STUDY ON AUTOMOBILE

An automobile is a wheeled vehicle that carries its own motive power for propulsion. Different types of automobiles include cars, buses, trucks, vans, and motorcycles, with cars being the most popular. The term is derived from Greek 'autos' (self) and Latin 'movére' (move), referring to the fact that it 'moves by itself'. Earlier terms for automobile include 'horseless carriage' and 'motor car'. An automobile has seats for the driver and, almost without exception, one or more passengers. Today it is the main source of transportation across ithe world.

Population

As of 2005 there are 500 million cars worldwide (0.074 per capita), of which 220 million are located in the United States [[1]] (0.75 per capita).

Inventors

The modern automobile powered by the Otto gasoline engine was invented in Germany by Carl Benz [[2]]. Even though Carl Benz is cred with the invention of the modern automobile several other German engineers work on building the first automobile at the same time. The inventors are: Carl Benz on July 3, 1886 in Mannheim [[3]], Gottlieb Daimler [[4]]and Wilhelm Maybach [[5]]in Stuttgart [[6]](also inventors of the first motor bike) and in 1888/89 Germany|German-Austrian inventor Siegfried Marcus [[7]] Vienna [[8]].

Steam powered vehicles

Steam-powered self-propelled cars were devised in the late 18th century. The first self-propelled car was built by Nicolas-Joseph Cugnot [[9]] in 1769; it could attain speeds of up to 6 km/h. In 1771 he designed another steam-driven car, which ran so fast that it rammed into a wall, producing the world's first car accident.

Combustion engine

In 1807 François Isaac de Rivaz [[10]] designed the first internal combustion engine (sometimes abbreviated "ICE" today) [[11]]. He subsequently used it to develop the world's first vehicle to run on such an engine, one that used a mixture of hydrogen [[12]] and oxygen [[13]] to generate energy [[14]].

This spawned the birth of a number of designs based on the internal combustion engine [[15]] in the early nineteenth century with little or no degree of commercial success. In 1860 thereafter, Jean Joseph Etienne Lenoir built the first successful two-stroke gas driven engine. In 1862 he again built an experimental vehicle driven by his gas-engine, which ran at a speed of 3 km/h. These cars became popular and by 1865 could be frequently seen on the roads.

The first American automobiles with gasoline-powered internal combustion engines were completed in 1877 by George Baldwin Selden [[16]] Rochester, New York, who applied for a patent on the automobile in 1879. Selden received his patent and later sued the Ford Motor company for infringing his patent. Henry Ford was notoriously against the American patent system, and Selden's case against Ford went all the way to the Supreme Court of the United States, who ruled that Ford had to pay a penalty to Selden, but could continue manufacturing automobiles, because the technology had changed quite a bit by that time.

Meanwhile, notable advances in steam power evolved in Birmingham [[17]], England by the Lunar Society [[18]]. It was here that the term horsepower [[19]] was first used. It was in Birmingham also that the first British four wheel petrol-driven automobiles were built in 1895 by Frederick William Lanchester [[20]] who also patented the disc brake in the city. Electric vehicles were produced by a small number of manufacturers.

Innovation

The first automobile patent in the United States was granted to Oliver Evans [[21]] in 1789; in 1804 Evans demonstrated his first successful self-propelled vehicle, which not only was the first automobile in the USA but was also the first amphibious vehicle, as his steam-powered vehicle was able to travel on wheels on land and via a paddle wheel [[22]] in the water.

On 5 November, 1895, George B. Selden [[23]] was granted a United States patent for a two-stroke cycleTwo-stroke_cycle automobile engine. This patent did more to hinder than encourage development of autos in the USA. A major breakthrough came with the historic drive of Bertha Benz [[24]] in 1888. Steam, electric, and gasoline powered autos competed for decades, with gasoline internal combustion engines achieving dominance in the 1910s.

