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АНГЛИЙСКИЙ ЯЗЫК

Сборник текстов
для студентов специальности
«Автомобили и автомобильное хозяйство»

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SECTION I

Text 1

WHERE DOES THE WORD "AUTOMOBILE" COME FROM?

The word automobile is not English. It consists of two words: autos and mobiles. Autos is a Greek word meaning "self," mobilis – a Latin word meaning "movable". The two words taken together mean "self-moving". Thus, an automobile means a self-moving vehicle. The synonyms of automobile are: auto, car, auto- car, motor car.

The role and importance of an automobile arise from the fact that it can move along roads unprovided with rails. In this respect, it substantially differs from a street car (tram) and a railway car (train). In fact, it often replaces street cars, railway cars, and other agencies of transportation and communication. In short, the automobile is a vehicle well adapted for ordinary road conditions.

The automobile has long since ceased to be a matter of luxury or sport and has become a decisive factor in the economic development of many countries. This accounts for the fact that the world at large uses a great number of automobiles. In some countries where automobiles are found in millions they are playing a most important part in the solution of many problems of transport.

The development of automobiles is also accountable to a large extent for the progress in road maintenance, improvement and construction.

Questions:

1. What is the origin of the word *automobile*?
2. What fact does the role and importance of the automobile arise from?
3. Why does the automobile play an important part in the economic development in many countries?

Text 2

THE EARLY DAYS OF THE AUTOMOBILE

Like most other great human achievements, the motor car is not the product of any single inventor.

One of the earliest attempts to propel a vehicle by mechanical power was suggested by Isaac Newton. But the first self-propelled vehicle was constructed by the French military engineer Cugnot in 1763. He built a steam-driven engine which had three wheels, carried two passengers and ran at maximum speed of four miles per hour.

In 1784 the Russian inventor Kulibin built a three-wheeled carriage.

In his vehicle he used for the first time such new elements as brakes, rollers and a gearbox.

In 1825 a steam engine was built in Great Britain. The vehicle carried 18 passengers and covered 8 miles in 45 minutes. However, the progress of motor cars met with great opposition in Great Britain. Further development of motor car lagged because of the restrictions resulting from legislative acts. The most famous of these acts was the Red Flag Act of 1865, according to which the speed of the steam-driven vehicles was limited to 4 miles per hour and a man with a red flag had to walk in front of it.

In Russia there were cities where motor cars were outlawed altogether. When the editor of the local newspaper in the city of Uralsk bought a car, the governor issued these instructions to the police: "When the vehicle appears in the streets, it is to be stopped and escorted to the police station, where its driver is not to be prosecuted".

Questions:

1. Is the motor car a product of a single inventor?
2. When was the first self-propelled vehicle constructed?
3. What elements did the Russian inventor Kulibin use for the first time in his vehicle?
4. Did the progress of motor cars meet with great opposition?

Text 3

THE ELECTRIC

The electric automobile energized by rechargeable batteries appeared to have a great future nearly a century ago.

In 1888, Scientific American described an English electric carriage. An ordinary four-passenger "dog cart", the vehicle was electrified by Immisch & Company of London for the Sultan of Turkey. It had a 1-hp motor connected by chain to a rear wheel. The makers claimed that the twenty-four-cell batter (stored under the seats) could "propel the vehicle at a speed of about ten miles an hour for five hours".

In a trial run at a skating rink in Camden Town, "no great speed could be attained, on account of the confined space and the consequent necessity for frequent sharp turns". One assumes that ordinary Turks were properly impressed by their Sultan's electric dog cart.

In 1847, Werner von Siemens publicly said he would build an electric-powered carriage. He did so with the 1897 Viktoria.

Twenty-eight percent of the 4, 192 American automobiles produced in 1900 were electric. In the New York automobile show of that year more electrics were on display than gasoline or steam vehicles.

Some of America's most distinguished inventors, including Thomas Edison, were promoting electrics or taking part in their development. And the first American firm to manufacture cars by hundreds was churning out well-designed electrics.

Questions:

1. Did the electric automobile appear to have a great future nearly a century ago?
2. Were most distinguished inventors, including Thomas Edison, promoting electrics or taking part in their development?
3. What electric car was described by *Scientific American* in 1888?

