**Calculations To Determine The Maximum Torque To Be Produced By The Motor**

The expected maximum load given acceleration of 0.5m/s2 and a carriage of 220Kg is is 500W. To determine the maximum torque required for this application, then:

Smaller Sprocket: 48.42mm

Larger sprocket: 17.5cm

Wheel: 50cm

C = =

Diameter of wheel = 0.5m

Cof wheel =

Distance (D) covered by the wheel is

The maximum speed of the tricycle is 4.5 m/s

Therefore, to obtain the number of revolutions per second for the wheel at maximum speed:

Speed in rps = =

In rpm =

***Method 1:***

**Large Sprocket Parameters:**

Since angular velocity is the same for two axially connected wheels, then the rpm of the wheel is the same as the rpm of the large sprocket:

Rpm of wheel =

C = =

Diameter of large sprocket = 0.175m

Cof wheel =

Distance (D) covered by the larger sprocket is

Linear speed of larger sprocket = = 94.5 m/min = 1.575 m/s

**Small Sprocket parameters:**

Since linear velocity is the same for two radially connected wheels, then the linear velocity of the large sprocket is the same as the linear velocity of the small sprocket:

V of small sprocket = 1.575 m/s

C = =

Diameter of small sprocket = 0.04842m

Cof small sprocket =

Distance (D) covered by the small sprocket is

Speed in rps = =

In rpm = =

***Method 2:***

**Large Sprocket Parameters:**

Since angular velocity is the same for two axially connected wheels, then the rpm of the wheel is the same as the rpm of the large sprocket:

And r of the larger sprocket is 0.0875m

**Small Sprocket parameters:**

Since linear velocity is the same for two radially connected wheels, then the linear velocity of the large sprocket is the same as the linear velocity of the small sprocket:

V of small sprocket = 1.575 m/s

Radius = 0.02421m

On a flat surface, the expected torque at maximum speed is approximately 8 nm.

However, if the angular velocity was to fall due to motion on an inclined plane, i.e. a ramp, then the torque would dramatically increase. Let us take a critical case where the angular velocity dropped to 5 rad/s.

Our BLDC motor is rated for an adjustable maximum torque between 120nm to 320nm hence it is safe above an angular velocity of: