ENGINE MODIFYING

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An engine whose purpose is to produce kinetic energy output from a fuel source is called a prime mover; alternatively, a motor is a device which produces kinetic energy from a preprocessed "fuel" (such as electricity, a flow of hydraulic fluid or compressed air).

For more conventional, reciprocating internal combustion engines, the fundamental theory for two-stroke engines was established by Sadi Carnot, France, 1824, whilst the American Samuel Morey received a patent on April 1, 1826. Sir Dugald Clark (1854 – 1932) designed the first two-stroke engine in 1878 and patented it in England in 1881. Automotive production has used a range of energy-conversion systems. These include electric, steam, solar, turbine, rotary, and piston-type internal combustion engines. The petrol internal combustion engine, operating on a four-stroke Otto cycle, has been the most successful for automobiles, while diesel engines are used for trucks and buses. Karl Benz was one of the leaders in the development of new engines. In 1878 he began to work on new designs. He concentrated his efforts on creating a reliable gas two-stroke engine that was more powerful, based on Nikolaus Otto's design of the four-stroke engine. Karl Benz showed his real genius, however, through his successive inventions registered while designing what would become the production standard for his two-stroke engine. Benz was granted a patent for it in 1879.

In 1896, Karl Benz was granted a patent for his design of the first engine with horizontally-opposed pistons. Many BMW motorcycles use this engine type. His design created an engine in which the corresponding pistons move in horizontal cylinders and reach top dead centre simultaneously, thus automatically balancing each other with respect to their individual momentums. Engines of this design are often referred to as flat engines because of their shape and lower profile. They must have an even number of cylinders and six, four or two cylinder flat engines have all been common.

The most well-known engine of this type is probably the Volkswagen beetle engine. Engines of this type continue to be a common design principle for high performance aero engines (for propeller driven aircraft) and, engines used by automobile producers such as Porsche and Subaru.

The first half of the twentieth century saw a trend to increasing engine power, particularly in the American models. Design changes incorporated all known methods of raising engine capacity, including increasing the pressure in the cylinders to improve efficiency, increasing the size of the engine, and increasing the speed at which power is generated. The higher forces and pressures created by these changes created engine vibration and size problems that led to stiffer, more compact engines with V and opposed cylinder layouts replacing longer straight-line arrangements. In passenger cars, V-8 layouts were adopted for all piston displacements greater than 250 cubic inches (4 liters).

The design principles favored in Europe, because of economic and other restraints, leant toward smaller cars and corresponding design principles that concentrated on increasing the combustion efficiency of smaller engines. This produced more economical engines with earlier four-cylinder designs rated at 40 horsepower (30 kW) and six-cylinder designs rated as low as 80 horsepower (60 kW), compared with the large volume V-8 American engines with power ratings in the range from 250 to 350 hp (190 to 260 kW).

Earlier automobile engine development produced a much larger range of engines than is in common use today. Engines have ranged from 1 to 16 cylinder designs with corresponding differences in overall size, weight, piston displacement, and cylinder bores. Four cylinders and power ratings from 19 to 120 hp (14 to 90 kW) were followed in a majority of the models. Several three-cylinder, two-stroke-cycle models were built while most engines had straight or in-line cylinders. There were several V-type models and horizontally opposed two- and four-cylinder makes too. Overhead camshafts were frequently employed. The smaller engines were commonly air-cooled and located at the rear of the vehicle; compression ratios were relatively low. The 1970s and '80s saw an increased interest in improved fuel economy which brought in a return to smaller V-6 and four-cylinder layouts, with as many as five valves per cylinder to improve efficiency.

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