Production

The large scale, production-line manufacturing of affordable automobiles was debuted by Oldsmobile [[25]] in 1902, then greatly expanded by Henry Ford [[26]] in the 1910s. Early automobiles were often referred to as 'horseless carriages', and did

not stray far from the design of their predecessor. Through the period from 1900 to the mid 1920s, development of automotive technology was rapid, due in part to the hundreds of small manufacturers competing to gain the world's attention. Key developments included electric ignition and the electric self-starter (both by Charles Kettering), for the Cadillac Motor Company in 1910-1911), independent suspension, and four-wheel brakes.

Developments

By the 1930s, most of the technology used in automobiles had been invented, although it was often re-invented again at a later date and cred to someone else. For example, front-wheel drive was re-introduced by Andre Citroën with the launch of the Traction Avant in 1934, though it appeared several years earlier in road cars made by Alvis and Cord, and in racing cars by Miller (and may have appeared as early as 1897). After 1930, the number of auto manufacturers declined sharply as the industry consolidated and matured. Since 1960, the number of manufacturers has remained virtually constant, and innovation slowed. For the most part, "new" automotive technology was a refinement on earlier work, though these refinements were sometimes so extensive as to render the original work nearly unrecognizable. The chief exception to this was electronic engine management, which entered into wide use in the 1960s, when electronic parts became cheap enough to be mass-produced and rugged enough to handle the harsh environment of an automobile. Developed by Bosch, these electronic systems have enabled automobiles to drastically reduce exhaustemissions while increasing efficiency and power.

Model changeover and design change

Cars are not merely continually perfected mechanical contrivances; since the 1920s nearly all have been mass-produced to meet a market, so marketing plans and manufacture to meet them have often dominated automobile design. It was Alfred P. Sloan who established the idea of different makes of cars produced by one firm, so that buyers could "move up" as their fortunes improved. The makes shared parts with one another so that the larger production volume resulted in lower costs for each price range. For example, in the 1950s,Chevrolet shared hood, doors, roof, and windows with Pontiac; the LaSalle of the 1930s, sold by Cadillac, used the cheaper mechanical parts made by the Oldsmobile division.

He also conceived of the notion of the yearly model change-over, which became a three-year cycle. In the second year of the cycle, the superficial appearance of the cars changed incidentally; for the third, major changes took place, e.g., the fender dies for the 1957 Chevrolet had to be modified to produce thin, pointed fins and squarish headlamp housings. In the next cycle, the doors, roof, trunk, and often the suspension would have to be redesigned. Factories and the yearly work schedule had to be specialized to accommodate these changeovers.

Such patterns became dominant for the Big Three [[27]] automakers in the U.S., though European firms neither amalgamated nor could afford the changeover. After the 1950s, when American firms tackled the technical problems of high-compression V8, automatic transmissions, and air conditioners, investment shifted to meeting the market for non-technical matters. This was criticized as "planned obsolescence," although by this it was meant that the car would simply be made to go out of style rather than really being technically surpassed. For example, only those few American cars of the 1960s with front-wheel drive or a rear engine had a fully

independent rear suspension because the Hotchkiss drive was cheaper, and people were used to it. Such bad investment left American firms unprepared for the Oil Crisis [[28]] of the 1970s and the rise of imported luxury cars in the 1980s.

Regulation

In almost every nation, laws have been enacted governing the operation of motor vehicles. Most of this legislation, including limits on allowable speed and other rules of the road, are designed to ensure the smooth flow of traffic and simultaneously protect the safety of vehicle occupants, cyclists, and pedestrians.