Text 4

THE ERA OF THE GASOLINE-POWERED AUTOMOBILE

Inventors on both sides of the Atlantic discovered during the 1880s that technologies for making self-propelled carriages and wagons had progressed dramatically. Soon sundry vehicles powered by steam, internal combustion engines, and electricity were rolling across Germany, France, and the United States.

The first practical internal combustion engine was built by Etienne Lenoir, a Belgian living in France. Patented in 1860, his water-cooled contraption burned coal gas and was noisy and inefficient; even so, for two decades it had many buyers. Lenoir's engine was a clear proof of concept to other inventors, especially in Europe.

Nikolaus Otto, a German, was one of many inspired by Lenoir's technical and commercial success. Mechanically gifted, Otto sought to improve the Lenoir engine, and in the late 1870s he did. Otto's four-cycle design embodied features that would become standard in gasoline automobile engines.

The cars of that time were very small, two-seated cars with no roof, driven by an engine placed under the seat. Motorists had to carry large cans of fuel and separate spare parts, for there were no repair or filling stations to serve them.

The Otto engine and the many clones it spawned, though intended to replace small steam engines in industry, inaugurated the era of the gasoline-powered automobile. Clearly, the compact internal combustion engine was a most suitable technology for the self-propelled vehicle.

Karl Benz, also a German, employed his own Otto-type engine to power a three-wheel carriage in 1885. These tri-wheelers, with a one-cylinder engine that developed 0.8 hp, were put on the market in 1887, perhaps the earliest commercial automobiles.

In 1891 Benz added a four-wheel motorized carriage to his company's offerings. These automobiles were sold well and widely imitated. In the early 1890s, for example, Panhard et Levassor as well as Peugeot in France were peddling cars to the public. Henry Ford, however, was still a long way from building automobiles.

Questions:

1. Who built the first practical internal combustion engine?
2. Who improved the Lenoir engine?
3. What era did the Otto engine inaugurate?
4. Who introduced the first commercial automobile?
5. What did Benz add to his company's offerings in 1891?

Text 5

THE ENGINE

The word *engine* originally meant any ingenious device, and came from the Greek word *ingenious*, clever. Any kind of vehicle must be able to move. The ability to move demands power. A machine that produces mechanical power or energy is called an engine or a power plant.

Engines present one of the most interesting groups of problems considered in the engineering field. One of the main problems is receiving the maximum possible power or thrust for minimum weight. The weight is included in the factor called the weight/power ratio, which may be defined as the pounds per horse power output.

Another important problem is that of fuel. Both in the past and today the designers work at the problem of getting lower specific fuel consumption. Specific fuel consumption is obtained by dividing the weight of the fuel burned per hour by the horse power developed.

Another possible problem considered in any engine is its flexibility. Flexibility is the ability of the engine to run smoothly and perform properly at all speeds and through all variations of atmospheric conditions.

One more important problem worked at by the designers the engine reliability. The engine is to have a long life, with maximum of time between overhaul periods. In some cases the problem of balance is one of the main. Balance has several possible meanings but the principle factor is freedom from vibration. Besides any engine must be started easily and carry its full load in a few minutes. There are gasoline engines, diesel engines, gas turbines, steam engines, jet engines and rocket engines. Each of them has certain advantages and disadvantages over other forms of power plants.

Questions:

1. What did the word engine originally mean?
2. What machine is called an engine or a power plant?
3. What is one of the main problems engines present?
4. What is the weight/power ratio?
5. What is flexibility of the engine?
6. Do the designers work at the engine reliability?
7. What engines do you know?

Text 6

THE DIESEL ENGINE

In 1890s, Rudolf Diesel, a German, invented the engine that bears his name. As distinguished from gasoline engines diesels have no ignition system fed with electricity. The fuel is ignited simply with very hot air in the cylinder.

The operation performed is like this: when taken in the cylinder the air is highly compressed, the temperature rises so the heated fuel-air mixture burns. The higher the pressure, the higher the temperature. Besides the compressed mixture produced more power than that uncompressed.

Diesel engines power many of the used vehicles and other equipment. They are usually used in cases where engine weight is not a prime factor. Their advantage is that they are simple in design and use much heavier liquid fuels than gasoline engines. The cost of a heavier fuel is much less than that of a light one. Besides the fuel consumption of a diesel is much less than that of gasoline engines.

