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A Project Report on

“HYBRID TRIKE”

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ELECTRICAL AND ELECTRONICS

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Chapter 1

INTRODUCTION

A hybrid vehicle is a vehicle that uses two or more distinct power sources to move the vehicle. The term most commonly refers to hybrid electric vehicles (HEVs), which combine an internal combustion engine and a electric power train.

Vehicle Type

Two Wheeled and Cycle Type

Early prototypes of motorcycles in the late 19th century used the same principles.

- In a **parallel hybrid bicycle** human and motor power are mechanically coupled at the pedal drive train or at the rear or the front wheel, e.g. using a hub motor, a roller pressing onto a tire, or a connection to a wheel using a transmission element. Human and motor torques is added together..
- In a **series hybrid bicycle (SH)** the user powers a generator using the pedals. This is converted into electricity and can be fed directly to the motor giving a chainless bicycle but also to charge a battery. The motor draws power from the battery and must be able to deliver the full mechanical torque required because none is available from the pedals. SH bicycles are commercially available, because they are very simple in theory and manufacturing.

The first known prototype and publication of an SH bicycle is by Augustus Kinzel in 1975. In 1994 Bernie Macdonalds conceived the Electrilit SH lightweight vehicle which used power electronics allowing regenerative braking and pedaling while stationary. In 1995 Thomas Müller designed a "Fahrrad mit elektromagnetischem Antrieb" in his 1995 diploma thesis and built a functional vehicle. In 2005 Fuchs and colleagues built several prototype SH tricycles and quadricycles.

Engine Type

Hybrid electric-petroleum vehicles

A petroleum-electric hybrid most commonly uses internal combustion engines (generally gasoline or Diesel engines, powered by a variety of fuels) and electric batteries to power the vehicle. There are many types of petroleum-electric hybrid drive trains, from Full hybrid to Mild hybrid, which offer varying advantages and disadvantages.

Henri Pieper in 1899 developed the first petro-electric hybrid automobile in the world. In 1900, Ferdinand Porsche developed a series-hybrid using two motor-in-wheel-hub arrangements with a combustion generator set providing the electric power, setting two speed records. While liquid fuel/electric hybrids date back to the late 19th century, the braking regenerative hybrid was invented by David Arthurs, an electrical engineer from Springdale.

The plug-in-electric-vehicle (PEV) is becoming more and more common. It has the range needed in locations where there are wide gaps with no services. The batteries can be plugged in to house (mains) electricity for charging, as well being charged while the engine is running.

Hybrid vehicle power train configurations

Parallel hybrid

In a parallel hybrid the single electric motor and the internal combustion engine are installed so that they can both individually or together power the vehicle. In contrast to the power split configuration typically only one electric motor is installed. Most commonly the internal combustion engine, the electric motor and gear box are coupled by automatically controlled clutches. For electric driving the clutch between the internal combustion engine is open while the clutch to the gear box is engaged. While in combustion mode the engine and motor run at the same speed.

Mild parallel hybrid

These types use a generally compact electric motor (usually <20 kW) to provide auto-stop/start features and to provide extra power assist during the acceleration, and to generate on the deceleration phase (aka regenerative braking).

Series hybrid

A **series- or serial-hybrid vehicle** has also been referred to as an Extended Range Electric Vehicle or Range-Extended Electric Vehicle (EREV/REEV); however, range extension can be accomplished with either series or parallel hybrid layouts.

Series-hybrid vehicles are driven by the electric motor with no mechanical connection to the engine. Instead there is an engine tuned for running a generator when the battery pack energy supply isn't sufficient for demands.

In 1997 Toyota released the first series-hybrid bus sold in Japan. Meanwhile, GM will introduced the Chevy Volt EREV in 2010, aiming for an all-electric range of 40 miles, and a price tag of around \$40,000. Supercapacitors combined with a lithium ion battery bank have been used in SUV vehicle. Using supercapacitors they claim up to 150 mpg in a series-hybrid arrangement.

Plug-in hybrid electric vehicle (PHEV)

Another subtype added to the hybrid market is the Plug-in Hybrid Electric Vehicle (PHEV). The PHEV is usually a general fuel-electric (parallel or serial) hybrid with increased energy storage capacity (usually Li-ion batteries). It may be connected to mains electricity supply at the end of the journey to avoid charging using the on-board internal combustion engine.

This concept is attractive to those seeking to minimize on-road emissions by avoiding – or at least minimizing – the use of ICE during daily driving. As with pure electric vehicles, the total emissions saving, for example in CO₂ terms, is dependent upon the energy source of the electricity generating company.