In 1965, in the U.S. state of California, state legislation was introduced to regulate exhaust emissions, the first such legislation in the world. Answering this new interest in environmental and public safety issues, theDepartment of Transportation (DOT) and the Environmental Protection Agency (EPA) both introduced legislation in 1968 which substantially altered the course of automotive development. Since the U.S. market was the largest in the world (and California the largest market in the U.S.), manufacturers worldwide were forced to adapt. For the first time, safety devices were mandatory, as were controls on harmful emissions. Prior to this legislation, even seat belts were considered extra-cost options by many manufacturers. Other countries followed by introducing their own safety and environmental legislation. In time, meeting regulations became the main challenge for the engineers designing new cars. In the decade from 1975 to 1985, the world's manufacturers struggled to meet the new regulations, some producing substandard cars with reduced reliability as a result. However, by the end of this period, everyone had learned how to handle the newly regulated environment. The manufacturers discovered that safety

and environmentalism sold cars, and some began introducing environmental and safety advances on their own initiative.

Environmental improvements

The automobile was hailed as an environmental improvement over horses when it was first introduced. Before its introduction, in New York City[[29]], over 10,000 tons of manure had to be removed from the streets daily.

Among the first environmental advances are the so-called alternative fuels[[30]] for the internal combustion engine, which have been around for many years. Early in automotive history, before gasoline was widely available at corner pumps, cars ran on many fuels, including kerosene[[31]] (paraffin) and coal gas[[32]]. Alcohol as a fuel [[33]]were used in racing[[34]] cars before and just after World War II[[35]]. Today, methanol [[36]]and ethanol [[37]]are used as petrol extenders in some countries, notably in Australia[[38]] and the United States[[39]]. In countries with warmer climates, such as Brazil[[40]], alcohol derived from sugar cane[[41]] is often used as a substitute fuel.

In many countries, plentiful supplies of natural gas[[42]] have seen methane[[43]] sold as compressed natural gas [[44]](CNG) and propane[[45]] sold as liquified petroleum gas(LPG)[[46]] alongside petrol and diesel fuels [[47]]since the 1970s. While a standard automotive engine will run on these fuels with very low exhaust emissions, there are some performance differences, notably a loss of power due to the lower energy content of the alternative fuels. The need to equip filling stations and vehicles with pressurized vessels to hold these gaseous fuels and more stringent safety inspections, means that they are only economical when used for a long

distance, or if there are installation incentives. They are most economical where petrol has high taxes and the alternative fuels do not.

Alternative fuels and batteries powered

With heavy taxes on fuel, particularly in Europe and tightening environmental laws, particularly in California, and the possibility of further restrictions on greenhouse gas [[48]], work on alternative power systems for vehicles continued.

Diesel-powered cars can run with little or no modification on 100% pure biodiesel, a fuel that can be made from vegetable oils. Many cars that currently use gasoline can run on ethanol, a fuel made from plant sugars. Most cars that are designed to run on gasoline are capable of running with 15% ethanol mixed in, and with a small amount of redesign, gasoline-powered vehicles can run on ethanol concentrations as high as 85%. All petrol fuelled cars can run on LPG. There has been some concern that the ethanol-gasoline mixtures prematurely wear down seals and gaskets. Further, the use of higher levels of alcohol requires that the automobile carry/use twice as much. Therefore, if your vehicle is capable of 300 miles on a 15-gallon tank, the efficiency is reduced to approximately 150 miles. Of course, certain measures are available to increase this efficiency, such as different camshaft configurations, altering the timing/spark output of the ignition, or simply, using a larger fuel tank.

In the United States, alcohol fuel was produced in corn-
alcohol stills until Prohibition criminalized the production of alcohol in 1919. Brazil is the only country which produces ethanol-running cars, since the late 1970s.

Attempts at building viable battery-powered electric vehicles continued throughout the 1990s (notably General Motors with the EV1), but cost, speed and inadequate

driving range made them uneconomical. Battery powered cars have used Lead-acid_battery stacks which are greatly damaged in their recharge capacity if discharged beyond 75% on a regular basis and NiMH batteries (Rechargeable_batteries).

Current research and development is centered on "Hybrid electric vehicle" [[49]] vehicles that use both electric power and internal combustion. The first hybrid vehicle available for sale in the USA was the Honda Insight. As of 2005, The car is still in production and achieves around 60 mpg.