Although applied for many purposes diesel engines have certain disadvantages. Their weight is more than that of a gasoline engine of the same power and it occupies much space. The disadvantages of diesels as passenger-car engines are slow performance, noise and smoke.

All the companies investigating diesel are trying to reduce noise and smoke, but the problems are not yet entirely solved. Diesel engines clatter when started on a cold morning. And the warm-up period for all diesels seems too long to drivers accustomed to gasoline models.

Questions:

1. Who invented diesel engine?
2. Do diesel engines have ignition system fed with electricity?
3. How is the fuel ignited in the diesel engine?
4. What is the operation performed?
5. Do diesel engines power most of vehicles and other equipment?
6. What is the advantage of diesel engines?
7. What are disadvantages of diesels as passenger-car engines?
8. Are the companies trying to reduce and smoke of diesel engines?

Text 7

DRIVER, VEHICLE, AND ROAD

Transportation is a system consisting essentially of three components: driver, vehicle, and road. If any one of these components fails, the whole system would fail, and conditions of hazards would be created on the road.

To provide a safe and efficient transportation system, it is necessary that all of these three components should function in a well coordinated manner.

Driver. Studies have shown that 86 % of the serious accidents are caused by drivers.

Vehicle. This component also plays a vital part in determining safety on roads. An unsafe vehicle is a source of constant danger in a road transportation system.

Road. To ensure maximum safety for the transportation system, it is necessary to plan and design highways on sound engineering techniques.

Modern roads. Modern roads should possess the following principal features. They should be designed according to the anticipated volume and speed of the traffic. Bends and gradients should always be slight. Visibility should not be hindered. They should be well lit. Hedge and tree planting on the road sides should provide a pleasant and interesting outlook to avoid monotony and boredom.

Road construction. In modern road construction, there is much greater recognition of the importance of the subsoil beneath a road. It is regarded as an integral part of the road. In case of mechanical stabilization granular or cohesive materials are added to the subsoil. In dry climates it is necessary to add substances helping to retain sufficient moisture.

Stabilization can be carried out by adding substances that harden the soil, and greatly increase its compressive strength. The constantly increasing volume of modern traffic involves the construction of numerous auxiliary structures, such as bridges, flyovers, tunnels, and underpasses. It is mainly these structures that will present problems for the engineers.

Questions:

1. What are the three main components of transportation?
2. What will happen if any one of these components fails?
3. What is necessary to provide a safe and efficient transportation system?
4. Which is the most important component?
5. What should be made to obtain maximum highways safety?
6. What should be made to avoid monotony and boredom on roads?
7. What role does the subsoil play in the modern road construction?
8. What does mechanical stabilization help to do?

Text 8

THE CHANGING EXPECTATIONS OF AUTOMOTIVE ENGINEERS

In the past, automotive engineers were closely associated with the field of mechanical engineering. After all, most automotive engineers dealt with topics such as gasoline and diesel engines, transmissions, suspension systems, chassis, door handles, seats, etc. A few ventured off into new developments such as turbine gas engines, continuously variable transmissions, or even Sterling engines. Some dealt with plastics and painting systems. The vast majority of knowledge needed by the automotive engineer of the past was mechanical in nature.

The reality of today is that the automotive engineer is expected to know about far more than just mechanical engineering. To attract the best and brightest, the industry needs to project an image of the automotive engineer as someone with skills and knowledge beyond mechanical engineering.

The modern automobile has often been described as a computer on wheels. It is that and more – much more. Electronics control component systems such as the engine, transmission, and brakes. Those controls have become not just addons but integral parts of the operation of each system and the whole vehicle. A focus is on intelligent vehicle technology, which highlighted the integration of more electronics into the vehicle.

No longer can design engineers "throw their designs over the wall" to the manufacturing engineer. The design engineer must know enough about the manufacturing capability of his/her organization or supplier, and the manufacturing engineer must be an early participant in the design team. Competitive quality and cost require that the design specifications match the manufacturing capability. Empty promises by manufacturing ("give us a design and we will build it") are no longer accepted.

Software development is not only necessary to achieve optimum operation of each vehicle computer, but vehicle performance evaluation prior to design is becoming standard practice. Computer simulation for demonstrating compliance with regulations will probably be widely accepted in the not-too-distant future.

