

When Old Things Turn Into New Again

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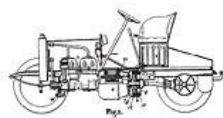
WHILE combining gasoline and electric motors in a car seems like a miracle of automotive wizardry of the 21st century, the origins of hybrid technology actually date to the end of the 19th. In the intervening years the chapters of hybrid history have roared to life, only to fall quickly silent — much like the gasoline engines in hybrids today. More than once the technology has been championed as a breakthrough, only to be cast aside when a more convenient alternative emerges. Then the idea is “discovered” again.

1898



Ferdinand Porsche, at age 23, creates an electric vehicle that later uses a gasoline engine to provide power to electric motors in the wheel hubs.

1905



Henri Pieper, a Belgian engineer, files a United States patent for a gas-electric vehicle that uses an electric motor to help it achieve 25 m.p.h. The patent is issued three years later, but hybrids and electrics are on the wane.

1969



Popular Science reviews General Motors' XP-883 plug-in hybrid concept car, which is “equipped with an on-board charger that can be connected to an external 115-volt A.C. source.”

1969



The government's Partnership for a New Generation of Vehicles seeks to develop a clean car that can get up to 80 miles a gallon. Several years and a billion dollars later, three prototypes emerge — the G.M. Precept, Ford Prodigy and Chrysler ESX-3 — but they remain concepts.

Hybrids Through the Years

Gas-electric vehicles are nothing new. Ferdinand Porsche invented one year before he came up with the Volkswagen. Here are some hybrid highlights.

The Paris Exposition of 1900 featured the Lohner-Porsche Elektromobil, which would later become one of the first hybrid cars. It was designed two years earlier by a 23-year-old engineer, unknown at the time, named Ferdinand Porsche. Exposition records show that Porsche's vehicle could travel 38 miles solely on electricity.

How it came about was this: Jacob Lohner, a coach builder in Vienna in the late 1800s, was interested in the development of motorcars that incorporated coaches of the period. He asked the young Porsche, a graduate of the Vienna Technical College, to build a silent electric carriage. The gas-powered vehicles of the era were noisy, smelly, shaky and difficult to start.

Porsche integrated battery-powered electric motors directly into the front-wheel hubs, producing one of the first front-wheel-drive cars. He later added an internal combustion gasoline engine to drive a generator, which charged the batteries. The Lohner-Porsche vehicle could reach a maximum speed of only about 35 miles an hour, but the proto-hybrid was born.

Porsche is better known today as the designer of the Volkswagen and for the famed sports car company brought to prominence by his son.

Hybrids virtually disappeared for the next 60 years, a period which brought the growth of the modern automobile industry, a rapidly expanding national highway system in the United States and lots of cheap gasoline. Backyard tinkerers and dreamers cobbled together hybrids, yet no project enjoyed enough drive to take them to market.

The first concerns about auto emissions restored interest in electric vehicles. C. Russell Feldman, a founder of Motorola, took notice in 1962 of the rising concern over automobile pollution and explored the market possibilities for electric cars. Mr. Feldman contacted Victor Wouk, an electrical engineer and entrepreneur, who drove Mr. Feldman's test electric vehicles, took measurements and reported that the batteries did not have the energy required to produce enough speed or range.

Throughout the 60s, Dr. Wouk pondered the problem and reached an ingenious solution: combine the low-emissions benefits of an electric car with the power of a gasoline engine to produce a hybrid vehicle. Dr. Wouk and his colleague, Charles L. Rosen, formed a new company, Petro-Electric Motors, to develop their hybrid car idea and pitch it to the [Environmental Protection Agency](#), which had announced a program to encourage development of "clean cars."

The inventors chose a Buick Skylark, which had ample room under the hood, for their prototype. The team used the garage at Dr. Rosen's home in Teaneck, N.J., as the workshop. A Wankel rotary gasoline engine and eight lead-acid batteries were shoehorned under the Skylark's hood. Predating computer controls, a mechanical system blended the drive power from the batteries and gasoline engine. A welding shop melded the crazy quilt of parts and pieces into a rough prototype that shook and rattled at highway speeds.

Dr. Wouk and Dr. Rosen tinkered and tested for the next two years. If only they could get a rough hybrid prototype built and tested, they reasoned, the government or an automaker would surely invest millions to mass-produce the hybrid.

After the E.P.A. threatened to drop the entire program, Dr. Wouk pleaded with the agency to let the project proceed. In 1974, the agency tested the hybrid over three months, and it passed standards for more development. But a month later, the E.P.A. sent a report citing many reasons the hybrid would not go into the next phase of support — mostly because of the testing equipment's inability to evaluate vehicles using multiple power sources.

After two years of trying to get the E.P.A. to overturn its rejection, or to get the auto industry to pay attention to the hybrid's abilities, Petro-Electric Motors ran out of money. Once again, hybrid history went silent.

The 1980s and '90s brought the sport-utility vehicle and several industry research projects, notably the Clinton administration's billion-dollar Partnership for a New Generation of Vehicles, which resulted in hybrid prototypes. But none made it past the concept phase.

Then in 1994, nearly a century after Porsche's hybrid arrived on the scene, Akihiro Wada, executive vice president of Toyota, posed a challenge before a special team of company

engineers: build a car with double the fuel efficiency of contemporary vehicles. Three years later, Toyota introduced the Prius in Japan as the world's first mass-produced gas-electric car.

