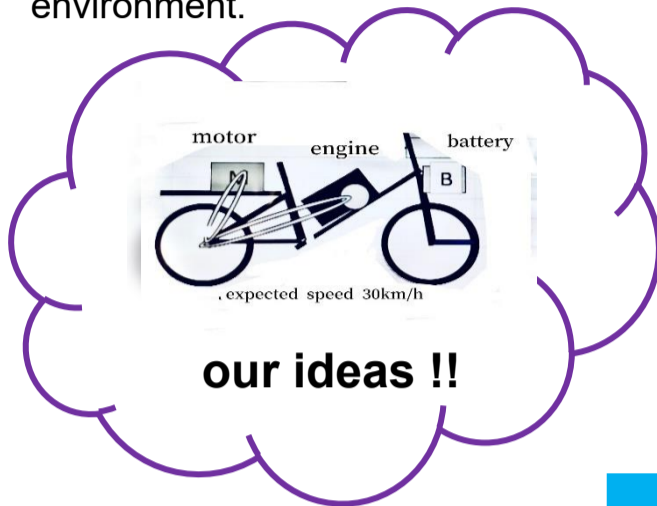


Development of small-output hybrid systems

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1. Research Background

In recent years, hybrid systems in automobiles have predominantly focused on high-output configurations, leading to the enlargement of components such as engines, motors, and batteries. Therefore, we aim to create an "ultra-compact" hybrid system that does not currently exist and examine its practicality and challenge and turn our eyes to the environment.



2. Hypothesis

We define the "ultra-compact hybrid system" we envision as a hybrid system with an engine of 50[cc] or less (or, in the case of an electric motor, an output of 0.6[kW] or less) according to legal standards. In this case, we hypothesize and verify assumptions regarding the main bike body and various components.

Bike	maker : GALWAY Tire size : 27 [inch]
Engine	Maker : RYOBI Displacement : 20[cc]
Motor	MY1016Z2
Control Method	Swich



think to turn ideas into reality

3. Hybrid design

I want to produce easy hybrid system by putting the parts on the bike .For that we will calculate necessary power .After that we find the power of battery.When we think about above things we found what to do next

1. Calculate torque of motor
2. Think about how to switch between motor and engine
3. Consider where to put the parts on bike

3.1 Calculate torque of motor

This problem is what official do we use and how to apply the data.
Now we use this formula of gravity $[W=mg]$
We use this formula to apply above data $W = 11[\text{kg}] , 9.8[\text{m/s}] = 107.8 [\text{N}]$
And it becomes **torque = power of rotation × turning radius**
And then **torque = 107.8 [N] × 0.66 [m] = 71.148 [Nm]**
From above we can solve No1

Hybrid system

Engine	20 [cc]
motor	250 [W]

Data of bike

weight	35 [kg]
Traveling speed	30 [km/h]
Weight of acceleration	107.8[N]

3.2 Think about how to switch between motor and engine

gear ratios(G) = output side (T1) / input side(T2)
By applying above formula we can get this formula
motor`sgear T1 / T2 = engine`sgear T1 / T2
From the above motor and engine`s gear ratios formula become (T1/T2) . At last we will think about where to put the parts

3. 3 Consider where to put the parts on bike

The above figure shows the arrangement of parts
We put the battery in the basket ,the engine on the down tube and the motor is on the rack. This arrangement keeps the balance and by putting the axis of revolution of motor forward the transmission of power can be smooth. By using this method we can solve three problems.However new problems will arise.

4. Future prospects

In order to make hybrid system bike which we can ride. we want to repeat try and error.
At first, we have some problems. one of them is insufficient voltage.
Actually we need 36[V]. but we couldn't find 36 [V] battery .So we have to use three 12 [V] batteries for truck.
That means they are too heavy to move. And they can't keep a balance.
We don't have only this problem but also many problems.
Although now we solve only data but we will face irregular problems in the later.
I would like to research such things as well.

