January 11, 2013

Dear Vex Robotics Officials,

We as five person sub-team of 902C have decided to participate in the Vex online sustainability challenge by the future foundation, because green energy is an important concept that we believe should be given more thought globally. Because of this, we started a green energy project before this challenge had even been made. This team consists of Michael S, John Z, Sam H, Nico M. and Griffin D. With much support from the rest of the team, and our advisors, Douglas and Annie Perkins, we created a pole that supports a wind turbine made almost completely of Vex parts, and solar panels that track the sun using a Vex cortex that is connected to a Vex motor, Vex light sensor, and a Vex turret that turns the pole.

Our first approach to green energy was a Peltier device; Mansfield Middle School has part of its power and all of its heat generated by a natural gas turbine. However, even after the exhaust had transferred a large portion of its heat energy to the school, the exhaust gas was still at 100°C, and we believed that the energy could be harvested using a Peltier Device (which produces energy by using thermal differences between the P and N junctions). Since this was not an efficient way of producing energy autonomously, we omitted it from the final project.

After this, we made a hand crank using a large motor, axle and 1x. We used this to make a lever, and generated up to 9 volts of power. However, the motor was deteriorating, and we decided not to add it to the final project.

Our next project was to make a wind turbine. The blades themselves were old fan blades, and the motor an un-geared Vex-motor. The turbine could spin very easily, but we produced only a tiny amount of power, 200mV. We then replaced the motor with a large Vex motor, and made a gearing ratio of 30:1 so that it could spin just as fast as the original. However, this design produced 1 volt, 5 times more power. We attached this to the top of a PVC pipe, and we had our wind turbine.

To make our solar array we used solar panels, and supported them with Vex parts; a metal base, then a part that held up the entire solar array at an angle so that it could absorb more sunlight. We then mounted it on a solar tracker so that it would follow the sun. Our solar tracker was made using a turret, cortex, light sensor, and a powerful Vex motor. We used EasyC Version 4 to program the light sensor to track the sun by creating a turret with a wheel and axel. Later, when attaching the solar tracker to the solar panel and wind turbine, we substituted the wheel for a turret, and changed the programming so that the tracker would spin in arcs instead of circles, and so would prevent the wires from tangling. We also added a cardboard tube to the light sensor so it would only stop spinning when it faced directly at the sun.

Finally, we made a base entirely out of VEX parts. To make it, we screwed an 5x1x onto the bottom of the PVC pipe. Then, we added VEX awards on both sides, six in total. This stabilized our base so that it would not fall over in the wind.

Our project currently only generates power through two sources, the sun and the wind. In the future we would also like to apply an efficient and effective pelletier device, a water turbine connected to to the schools gutters, we would also like to add a human powered hand crank in order to provide more power by using the living resoirces at hand.

Our project currently supplies one volt from the wind turbine and around 18 volts from the solar lanels depending on the condition of the weather. the power supplied from the wind turbine we would like to directly route back to the vex battery pack using a diode to not allow the current from the battery to flow into the wind turbine. the other 18 volts we would like to use in order to run a battery charfer for the vex batteries that we charge through the wall socket.

This project was much fun for the three of us as we were able to see and build a real world application of what we have learned from vex robotics. We have also been able to learn about electronics and aspects of it by particapating in this challenge. Our advisor is very interested in sustainability as he has a solar powered house and a biodiesel car and he wishes to influence others to try to find more sustainable alternatives, in fact, our robotics team will be providing a green energy convention for all the students in our school.

I hope you will enjoy our project as much as we did and realize the importance in renewable energy sources and maybe become inspired by what our project is meant to show, a cleaner future.

Sincerely,

902C, Green Energy Robotics