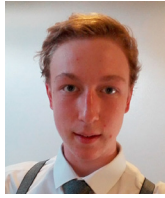


Engineering Design Project

Group F



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Taking part in the IMechE design challenge of 2018 we were tasked to create a pipe crawler capable of carrying a chain up a 2.5 meter and return back down without human assistance. From the start the design proved challenging due to the constrained budget of only twenty five pounds and through trial and error and many design alterations we have created a capable device built for purpose. The following outlines the make up of this device.



4 AA Batteries.

6V High Torque Motor, w/ Gearbox.

Stabalizer Wheels.

Sponge Wheels.

CHASSIS

For the main body of our chassis we used carbon fibre. we used a Dremel cutting wheel to cut out a 90x120mm rectangle out of our 3mm thick carbon fibre sheet. Using carbon fibre gave us an advantage over aluminium due to its lower density and higher tensile strength.

Carbon Specifications

Density = 1.8×10^{-3} (Kg/m³)

Mass = 0.019 (kg)

Tensile Strength = 1.730 (GPa)

Modulus = 228 (GPa)

TRACTION

The design of the wheels is 50mm which are made of foam to reduce costs, the wheelbase is designed to be slightly oversized to compress the wheels up against the pipe. This is so that there is a greater force which would increase grip levels. However, our design was slightly to wide and the foam didn't compress as much and put to much strain on motors.

The wheels are also sanded down to make sure the chassis doesn't need

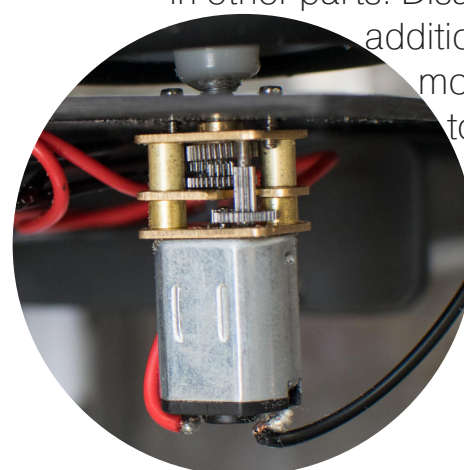
to be altered and to take the finish of the tyre and make the tyre more abrasive to generate more traction.

The wheels aren't tapped on the motors which mean that they have to be glued onto the motors which can be a problem when a motor fails because we can't get the wheel off.



PROPULSION

We started with the idea of using a large motor with a set of helical gears as our method of propulsion, we decided this to be too complex of a system and downgraded it to a 400rpm worm gear motor where its output axel is perpendicular to the motor, using regular linear gearing. This was also decided to be too complex for the given budget. We have now opted on the final version to use 2 smaller motors with internal gearing to generate as higher torque as possible. Some of the advantages of this is that it is simple which makes it easier to make changes to the system, it also reduces additional costs in other parts. Disadvantages include the additional cost from having 2 motors, it also makes the tolerance for the spacing small as it is reliant on the gap between the wheels being the correct dimensions.



SPECS

- Weights 0.227 kilograms.
- A Height of 135mm.
- A Width of 105mm.
- A Thickness of 55mm.
- Features a bump activated reverse switch system (BARS).
- Currently on the 3rd iteration of the design.

