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# History of Hybrid Development

by *Matt Stroud and Paul Bindon*

Have you ever thought about how you would handle yourself or your crew when dealing with a hybrid vehicle that was involved in an incident? Maybe you have taken a class. Did you get enough information from that class to make yourself comfortable dealing with any scenario? Did you walk away having questions unanswered? Even worse, did you walk away with more fear than before the class? Maybe you have never even thought about it.

Let's begin with some history. Automobiles were powered with electric motors as early as the late 1800s. They had the advantage of simplicity over their gasoline counterparts of the time. There were no difficult gears to shift, they did not need to be crank started, and they did not belch smoke into the atmosphere. They were the preferred method of transportation for the elite when traveling within the city. The development of better road systems between cities and the discovery of large amounts of crude oil in Texas in the early 1900s caused their limited range and high cost to sway public preference toward gasoline-powered automobiles. This preference has continued until the recent resurgence of age-old concerns about pollution and dependence on foreign oil that make alternatives more appealing.

From the Congressional Record, 1875:

“A new source of power... called gasoline has been produced by a Boston engineer. Instead of burning the fuel under a boiler, it is exploded inside the cylinder of an engine...The dangers are obvious. Stores of gasoline in the hands of people interested primarily in profit would constitute a fire and explosive hazard of the first rank. Horseless carriages propelled by gasoline might attain speeds of 14, or even 20 miles per hour. The menace to our people of this type hurtling through our streets and along our roads and poisoning the atmosphere would call for prompt legislative action even if the military and economic implications were not so overwhelming... the cost of producing (gasoline) is far beyond the financial capacity of private industry... In addition the development of this new power may displace the use of horses, which would wreck our agriculture.”

As you can see, current concerns regarding new vehicle technology being offered today differ little from those expressed at the end of the 1800s. New types of fuels and emission concerns are still very relevant.

Social and legislative pressures in the late 1980s led to the federal Clean Air Act and the subsequent adoption of the Zero-Emission Vehicle (ZEV) standard by the state of California in 1990. As a result of these regulations, the major auto manufacturers were required to sell ever-increasing numbers of zero-emission vehicles in California over the following years, with a goal of 2% by 1998 and 10% by 2003.

General Motors produced a zero-emission vehicle called the EV 1 from 1996 to 1999. The EV 1 was a capable electric vehicle with good range and power. GM offered it as a lease-only vehicle, leasing only 800 units because of high production costs. GM claimed it was not able to make enough of a profit on it

to justify continued production; thus, the vehicles were recalled and destroyed. Ford, Chrysler, Toyota and Honda also offered electric vehicles during that time in very limited numbers. Since the auto manufacturers were unable or unwilling to meet the zero-emission standards established in California, subsequent legal battles resulted in compromises that included blended gasoline with alcohol as an “alternative fuel,” a new rating system for gasoline-powered vehicle emission standards, and the production of natural gas and hybrid vehicles as Ultra Low Emission Vehicles (ULEVs) or Partial Zero Emission Vehicles (PZEV) instead of electric or zero-emission vehicles (ZEV). The byproduct of these emission standards is a very efficient vehicle with exceptional fuel economy: the hybrid. Hybrid vehicles became widely available to the public in the year 2000 with the introduction of the Honda Insight. The following year, Toyota introduced the Prius.

A hybrid vehicle blends internal combustion engine and high-voltage electric motor technology to reduce greenhouse gas emissions and increase fuel economy. Energy is stored in a high-voltage battery pack and used by high-voltage electric motors to either drive the wheels directly or assist in driving the wheels through a conventional transmission.

System types include the following:

- Parallel hybrids use the electric motors or the internal combustion engine together or individually to power the vehicle (Toyota Prius Synergy drive).
- Mid parallel hybrids use a compact electric motor to assist the internal combustion engine in driving the wheels (Honda Civic Integrated Motor Assist system IMA).
- Series hybrids use an internal combustion engine to produce electricity that is either stored in a battery or used by an electric motor to drive the wheels (soon to be released Chevy Volt).
- Hydrogen fuel cell vehicles are also a type of series hybrid. The fuel cell provides electricity for storage in the battery or for use by the electric motor that drives the wheels. While there are no production fuel cell vehicles available currently, prototypes from most major manufacturers have been produced (Toyota, GM, Hyundai, Honda etc.).

Hybrid vehicles use regenerative braking to capture the vehicle’s forward motion and convert it to electricity that is stored in the battery. Computer controls make this possible by converting the electric motors into generators.

With millions of these vehicles on the road today, they are an important part of our transportation system. Learning how they work and how to safely respond to an incident involving them is an important part of first responder training.



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*manage hybrid and new technology vehicle incidents.*



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*years, receiving both master diagnostic specialist and hybrid certification through factory training in the latest automotive technologies.*

*Matt and Paul perform all their own research on new technology vehicles in order to publish MGS TECH's Hybrid Safety Guide (HRG) and teach the hybrid safety course to firefighters around the country, including a class at the 2010 [FDIC](#) in Indianapolis, Indiana.*

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