Questions:

1. What topics most automotive engineers dealt with in the past?
2. What knowledge was needed by the automotive engineer of the past?
3. What is the reality of today for the automotive engineer?
4. What skills and knowledge does the automotive engineer need today?
4. How can we describe the modern automobile?
5. What aspect is the modern automotive technology focused on?
6. What is necessary to achieve optimum operation of a vehicle computer?
7. What must the design engineer know?

8. What is becoming standard practice in vehicle design?

Text 9

ALTERNATIVE VEHICLES

At the present rate of production oil supplies will run out rather soon, and we will have to look for other sources of energy.

What kind of vehicle will then dominate? Nowadays car makers discuss four promising types of cars: fuel cell cars, electric cars, hybrid cars, and solar electric cars.

The electric car has a long history. The first electrical cars were built at the end of 19 th century, but they could not compete against the internal combustion engine. Success of the electric car depends on light weight battery, capable of being recharged quickly, and the availability of electric energy.

Several U.S. companies already sell electrics. For example, Solar Electric Engineering of Santa Rosa, California, offers Solar Electric's Destiny 2000 which comes in at $ 28,500, and includes an array of solar cells which provides a tiny bit of power and extends battery life. With its lightweight fiberglass body, the Destiny 2000 can travel 40 to 60 miles on a charge and cruises at 60–70 mph.

General Motors produced the electric car named “Impact”. Designed as an electric from top to bottom, the impressive Impact is powered by lead-acid batteries. The Impact easily cruises at 70 to 100 mph, and its range is claimed to be 120 miles at lower speeds.

There are many different electric cars around the world. They are used for local deliveries, post offices and the services. But will the electric car ever become a universal means of transport?

Today there are several hundred million cars in the world not to mention millions of motorcycles. It is estimated that if these changed over to electricity, they would require six million kilowatt hours, and all the power stations in the world now generate only a little over a third of that.

The hydrogen/air fuel cells look very hopeful. These do not have to be charged, they generate their own energy from a chemical reaction. They convert fuel energy to electrical energy with better than 80 % efficiency. But at present the fuel cells prove too expensive.

A hybrid system where electric batteries for city driving would be recharged in highway driving with gasoline fuel is an alternative to the totally electrical system.

Questions:

1. Why will we have to look for other sources of energy?
2. What promising types of cars do car makers discuss nowadays?
3. What does success of the electric car depend on?
4. What are many different electric cars around the world used for nowadays?
5. Why do the hydrogen/air fuel cells look very hopeful?
6. What could be an alternative to the totally electrical system?

Text 10

SENSORS AND THE AUTOMOBILE

In the 1960s, vehicles were equipped with oil pressure, fuel level, and temperature coolant sensors. Their outputs were connected to analogue gauges or “idiot” lights. As we entered the 1970s and emissions became a driving factor, more sensors were added to help control the powertrain. With the addition of the catalytic converter, electronic ignition, and fuel injection came a number of sensors required to help maintain tight air/fuel control and exhaust emissions. In 1980s, safety became a factor with antilock brakes and airbags.

Today sensors are everywhere. In the powertrain area, sensors are used to measure the temperature and pressure of most of the fluids (air temperature, manifold absolute pressure, coolant temperature, and fuel injection pressure). Speed and position sensors are connected to most moving parts (vehicle speed, throttle position, camshaft, crankshaft, transmission shift position, EGR valve position, and transmission speed sensors). Others measure knock, engine load, engine misfire, and oxygen level in the exhaust. Climate control requires the use of various sensors in the air conditioning system to determine refrigerant pressure and temperature and interior air temperature.

Sensors have been added to the interior to determine seat position. With the addition of antilock braking and suspension control a number of sensors have been added to determine wheel speed, ride height, and tyre pressure. As airbags were added for frontal and side impact, more crash sensors and accelerometers were added to control airbag deployment. As the concern for front seat passengers has grown so has the need for sensors to determine if the passenger airbag needs to deploy. Occupant position sensors, passenger weight sensors, and others have been developed to ensure the correct deployment of the front passenger airbag. Other sensors are being added as car manufacturers add side impact bags, roof airbags, and sophisticated side impact head protection airbags.