Other R&D efforts in alternative forms of power focus on developing fuel cells, alternative forms of combustion such as GDI and HCCI, and even the stored energy of compressed air (see water Engine).

Safety

Automobiles were a significant improvement in safety on a per passenger mile basis, over the horse based travel that they replaced. Millions have been able to reach medical care much more quickly when transported by ambulance.

Major factors in accidents include the use of driving under the influence of alcohol or other drugs, inattentiveness, the use of handheld mobile phones, tiredness, road hazards such as snow, potholes, and animals, and recklessness. Special safety features have been built into cars for years, some for the safety of car's occupants only, some for the safety of others.

Cars have two basic safety problems: They have human drivers who make mistakes, and the wheels lose traction near a half gravity of deceleration. Automated control has been seriously proposed and successfully prototyped. Shoulder-belted

passengers could tolerate a 32G emergency stop (reducing the safe intervehicle gap 64-fold) if high-speed roads incorporated a steel rail for emergency braking. Both safety modifications of the roadway are thought to be too expensive by most funding authorities, although these modifications could dramatically increase the number of vehicles that could safely use a high-speed highway.

Early safety research focused on increasing the reliability of brakes and reducing the flammability of fuel systems. For example, modern engine compartments are open at the bottom so that fuel vapors, which are heavier than air, vent to the open air. Brakes are hydraulic so that failures are slow leaks, rather than abrupt cable breaks. Systematic research on crash safety started in 1958 at Ford Motor Company. Since then, most research has focused on absorbing external crash energy with crushable panels and reducing the motion of human bodies in the passenger compartment.

Tests for safety

There are standard tests for safety in new automobiles, like the EuroNCAP [[50]] and the US NCAP [US NCAP] tests. There are also tests run by organizations such as IIHS and backed by the insurance industry.

Despite technological advances, there is still significant loss of life from car accidents: About 40,000 people die every year in the U.S., with similar trends in Europe. This figure increases annually in step with rising population and increasing travel, but the rate per capita and per mile travelled decreases steadily. The death toll is expected to nearly double worldwide by 2020. A much higher number of accidents result in injury or permanent disability.

Future of the car

In order to limit deaths, there has been a push for self-driving automobiles. Much of the drive for computer-driven vehicles has been led by DARPA with their Grand Challenge race.

Major possible subsystems

On car proper

Engine; carburetor or fuel injection; fuel pump;engine configuration; Wankel engine or reciprocating engine; v engine; inline engine; flat engine; electronic control units; exhaust exhaust system; ignition system; automobile self starte; automobile emissions control devices; turbochargers and superchargers; front engine; rear engine; mid engine; automobile ancillary power - mechanical, electrical, hydraulic, vacuum, air drivetrain; transmission; gearbox; manual ransmission; semi-automatic transmission; fully-automatic transmission; layout; FF layout; FR layout; MR layout; RR layout; drive Wheels-2 wheel drive; 4 wheel drive; front wheel drive; rear wheel drive; all wheel drive; differential (mechanics; limited slip differential; locking differential; axle; live axle; brakes; disc brakes; drum brakes; anti-lock braking systems (ABS); wheels and tires; custom wheels; steering; rack and pinion; Ackermann steering geometry; caster angle; camber angle; kingpin; suspension (vehicle); MacPherson strut; wishbone suspension; double wishbone; multi-link suspension; torsion beam suspension; semi-trailing arm spension|semi; axle; body; crumple zones; monocoque(or unibody) construction; suicide doors; spoiler (automotive); interior equipment passive safety; seat belts; airbags; child safety locks; dashboard; shifter for

selecting gear ratios; wikt: ancillary equipment such as car audio; air conditioning; cruise control; car phones,Global Positioning Systems; cup holders, etc.

Source : http://engineering.wikia.com/wiki/Automobile