Today, the Prius competes with conventional sedans as a top seller in the United States, and nearly every major carmaker in the world has either introduced hybrids or is struggling to create the technologies to make cars more efficient.

The next big new idea is actually an old idea: the plug-in hybrid, which is expected to arrive sometime in the next 5 to 10 years. Victor Wouk saw this clearly in 1974, when he was quoted in The New York Times as saying an all-electric car "could solve the housewife's fuel problems."

"She could drive 10 miles to the supermarket just on the batteries," he said, "and when she got home, plug into an outlet in the garage and recharge the batteries for the next day."

The History of the Automobile



Starting in the late 1700's, European engineers began tinkering with motor powered vehicles. Steam, combustion, and electrical motors had all been attempted by the mid 1800's. By the 1900's, it was uncertain which type of engine would power the automobile. At first, the electric car was the most popular, but at the time a battery did not exist that would allow a car to move with much speed or over a long distance. Even though some of the earlier speed records were set by electric cars, they did not stay in production past the first decade of the 20th century. The steam-driven automobile lasted into 1920's. However, the price on steam powered engines, either to build or maintain was incomparable to the gas powered engines. Not only was the price a problem, but the risk of a boiler explosion also kept the steam engine from becoming popular. The combustion engine continually beat out the competition, and the early American automobile pioneers like Ransom E. Olds and Henry Ford built reliable combustion engines, rejecting the ideas of steam or electrical power from the start.

Automotive production on a commercial scale started in France in 1890. Commercial production in the United States began at the beginning of the 1900's and was equal to that of Europe's. In those days, the European industry consisted of small independent firms that would turn out a few cars by means of precise engineering and handicraft methods. The American automobile plants were assembly line operations, which meant using parts made by independent suppliers and putting them together at the plant. In the early 1900's, the United States had about 2,000 firms producing one or more cars. By 1920 the number of firms had decreased to about 100 and by 1929 to 44. In 1976 the Motor Vehicle Manufacturers Association had only 11 members. The same situation occurred in Europe and Japan.

The first automobile produced for the masses in the US was the three-horsepower, curved-dash Oldsmobile; 425 of them were sold in 1901 and 5,000 in 1904--this model is still prized by collectors. The firm prospered, and it was noted by others, and, from 1904 to 1908, 241 automobile-manufacturing firms went into business in the United States. One of these was the Ford Motor Company which was organized in June 1903, and sold its first car on the following July 23. The company produced 1,700 cars during its first full year of business. Henry Ford

produced the Model T to be an economical car for the average American. By 1920 Ford sold over a million cars.

At the beginning of the century the automobile entered the transportation market as a toy for the rich. However, it became increasingly popular among the general population because it gave travelers the freedom to travel when they wanted to and where they wanted. As a result, in North America and Europe the automobile became cheaper and more accessible to the middle class. This was facilitated by Henry Ford who did two important things. First he priced his car to be as affordable as possible and second, he paid his workers enough to be able to purchase the cars they were manufacturing. This helped push wages and auto sales upward. The convenience of the automobile freed people from the need to live near rail lines or stations; they could choose locations almost anywhere in an urban area, as long as roads were available to connect them to other places. Many states in the US established motor fuel taxes that were used only to build and maintain highways helping the auto highway system become self-supporting.

Popularity of the automobile has consistently moved with the state of the economy, growing during the boom period after World War I and dropping abruptly during the Great Depression, when unemployment was high. World War II saw a large increase in mass transit because employment was high and automobiles were scarce. The rapid growth of car owners after World War II, particularly in the United States and Western Europe demonstrated the population's favor towards automobiles. During the war, automobile motors, fuel, and tires were in short supply. There was an unsatisfied demand when the war ended and plenty of production capacity as factories turned off the war machine. Many people had saved money because there was little to buy, beyond necessities, in the war years. Workers relied heavily on mass transportation during the war and longed for the freedom and flexibility of the automobile.

A historian has said that Henry Ford freed common people from the limitations of their geography. The automobile created mobility on a scale never known before, and the total effect on living habits and social customs is endless. In the days of horse-drawn transportation, the practical limit of wagon travel was 10 to 15 miles, so that meant any community or individual farm more than 15 miles from a city, a railroad, or a navigable waterway was isolated from the mainstream of economic and social life. Motor vehicles and paved roads have narrowed the gap between rural and urban life. Farmers can ship easily and economically by truck and can drive to town when it is convenient. In addition, such institutions as regional schools and hospitals are now accessible by bus and car.

Yet, the effect on city life has been, if anything, more prominent than the effect on the farms. The automobile has radically changed city life by accelerating the outward expansion of population into the suburbs. The suburban trend is emphasized by the fact that highway transportation encourages business and industry to move outward to sites where land is cheaper, where access by car and truck is easier than in crowded cities, and where space is available for their one or two story structures. Better roads were constructed, which further increased travel throughout the nation. As with other automobile-related phenomena, the trend is most noticeable in the United States but is rapidly appearing elsewhere in the world.

Before the automobile, people both lived in the city and worked in the city, or lived in the country and worked on a farm. Because of the automobile, the growth of suburbs has allowed people to live on the outskirts of the city and be able to work in the city by commuting. New jobs due to the impact of the automobile such as fast food, city/highway construction, state patrol/police, convenience stores, gas stations, auto repair shops, auto shops, etc. allow more employment for the world's growing population.