As engineers have moved beyond antilock braking and traction control into electronic stability control, more sensors are required. Yaw rate, steering wheel angle, and collision avoidance sensors, such as radar sensors or sensors to determine the proximity of other vehicles, will be added. Additional sensors to help control or determine lateral acceleration speed of each wheel, and engine torque will be needed.

Control of the vehicle's braking system is tied into the stability control system. The first oil pressure and coolant temperature sensors were set up to work independently of each other. In fact some of them were nothing more than switches that were activated at certain maximum or minimum levels. As more sensors become electronic or digital, they are interconnected and their output is used for more than one vehicle system. Thus sensor manufacturers are searching for better ways to design and manufacture sensors.

Questions:

1. What sensors were vehicles in the 1960s equipped with?
2. What sensors appeared in 1970s and in 1980s?
3. What sensors are used today?
4. What are the role and functions of sensors?

SECTION II

TEXTS FOR READING AND DISCUSSION

Automobile

The history of the automobile goes back several hundred years. One of the earliest attempts to propel a vehicle by mechanical power was suggested by Sir Isaac Newton about 1680. It was little more than a toy consisting of a steam boiler supplying a steam jet turned to the rear.

However, the credit for building the first self-propelled road vehicle must undoubtedly go to the French military engineer, Nickolas Cugnot (Кюньо). Between 1763 and 1769 two steam-driven carriages were built and tried.

In 1784 The Russian inventor Kulibin built a three-wheeled carriage. In his vehicle he used for the first time such new elements as brakes, rollers and gear-box.

The first Englishman to build a full-size self-propelled vehicle for use on the roads and to obtain practical results was Trevithick (Тревитик). Between 1798–1800 he built several working models.

Up to 1860 most all road vehicles were powered by steam engines which ran at slow speeds. In 1860 Lenoir (Ленуар) of Paris built an internal combustion engine which ran on city gas, the gas being ignited by an electric spark. In 1866, Otto invented the type of four-stroke cycle engine which is used today.

Slowly but surely the auto industry is perfecting a number of alternatives to the conventional engines found in almost all of today's passenger cars.

Two prime factors lie behind the search for different engines – the necessity to reduce air pollution by requiring cleaner auto exhaust and the desire to produce cars that will run farther on a gallon of fuel.

While basic research is continuing on electric and steam-powered engines, it is the diesel, turbine and Stirling that are current industry favourites. Diesels get better mileage than gasoline engines, and the fuel is usually cheaper.

In 1890s, Rudolf Diesel, a German, invented the engine that bears his name. As air is drawn into the engine and compressed internal temperatures rise, and pressures reach two or three times those in a gasoline engine. The extreme pressures have meant that diesels usually are much larger and heavier than gasoline engines of the same power potential.

The disadvantages of diesels as passenger-car engines are slow performance, noise and smoke.

All the companies investigating diesels are trying to reduce noise and smoke, but the problems are not yet entirely solved. Even the 28,000-dollar Mercedes clatters when started on a cold morning. And the warm up period for all diesels seems too long to drivers accustomed to gasoline models.

The turbine and Stirling are multifuel engines, capable of running on any liquid that will burn, including such exotic types as peanut oil and perfume. This would be a major advantage if severe petroleum shortages develop.

The turbine cars now operating are hand-built models that cost more than 1 million dollars each. Alloys of precious metals of high durability are still required for certain vital turbine parts. Engineers believe that progress in ceramics holds the key to making turbines practical alternatives to present-day engines.

Experts say that the Stirling is the most promising among the three favoured engines. The Stirling concept, first offered more than 150 years ago by a Scottish clergyman, involves external instead of internal combustion.

In 1816 Robert Stirling patented a new engine for pumping water out of mines and quarries. It could run on almost any fuel, he boasted – including whisky. Indeed the parson had such faith in his engine that he often cut his Sunday sermons short to work on it. However, when Stirling died in 1878 at the age of 88, his engine was still unperfected. Soon it was totally overshadowed by the newer gasoline-powered internal combustion engine.

Unlike typical internal combustion engines, the Stirling engine is powered by heat from an external source. In the new design, hydrogen gas is heated by a burner, which can run on virtually all kinds of fuel. Hydrogen then expands, enters one cylinder and pushes a sliding piston. As piston moves, it forces gas out of the other end of the cylinder; the emerging gas is cooled and then moves towards an adjacent cylinder where heat is applied once more and the process is repeated.

