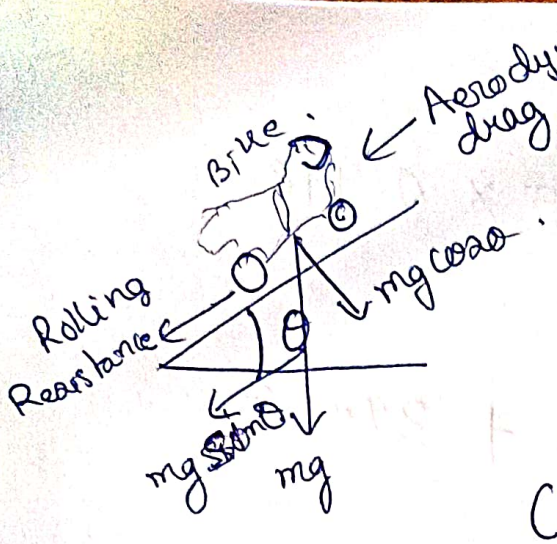
E-Bike

DEBABRATA GHOSH



Aerodynamic drag $= \frac{1}{2} * \rho * C_D * A * V^2$

V = velocity (m/sec)

Air density @ 27°C = ρ = 1.2 (kg/m³)

A = Vehicle Frontal Area = 0.5 m²

C_D = Drag Coefficient = 1.2

Rolling Resistance = $m * g * \mu * \cos\theta$

Climbing Force = $mg \sin\theta$.

F_{trac} = Acceleration Force + Aerodynamic Drag + Rolling Resistance + Climbing Force

$= m*a + \frac{1}{2} * \rho * C_D * A * v^2 + m * g * \mu + mg\sin\theta$.

V = 90 km/hr = 25 m/s

Aerodynamic Drag $= \frac{1}{2} \times 1.2 \times 1.2 \times 0.5 \times 25 \times 25$

$= 225$ N

Gradient assumed to be 5°.

Climbing Force $= 200 \times 9.81 \times \sin 5°$

$= 200 \times 9.81 \times 0.0871$

$= 170.89$

Rolling Resistance = $C_{rr} mg \cos\theta$.

$C_{rr} = 0.02$ $= 0.02 \times 9.81 \times 200 \times 0.996$

$= 39.083\ N$.

At constant acceleration.

$F = 225 + 170.89 + 39.083$

$= 434.973\ N$

$P = F \times V$

$= 434.973 \times 25$

$= 10,874.325\ W$

$= 10\ kW$.

So for 25 m/s the peak power of motor be 10kW

Torque = Force x Radius(m)

$= 434.973 \times 0.25$

$= 108.74325\ N\text{-}m$.

speed of 60km/hr.

$V = 60\,km/hr = 16.67\,m/s$

Aeradynamic Drag $= \frac{1}{2} \times 1.2 \times 1.2 \times 0.5 \times 16.67 \times 16.67$

$= 100.04N$

Climbing Force $= 200 \times 9.81 \times \sin 5^\circ$

$= 170.89\,N$

Rolling Resistance $= 0.02 \times 9.81 \times 200 \times 0.996$

$= 39.083N$

At constant acceleration

$F = 100.04 + 170.89 + 39.083$

$= 310.013\,N$

$P = F \times V$

$= 310.013 \times 16.67$

$= 5167.91671\,W$

$= 5kW$

So for 60km/hr the peak power of motor be 5kW

Torque $=$ Force x Radius (m)

$= 310.013 \times 0.25$

$= 77.503\,N-m.$

We are using Lithium ion battery 48V/20 amp. specification.