Osmosis Alive – Algae Water Filtration System

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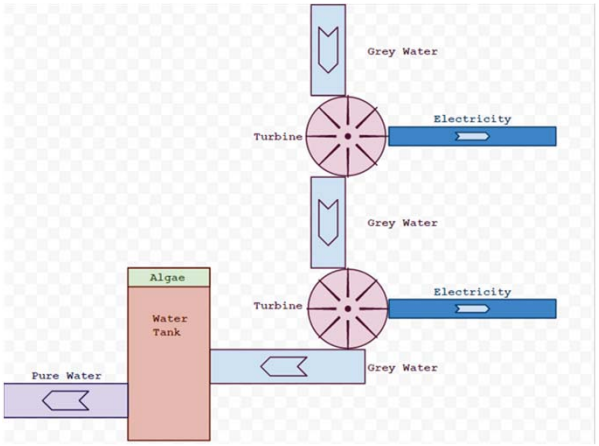
PROBLEM/OPPORTUNITY

Goals: Our goals of this project was to:
- Obtain an energy efficient, self-sufficient system to help reduce waste and money, and reuse and recycle water. To have a successful, natural, and more self-sufficient filtration system, using algae.
- To use algae and other plants as an efficient way to filter water.
- To create a water filtration system that is organic and would have 0 waste.
- To use the water in the best and most efficient way possible, and to reduce energy and coal/oil consumption (water turbine)
- To make our community cleaner and greener, and reduce carbon footprint, pollution, and environmental impact.

When we started this project, our first thought was renewable energy. We wanted to create a self-sustaining urban habitat for Humans to live in. We eventually began to gravitate towards a more specific concept which would involve grey water treatment. While gray water is known to be used for in home appliances such as toilets, it's not really used to generate electricity. What we have created is a system that utilizes the kinetic energy of grey water to help power the system itself. The system includes both standard filters and a less common non-photosynthetic algae filter to allow better use of the recycled city rainwater.

If one spends time in our fine city, they will certainly notice the many old buildings around Portland. Though, they have majesty and charm flowing out of the rafters, they are also often inefficient in many regards. The other thing they will likely notice is the consistent downpour Portland has during the winter months, and even an occasional trickle during the summer months. The Peaceful Penguins team also manages to be this observant. We saw in our tours that many of the greener buildings in Portland make use of grey water run offs, i.e. rain, and recycle it for use around the facility. We aim to truly re-envision the way we think about grey water and it's recycling.

Figure 1: Side angle and cross-section of water filtration and energy generator



KEY OBSERVATIONS

This project is focused around the concept of the *Osmosis Alive* algae filter system to purify water and the water turbines to generate electrical energy. However, there is an entire other side to this project that, for the sake of limited time and resources, the group declined to explore further. In the original project proposal, we considered creating not just a renewable water system, but an entire renewable and self-sustaining community.

This community would be designed with four separate home units, each comfortably housing one to four people, and shared utilities and commodities to conserve energy and water. The community would have all of the usual green systems like solar panels and energy efficient lightbulbs, but they would also have a shared central water heater to save water, and recycled blue jeans for insulation. The other main feature of the community would be the green roofs, which would contain bioindicator plants that would help to alert the residents to the condition and pollution content of the soil, water, and air in their habitat. The green roofs would also help to naturally insulate the buildings, reduce grey water runoff, and reduce pollution and heavy metals in the soil, water, and air.

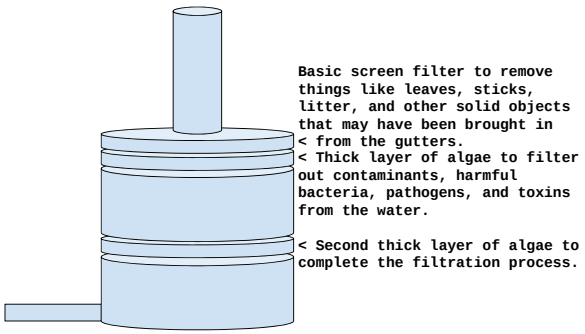
RESULTS

Cities naturally turn rainwater into grey water, but this gray water is rarely used for any purpose. with our biofiltration system, this grey water can be purified for any household use. In doing so, we reduce the cost of living and improve quality of life for low-income households. This system also has the potential to act as a recycling system in water poor countries. Osmosis Alive! utilizes the natural kennectic energy of falling rain to power its own pump. Our system is extremely flexible, as the non-photosynthetic algae can be easily placed underground. It can be used to retrofit existing buildings, or placed in new ones, in all climates. On a 2000 square foot property in portland, our system, on average, would produce 505 litres of clean water every day.

CONCLUSIONS

What we decided to work on was a system that would effectively filter out all contaminants and bad substances from the grey water, thus making it usable for any household need such as drinking water.
By the end of our project we came up with a product that recycles greywater, can be adapted to existing buildings, and can provide power to its pump. Two things we would have liked to include were; the ability to filter blackwater, and have the turbines generate excess power.

Figure 2: Filtration section in depth.



- Cities turn rainwater into grey water
- that grey water isn't used without our system, it just goes to waste.
- WITH this biofiltration system, we could purify and recycle this grey water for any household use.
- reduces cost of living, increasing qol for low-income households
- the algae filter could also be used to recycle house-produced water in places affected by water poverty.
- our design can be used to adapt existing buildings, making them more efficient, and creating a more green world.
- cleans with a 99.99% bias
- also produces electricity to help power the pump
- in portland, 921.9 liters per square meter of rain are produced every year.
- based on a 2000 square foot property, our system would produce 505 liters of usable rainwater every day in portland.