Engineers point out that a Stirling engine would be quieter than an equivalent internal combustion engine, would emit less toxic gases, and would use fuel more economically. Having no need for valves or cams, it would also have fewer parts. Stirling's old dream might yet become reality – perhaps by the end of the twentieth century.

Now, since experts seek fuel-saving, less-polluting alternatives to the modern auto engine, Stirling's machine has started a new life, they show great interest in the work of a giant Dutch electronics firm, which has tested Stirling prototypes in boats, large pumps and even buses. In 1972, Ford signed an agreement with the firm for joint development of a Stirling engine for passenger cars.

As for electronic cars, several types of small battery-powered vehicles are in production, but it is most unlikely that they will replace more conventional vehicles.

Yet, there is still opinion in the auto industry that the conventional gasoline powered engine – the type in almost universal use now – will continue to dominate until outside circumstances dictate otherwise.

The Problems of Public Transport

Britain has almost the same population as France but less than half the space. With 238 people per km^2, it is a densely populated country. 40 years ago, private car ownership was growing rapidly, and public transport was losing its dominant role. The process seemed quite natural and, on the whole, a good thing. In the 1960s, British Railways cut hundreds of lines and stations.

Roads became over-crowded and the solution to that problem was simple-build more roads. A massive new motorway around Outer London was opened in 1986. However, this provided a dramatic example of a phenomenon: building new roads appears to generate new traffic. This motorway was overloaded immediately, and now it is the site of some of the country's worst jams almost every day.

However crowded the roads are British car owners usually find a reason not to switch to public transport. The buses are too slow, or the trains are too expensive, or no public services actually take them where they want to go. In many cases, these are just the excuses of people who really want to sit in their own cars with the radio on, and who blame others for creating the traffic jams. There has been a serious lack of government investment in transport, with predictable consequences.

It has long been noted that car driving has some strange psychological effects on human beings. People who are normally quiet and pleasant are often transformed when they get behind the wheel of a car. Road accident figures, on the other hand, have not increased with the number of vehicles on the road; in fact they have decreased. Various reasons are suggested for this: modern cars have better lights and brakes, and the culture of driving has become more mature. Britain has a better record than most European neighbours; the number of deaths per 10,000 vehicles is less than half that of France, for example. Another significant factor is that seat belt laws for vehicle drivers and passengers are respected by almost everyone.

(From British Life and Institutions)

Future automobile industry trends

At the start of the 21st century the trends of global trade and manufacturing flexibility continue. Computerization continues to be a major part of auto design and manufacture, as do the search for alternative fuels and more efficient automobile design.

Hybrid-Electric Cars

Hybrids are a hot subject today, but they are the most complex vehicles to correctly design and the most complex to adequately discuss. It looks the go-anywhere family sedan of year 2010 and beyond will likely be some form of hybrid vehicle. The deciding factor hinges mainly on the economics of producing a complex hybrid power system, rather than the inherent capabilities of the technology itself.

The idea of a hybrid-electric vehicle naturally evolves from the inherent limitations of the storage battery. As first conceived, a hybrid vehicle would employ an onboard means of generating electricity in order to augment the limited energy available from the battery. The vehicle might then run on battery energy alone when range is within the capability of the battery's energy stores, then use the genset when range requirements exceed the energy stores of the battery. Although simple in concept, the task of achieving significant improvements in energy efficiency depends on the correct integration of subsystems within a sophisticated control strategy that continuously monitors and balances the energy flow onboard the vehicle. When approached as a system, a hybrid power system is no longer a simple battery-electric system augmented by a genset. Instead it is an integrated, self-adapting propulsion system that may ultimately utilize batteries (or ultracapacitors) as an energy reservoir for load leveling, rather than in their traditional role of supplying total vehicle motive power. Much of the research today is oriented toward developing the most effective control strategy, the best bias between subsystems, and the correct combination of subsystem types needed to achieve maximum efficiency with a minimum of hardware, mass, and manufacturing costs.

