**Introduction**

Electric vehicles offer some advantages over those powered by internal combustion engines. One important one is the greatly reduced amount of emissions. A second benefit not to be overlooked is the lower cost of the energy used.

Many major cities worldwide are restricting motorized traffic due to air quality problems. In the near future, alternative sources of power with no emissions at the point of use will be required at those locations. Stored electrical power is one the available technologies to address this issue.

Generating energy in bulk and distributing it to users is more efficient than each user generating energy as needed. A typical gasoline powered car attains a 20% average thermal energy efficiency. By comparison a commercial fossil fuel powered plant has an average efficiency ranging from a low of 33% on older plants to a high of 45% for plants with new technologies.

**Challenges**

- Match an electric motor to the power and torque curve of a 7 HP diesel engine.
- Design a power transmission system between the electric motor and the transaxle
- Design a mount for the electric motor
- Match speed pedal sensor to the controller
- Create charging protocol for batteries

**Solutions**

- Match power and torque of the original diesel engine with equivalent power of an electric motor, and use software to match output curve as well as match torque with reduction gearing
- Use chain and sprockets for power transfer efficiency of 98.5%
- Model in CAD and perform FEA
- Program controller for the sensor voltage range input
- Use published data for AGM charge acceptance

**Conclusions**

Modern battery efficiency for charge/discharge is upwards of 90%, which makes converting an existing vehicle from fossil fuel to electric power feasible. Considering that commercially available electricity is generated at an average of about 40% energy efficiency compared to 20% for automotive internal combustion engines, the 10% loss from the battery still delivers a 55% advantage. This value does not take into consideration the energy recovered through regeneration while braking.

As well as an economic gain for consumers, a significant reduction in polluting emissions is achieved. Further, the typical range of electric vehicles, approximately 150 miles, is not a disincentive for city populations with short commutes. In the future, charging stations are likely to be available at parking lots.

In brief, the future of electric vehicles looks promising as a means to comply with future regulations and reduce air pollution.

**Sources**

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