IPRO 326

Hybrid Electric Vehicles

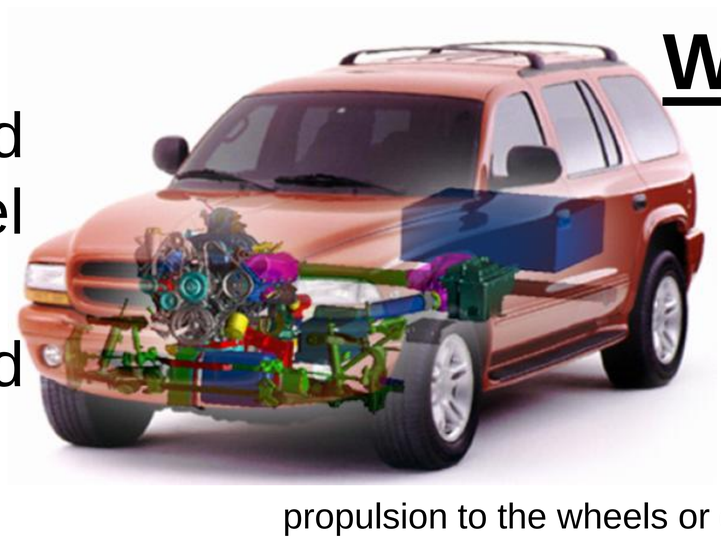
Spring 2005

Introduction

The dominant trend in the automotive industry leans towards the increased use of electrical power to drive automobile systems. A practical solution for the auto industry to achieve higher fuel economy, lower emissions, and increased performance is through Hybrid Electric Vehicles (HEVs), which uses a combination of Internal Combustion Engine and electric motors to achieve those objectives.

Objectives

- Analyze the advantages and disadvantages or series and parallel hybrid configurations
- Use ADVISOR software to simulate and determine optimal hybridization of:
  - Hummer H3
  - HMMWV
  - TATA 1512 Transit Bus
- Determine a practical implementation for HEVs in the consumer market



What is an HEV?

--ICE:

A normal internal combustion engine scaled up or down depending on the configuration of the HEV

--Motor:

An electric motor provides propulsion to the wheels or can generate power for the batteries

--Batteries:

A set of batteries provides electric power for both the electric motor and any other electric loads of the vehicle

Practical Recommendations

- Slightly hybridized vehicles
  - Hybridization factors between 10 and 30%
- Economical transition to hybrid vehicle production

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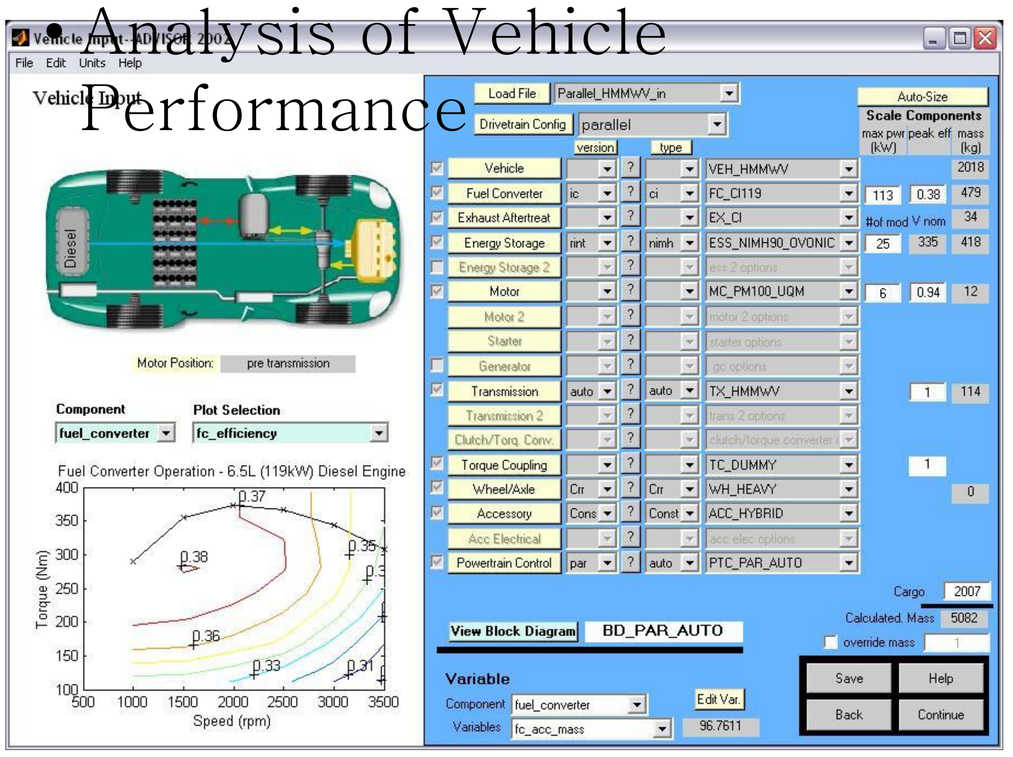
Advisor

