

Designing and Constructing an Electric Motorcycle



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Introduction

In 2016, transportation surpassed electricity generation as the largest source of greenhouse gas emissions in the United States. Within the transportation sector cars, followed by trucks are the biggest offenders, making up over 70 % of greenhouse gas emissions. If all cars were electrified, car emissions would be reduced by 50%, but this would fall short of the 90% reduction in transportation emissions demanded by the Paris Climate Accord by 2050

Activities:

Step one: Choosing a bike

The motorcycle I chose for the conversion was a 1985 Honda Sabre. In the condition I bought it, it is a touring bike without any fairing, meaning it has a good, comfortable seat height and riding position, and it has a large area for the primary drive battery. It was purchased for \$400

Step two: Removal of ALL gasoline components

This process began with the removal of the side fairing and small components, leading up to the removal of the Internal combustion engine. One of the big challenges involved loosening some of the rusty, 35 year bolts. All fluids, such as oil and coolant also had to be removed and properly disposed of.

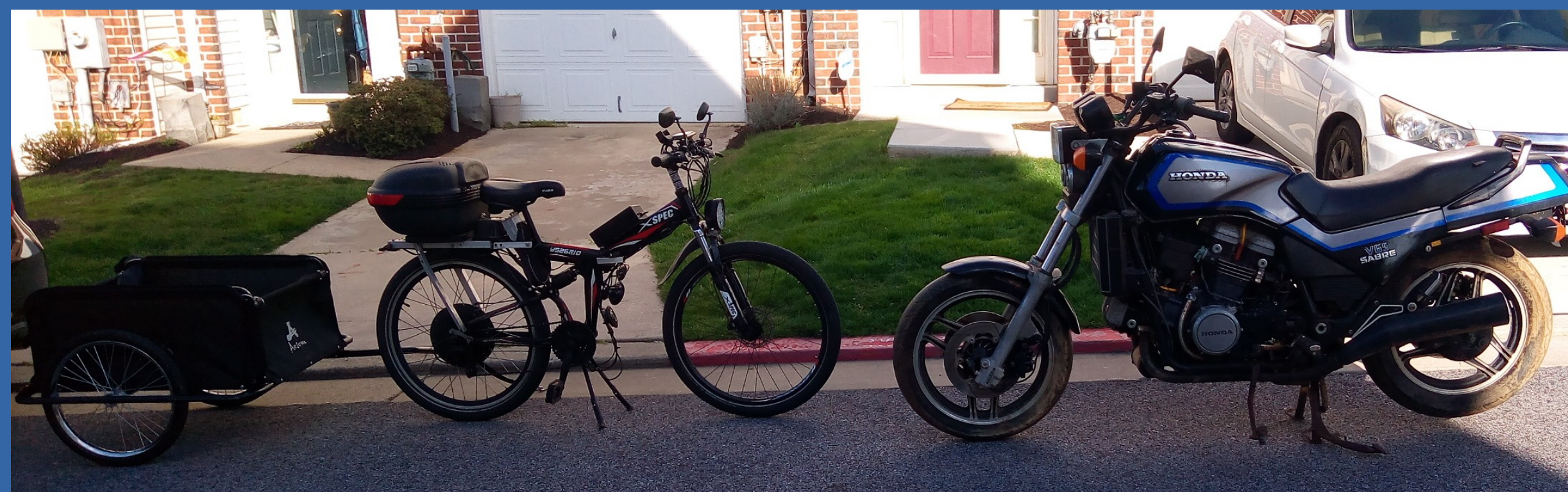
Step three: Preparing the frame

Despite its' good look, the relatively low cost and old age of the bike meant there were mechanical issues with the frame that needed to be fixed before the installation of the electric drive. First, the frame received a coat of gloss black rust protective paint. Secondly, all of the metal on the front forks needed polishing. Third, both new front and rear tires were needed, and the rims cleaned (due to the potential use hub motor, only the front rim was cleaned and the wheel replaced).

Step four: Brake repair

Both front and rear brakes need repair. This step is ongoing

Step five (optional): Add a front Windjammer fairing



My "New" Motorcycle before any modifications next to my 2018 Electric Moped!



Beginning to disassembly the Honda Sabre



Preparing to Remove the 1.1 liter engine



The engine and the left subframe off of the motorcycle



The new paint on the frame, polished forks, and the new front tire

Impact:

There is one type of personal vehicle with untapped potential for reducing vehicle emissions: Motorcycles! Motorcycles are the world's common motor vehicle, with most of them located in Asia powered by a 250cc or smaller gasoline engine. While gasoline motorcycles have modest CO₂ emissions reductions compared to cars, it's electric motorcycles and mopeds that really have the potential to drive down emissions due to their low power consumption.

The electric motorcycle I am designing will have between 1/8th to 1/12th the emissions of a gasoline car!

Future Work:

After finishing the preparation of the frame, the next step will be to install the electric drive. The largest two components are the drive battery and motor. Use of a hub motor is preferred because more room is available for the battery and other equipment, but an onboard motor might be used, too. Other key components include the speed controller, onboard slow charger, a step down converter or auxiliary battery for lights and other non-drive systems, and a microcomputer to control some lights and other systems

The last step involves all accessory components including adding top and side storage, a high-power charger, theft protection, onboard speakers, a trailer hitch, insurance and registration, and any other luxury items.



Site Information:

Address: My house, and the University of Maryland

Supervisor: Dr. Romel Gomez, Professor in the Computer and Electrical Engineering Department

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