Hybrid power systems began as a way to make up for the shortfall in battery technology. Since batteries could supply only enough energy for short trips, then an onboard ICE-powered generator could be installed and switched on for longer trips in order to extend range. In the old days, we thought that by biasing the system toward battery-electric power and operating on wall-plug electricity as much as possible, efficiency and emissions would then be about as optimal as one could hope for until better batteries came along. The natural conclusion of this concept was that, with better batteries, we probably would not need hybrids at all. But after some 20 years of study, it's beginning to look as though a correctly designed hybrid vehicle may actually be just as clean (+/–10 %) and energy efficient as a battery-electric car, and perhaps even cleaner and more energy efficient (considering the entire fuel chain, and depending on the source fuel used to generate electrical power).

There are lots of possible configurations with a hybrid vehicle. On a fundamental level, a hybrid combines an energy storage system, an energy conversion system, and a vehicle propulsion system.

What's a Hybrid Car?

What makes it a' Hybrid'?

Any vehicle is a hybrid when it combines two or more sources of power. In fact, many people have probably owned a hybrid vehicle at some point. For example, a moped (a motorized pedal bike) is a type of hybrid because it combines the power of a gasoline engine with the pedal power of its rider.

Hybrid vehicles are all around us. Most of the locomotives we see pulling trains are diesel-electric hybrids. Cities like Seattle have diesel-electric buses – these can draw electric power from overhead wires or run on diesel when they are away from the wires. Giant mining trucks are often diesel-electric hybrids. Submarines are also hybrid vehicles-some are nuclear-electric and some are diesel-electric. Any vehicle that combines two or more sources of power that can directly or indirectly provide propulsion power is a hybrid.

Types of Hybrids

Hybrids are normally divided into the subtypes of either series or parallel, which refers to the way in which the engine supplies power to the propulsion system. In the series hybrid, a heat engine powers a generator, which either charges the battery or supplies power directly to the propulsion circuit and thereby reduces demand on the battery. In a parallel hybrid, the heat engine delivers mechanical power directly to the drivetrain, and the generator is eliminated. With this type, either the battery-electric system or the heat engine may be used to propel the vehicle, or they may be used simultaneously for maximum power.

In comparison, the series hybrid is less complex because the interface with the drivetrain is electrical rather than mechanical. But originally, the parallel hybrid was preferred design because of the large size, high mass and limited power of existing gensets. With a parallel hybrid it was possible to obtain more power from a smaller, lighter package. Today, due to lighter, smaller and more powerful gensets that have been developed, the emphasis has shifted to the series hybrid.

Hybrid Components

Hybrid cars contain the following parts:

Gasoline engine – The hybrid car has a gasoline engine much like the one you will find on most cars. However, the engine on a hybrid is smaller and uses advanced technologies to reduce emissions and increase efficiency.

Fuel tank – The fuel tank in a hybrid is the energy storage device for the gasoline engine. Gasoline has a much higher energy density than batteries do. For example, it takes about 1,000 pounds of batteries to store as much energy as 1 gallon (7 pounds) of gasoline.

Electric motor – The electric motor on a hybrid car is very sophisticated. Advanced electronics allow it to act as a motor as well as a generator. For example, when it needs to, it can draw energy from the batteries to accelerate the car. But acting as a generator it can slow the car down and return energy to the batteries.

Generator – The generator is similar to an electric motor, but it acts only to produce electric power. It is used mostly on series hybrids.

Batteries – The batteries in a hybrid car are the energy storage device for the electric motor. Unlike the gasoline in the fuel tank, which can only power the gasoline engine, the electric motor on a hybrid car can put energy into the batteries as well as draw energy from them.

Transmission – The transmission on a hybrid car performs the same basic function as the transmission on a conventional car. Some hybrids, like the Honda Insight, have conventional transmissions. Others, like the Toyota Prius, have radically different ones.

How Hybrids Save Energy and Gasoline

Hybrid engines are much smaller than those on conventional cars. A hybrid car engine is built small to accommodate the 99 % of driving time when a car is not going up hills or accelerating quickly. When extra acceleration power is needed, it relies on the battery to provide additional force.

Hybrid gasoline motors can shut off when the car is stopped and run off their electric motor and battery.

Hybrid cars are lighter, and their tires create half the drag of conventional cars because they are stiffer and inflated to a higher pressure.

Hybrid cars often recover braking energy. Electric hybrid motors take the kinetic energy lost in braking and use it to charge the battery.

Hybrid cars are often more aerodynamic, reducing wind resistance.

Fuel Cells and the Future

It is difficult to imagine a future without electric vehicles. Over the near term, some form of hybrid vehicle, most likely using a diesel auxiliary power unit, is probably the best alternative to conventional vehicles.