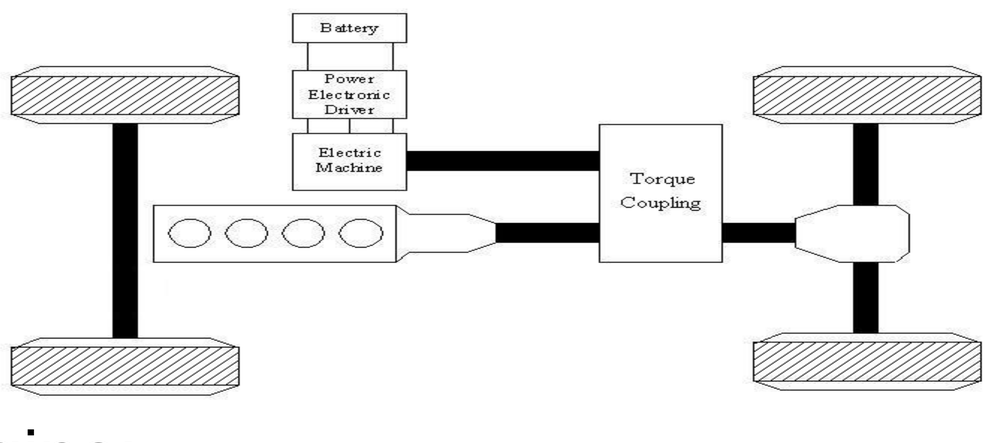
- Department of Energy developed
- MATLAB 6.1 sub-program
- Simulates various vehicle types
- Multiple Driving Environments
- Analysis of Vehicle Performance



Configurations

Parallel Configuration

- Electric motor mechanically connected to ICE
- Increased Fuel Efficiency & Performance

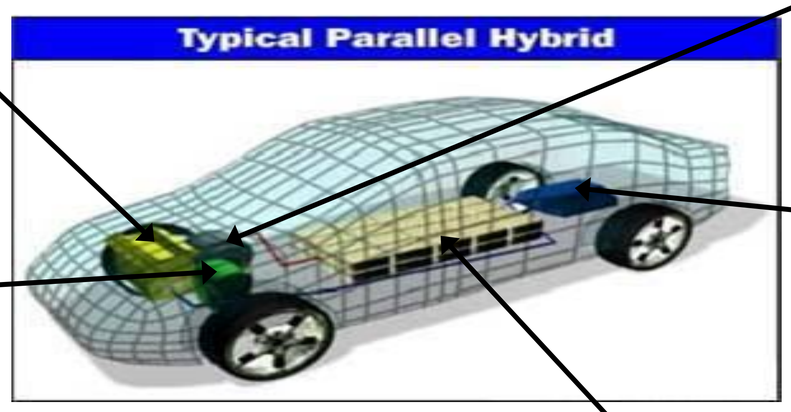


Internal Combustion Engine:

Typical ICE except usually scaled down in power.

Electric Motor:

Used with the ICE to supply power to the tires.



Transmission:

Usually a typical transmission used to transfer power from the ICE and motor to the wheels.

Fuel Tank:

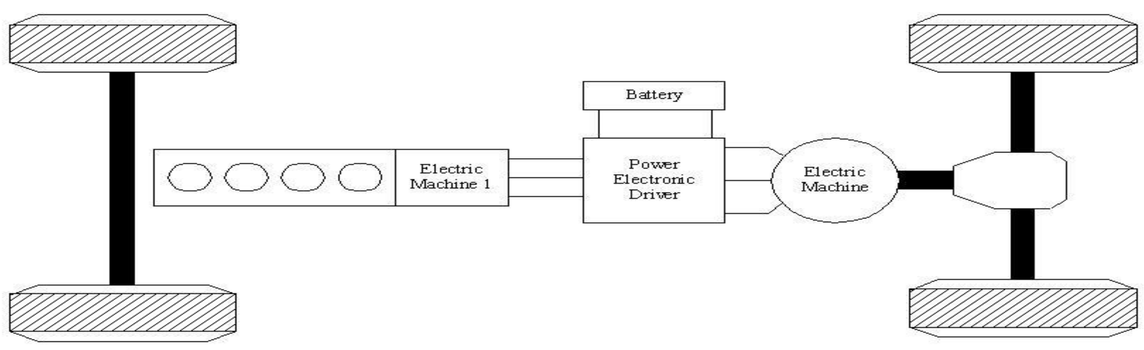
Contains fuel for the ICE.

Batteries:

Used to power the electric motor and any other electrical loads for the car.

Series Configuration

- ICE powers electric generator
- Electric Generator charges batteries
- Batteries and generator power electric motor
- Increased Fuel Efficiency & Performance

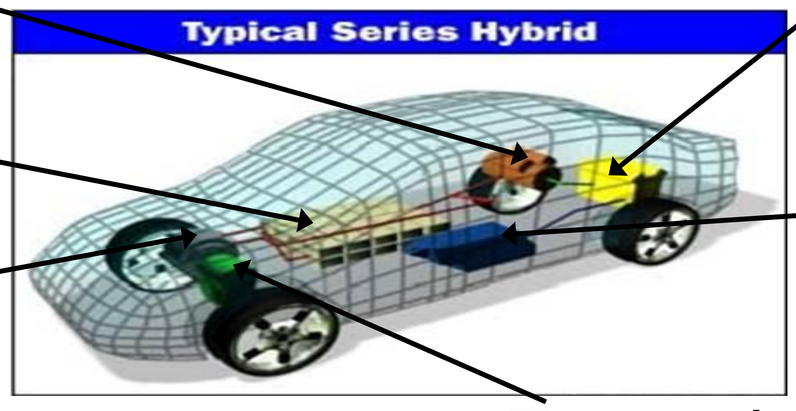


Generator:

Converts power from the ICE to electric power.

Internal Combustion Engine:

Typical ICE used to generate power.



Batteries:

Used to power the electric motor and any other
electrical loads for the car.

Fuel Tank:

Contains fuel for the ICE.

Electric Motor:

Gets electric power from the generator and batteries and supplies power to the wheels.

Transmission:

Usually just a single gear transmission like the ones in typical fully electric vehicle.