A Mechanism Utilizing Renewable Energy for Eliminating Aquatic Trash in Waterways That Does Not Contribute to Global Warming and Air Pollution

Perry, Dakota (School: WP Davidson High School)

The purpose of this engineering project was to design a system that can remove aquatic trash from a creek before it could make its way to the Gulf of Mexico, without contributing to global warming. My research included ways to remove trash from waterways. I discovered a bubble curtain that would work well at capturing aquatic trash and other pollutants by directing it to a cleanout area. The bubble curtain works by creating an underwater upwards swirling current that stops floating trash, traps floating oils, fuels, and microplastics from moving past. The bubble curtain increases the oxygen content of the water, does not stop fish or other wildlife from crossing, and will not disrupt boat traffic. Systems typically use, electric-powered air compressors to produce the bubble curtain which contributes to global warming. Using only renewable resources which includes a breastshot waterwheel, to power a rotary vane air compressor, a bubbler tube, and a collection area with a conveyor belt powered by a battery bank, charged with an undershot waterwheel and solar panels. During a flooding event at the creek, when most of the aquatic trash flows, the velocity of the water was calculated at a speed of 1.3m/s and the water rose to a depth of 1.5m. I needed to find out the minimum pressure was needed at that water depth and flow rate for the water curtain to work efficiently. Through a multitude of tests, I was able to show that the air compressor would need to produce a minimum of 2bar to operate the bubble curtain during a flooding event. The rotary vane compressor driven by the waterwheel would easily maintain that pressure. My hypothesis was proven correct that you can design an environmentally safe method for cleaning up waterways without endangering the environment.

Awards Won:

National Oceanic and Atmospheric Administration - NOAA: Judges' Award