Hybrid technology is an interim solution that can lessen, but not eradicate, our dependence on fossil fuel.

There is another new technology called “Fuel Cells” that should be available by the end of the decade that will eliminate our dependence on non-renewable resources.

Fuel cells convert hydrogen and oxygen to electricity without going through a combustion process; thereby virtually eliminating emissions. They also operate at much higher efficiencies than internal combustion engines, producing double the amount of energy.

Most of the world’s auto manufacturers have a fuel cell project in progress and virtually all of them agree that fuel cells are the propulsion system of the future.

Soon, you should expect mid-sized sedans with all the trimmings and power that we enjoy today, with the ability to deliver upwards of 100 miles per gallon.

Cars: passion or problem

For some people, the car is a convenient form of transportation. But for others, the car is an exciting hobby. Some people spend their lives collecting valuable cars. Others drive them in races, including the Mille Miglia in Italy, the Carrera Panamericana in Mexico, and the world-famous Indianapolis 500.

For many people, cars are more than transportation: they are source of passion and pleasure. Yet cars can also be a source of many problems.

In 1903, Henry Ford began selling the Model T car for $ 825. His company, Ford Motors, was the first to produce cars in large numbers. This made the car available to large numbers of people and helped them to travel long distances quickly and easily. The car has brought people much closer to places of work, study and entertainment.

Many people also work in car-related industries: fixing cars, washing cars, advertising cars, and selling car products such as stereos and cellular phones.

Most Americans buy a new car every five or six years. This means that one American may own a dozen cars in a lifetime. In fact, there are more cars than people in the United States. In New York City, 2.5 million cars move in and out of the city each day. In this traffic the average speed is sometimes 8.1 miles per hour. This speed could easily be reached by riding a horse instead of driving a car. But New Yorkers continue to drive, just as people do in California, where freeways are often crowded.

Some environmentalists believe that forms of public transportation such as buses and trains have not been fully developed in the United States. They try to teach others that public transportation saves fuel and helps to protect the environment.

Many people are unhappy with car traffic and pollution, as well as with the use of beautiful lands for building new roads. One environmentalist, Jan Lundberg, left his Mercedes-Benz in Los Angeles and moved to the forests of northern California. There he works on the Auto-Free Times, a newspaper that teaches people how to live without diving. Lundberg travels on foot, on bicycle or by bus. Before he decided to live without a car, Lundberg worked for the oil companies, studying the prices of gasoline.

Lundberg and other environmentalists dream of turning parking lots into parks and replacing cars with bicycles, but most people around the world believe that the car is a necessary part of life in today’s world. Still, there is an important question that must be answered: What kind of fuel will we use when gasoline is no available? Lundberg believes that by the year 2021, there will no longer be oil for gasoline makers to use. To solve this problem, car companies in Korea, Japan, Europe, and the United States are trying to develop an electric car that will not require gasoline at all.

The electric car is not a new idea. It had success with American women in the early 1900s. Women liked electric cars because they were quiet and did not pollute the air. Electric cars were also easier to start than gasoline-powered ones. But gasoline-powered cars were faster, and in the 1920s they became much popular.

The electric car was not used again until the 1970s, when there were serious problems with availability of oil. Car companies began to plan for a future without gasoline. The General Motors Company had plans to develop an electric car by 1980; however, oil became available again and this car wan never produced.

Today there is a new interest in the electric car, which is partly related to a passion for speed and new technology. In 1977, engineer Paul MacCready, designed a human-powered airplane that successfully completed a three-mile flight.

A similar airplane crossed the English Channel in 1977, followed by a solar-powered airplane. In 1987, the Sunraycer, a solar-powered car, won a 2,000-mile race in Australia. As a result of this success, the General Motors Company began new work on the development of the electric car. The Toyota Company recently decided to spend $ 800 million a year on the development of new car technology. Many engineers believe that the electric car will lead to other forms of technology being used for transportation.

Cars may change, but their importance will not. Cars are important to nearly everyone, including engineers businesspeople, environmentalists and even poets. Poet Curt Brown believes that cars are part of our passion for new places and new experiences. According to Brown, this “very, comfortable flying chair” will continue to bring us travel and adventure, no matter how it changes in the future.