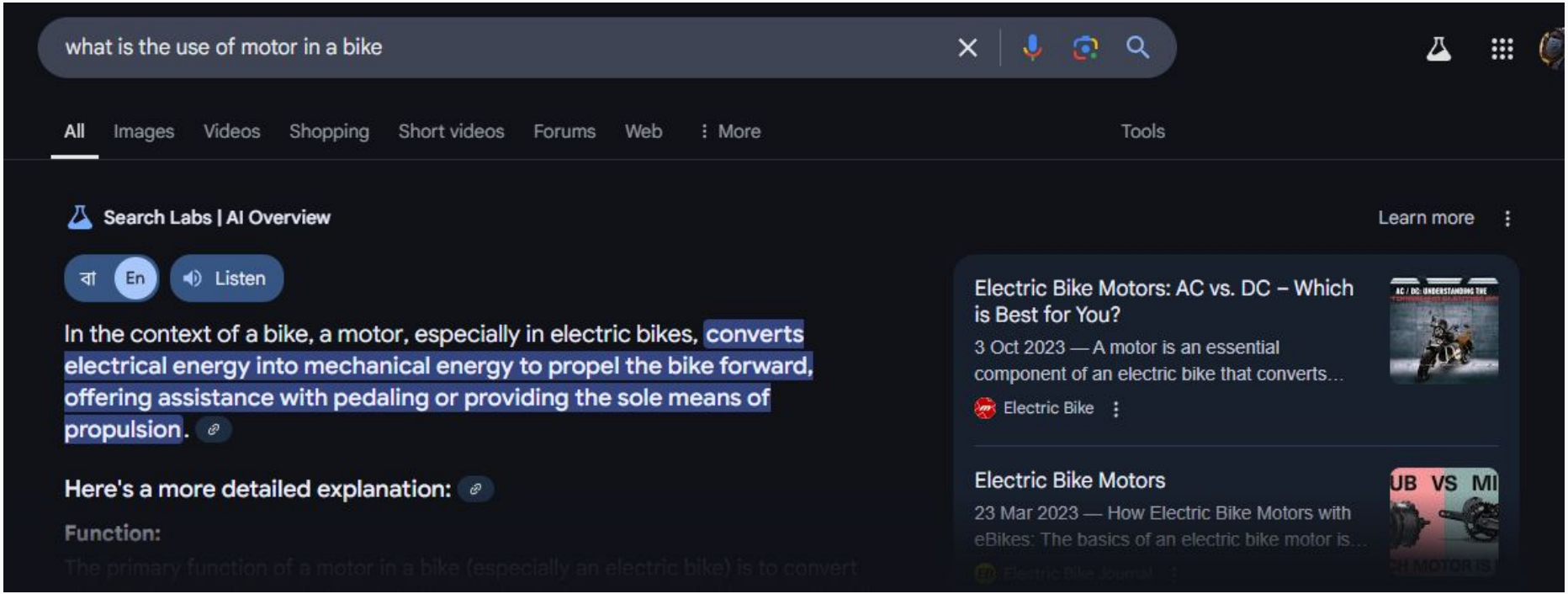
Haquenich M1

Motor

Motors


what is the use of motor in a bike
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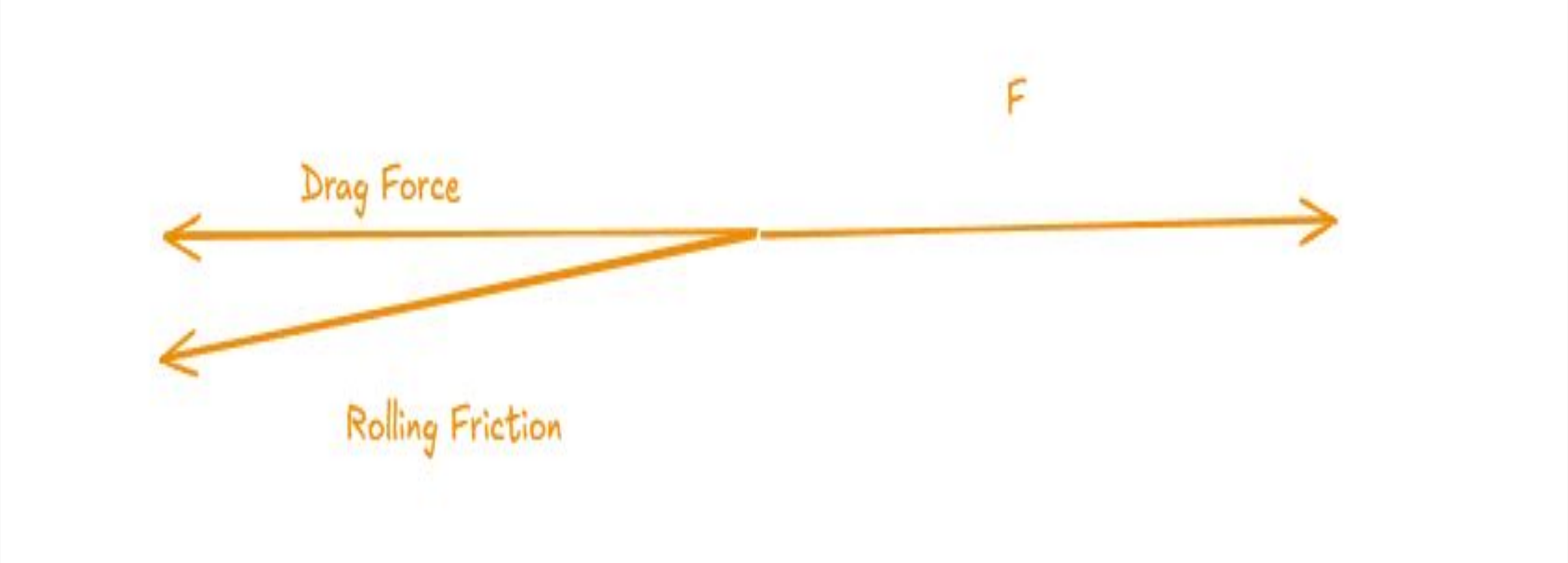
In the context of a bike, a motor, especially in electric bikes, converts electrical energy into mechanical energy to propel the bike forward, offering assistance with pedaling or providing the sole means of propulsion.
Here's a more detailed explanation:
Function:
The primary function of a motor in a bike (especially an electric bike) is to convert
Electric Bike Motors: AC vs. DC – Which is Best for You?
3 Oct 2023 — A motor is an essential component of an electric bike that converts...
Electric Bike
Electric Bike Motors
23 Mar 2023 — How Electric Bike Motors with eBikes: The basics of an electric bike motor is...

Forces To Overcome when in running condition

Free Body Diagram



Forces(edge cases)

$$F_{\text{drag}} = \frac{1}{2} C_d A \rho v^2$$

Cd = 1.2 (for upright person)

A = 0.5 m^2

v= 25 m/s (90Km/h)

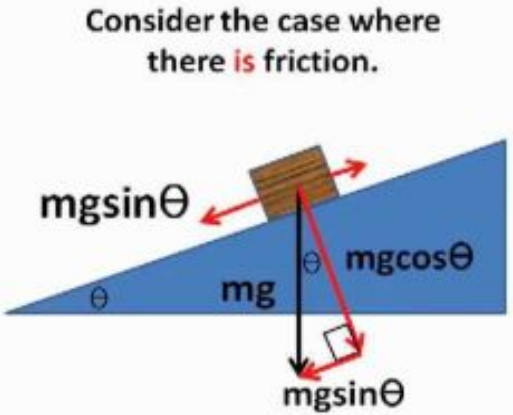
P = 1.293

$$F_{\text{rolling}} = C_r m g$$

Cr =0.02

F = Fd + Fr

Slope consideration



IRC = 1 IN 12 edge case theta becomes around 4.76

Force = 353.5655

P= F* V
= 8839.1375 W

So the power should be 8.9 Kw to have at least constant velocity of 25 m/s for one person and 11 Kw FOR 2 PERSONS

Requirement is 12-14 KW BLDC motor for 1 person and 16-18 KW BLDC motor for 2 persons

Due to the speed being higher the force to overcome during starting is lower where static friction comes into play

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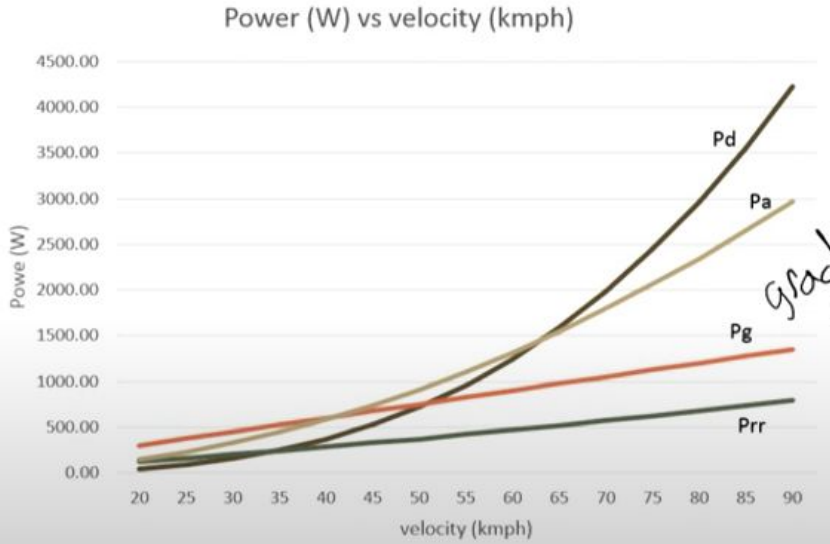
Some resources :

https://docs.google.com/spreadsheets/d/1TbL-WenXAWLYUyV1rtrz93Q6O-nUkrVOUm_APmZFHSI/edit?gid=0#gid=0

For motor power calculation (paste this link)



gradient requires torque

$\rho = 1.2\ kg/m^3$, $C_D = 0.9$, A= 0.5 sqm, $\mu = 0.013$, weight = 180 Kg, Gradient of 5°

2-wheeler

Power

- Gradient and Acceleration not required together
- Gradient never done at high speed: Climbing 5° slope at 15 kmph will require about 700 W
- Acceleration (pick-up) power is small at 25 kmph; and only 1000 W even at 50 kmph
- Rolling resistance on decent roads is small and higher than others only at very low speed
- Drag power is only 700W even at 50 kmph, but can become very high at higher speed

Force related to Torque: Only gradient or acceleration torque matters at all speeds

- T req = 44.8 Nm (R_{wheel} = 0.28m) at 60 kmph

Speeds below 25 kmph

- 500 Watts motor will be enough

With 20 sec pick-up to 50 kmph

- Acceleration Power reqd. itself is 1 kW
- Drag is also considerable: Power reqd. 2 kW

Power required is 6 kW at 80kmph and 9kW at 90 kmph

- For slower pick-up, a 5 kW drive will just about be ok for up to 90 kmph