TYPES OF ENGINES

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ABSTRACT

This work make a study of different types of engines. Vehicle engines are usually divided into several types like internal combustion engine drive mechanism, electric motor drive and hybrid drive. We can analyse what type of engines are more advantageous economically and the one that can reduce de pollution.

Keywords: engines, combustion, motor, pollution, study.

1.INTRODUCTION

The most important for the drive vehicle components are engine (including intake and exhaust stroke), engine cooling, energy storage, speed-torque converter, drive shafts, etc. Brake system, spring and damper belong to the chassis. They are of minor importance for the drive.

The engines of the vehicle usually divide into many types: internal combustion engine drive, electric motor drive and hybrid drive.

2.INTERNAL COMBUSTION ENGINE

Many drive concepts use an internal combustion engine. In an internal combustion engine, the fuel burns in a cylinder, and the heat released is converted into mechanical energy via piston and crank mechanism. That is, the chemical energy is converted into mechanical energy. The required fuels are Petrol and Diesel. They are used in liquid form and have a large energy reserve with low volume. Common examples of internal combustion engines are the gasoline engine (spark ignited by igniting with the help of spark plugs) and the diesel engine (diesel ignite, without aids, by the high compression of the air-fuel mixture) in vehicles. The following picture is a functional description of the 4-stroke engine according to the Otto principle. There are four steps: When aspirating enters the air-fuel mixture through the injection system in the cylinder, then the air-fuel mixture is compressed in the second step by piston. By a spark at the spark plug is the Air-fuel mixture ignited. A high pressure arises in the combustion chamber and thus a large force on the piston. In the fourth step, the burned air-fuel mixture flows out.

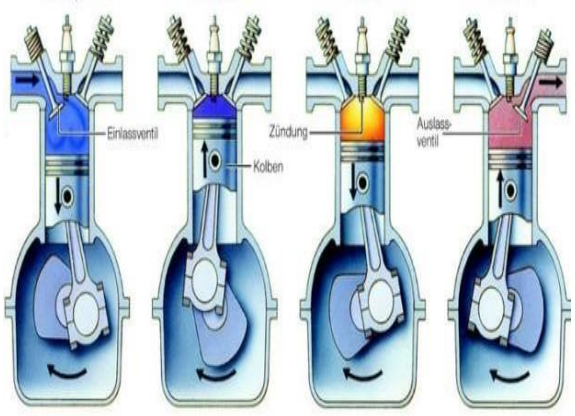


Figure 1 Operation of an internal combustion engine

An advantage of the internal combustion engine is the low volume. The liquid fuels can be transported in tanks or bottles. Another advantage is the fast operational readiness. In contrast, he has a low load capacity, and he can not start from a standstill. Indoor use is problematic, and emissions like CO_2 are also a problem for the environment.

The combustion of fuels in the internal combustion engine and the friction also generates heat. Therefore, the engine cooling is necessary. The cooling system in an internal combustion engine mainly dissipates the heat. Too high temperatures would damage the engine.

The primary cooling system used is air and water cooling. In addition, there are mostly air cooling coolers for the lubricant to keep the engine at operating temperature.

Because heat is very hard to collect and convert to other forms of energy, it is now released to the environment. This is a significant energy loss that is more than 50% of the combustion energy.

The technicians always try to improve this situation. BMW AG has developed a lot in this area. It uses a thermocouple, the so-called thermoelectric generator (TEG), in the cooling water system of the vehicle. Thermoelectricity can convert heat into electrical energy. For this purpose, two conductors made of different materials are electrically connected to each other. Between their ends, a voltage is applied, which depends on the temperature difference between the ends and the contact point. The occurrence of a voltage between two points of different temperature of a conductor is referred to as Seebeck effect.

Another direction of development is the heat lost by the exhaust gases. BMW AG is trying to invent a converter to store and use this heat. The stored heat may e.g. to serve as heating for the vehicle.

Electric Drives

By the electric motor, the electrical energy can be converted into mechanical energy. There are usually two motors in transport technology: three-phase and DC motors.

DC is constantly flowing in one direction, can be transported over long distances and can be stored in chemical energy. DC motors can control the working speed well. The use of DC motors is usually done with discontinuous conveyors.

Three-phase current is a form of alternating current that arises when there is a specific chain of three different alternating currents. Three-phase motors are available as synchronous and asynchronous motors. In transport technology, only asynchronous motors play a role, which has about 5% to 10% slip compared to the synchronous speed.

Furthermore, the electric motor can operate as a generator in braking mode and feed the battery, so that a part of the brake energy is recovered. In other concepts, the kinetic energy or mechanical energy with the aid of transducers. Flywheel converted into electrical energy.

Advantageous are environmentally friendly drives. The energy storage (battery, rechargeable battery etc.) can be used again and again. But the big problem is the energy storage: The batteries carry relatively low electronic energy and it leads to high costs.

Hybrid Drives

Hybrid drives are the combination of different drive types, they enable the change from one energy source to a second. The switching takes place without interruption of the journey, e.g. can be changed between battery electric drive for indoor use and internal combustion engine drive for outdoor use.10

In a hybrid electric vehicle, e.g. an electric motor and usually a gasoline or diesel engine, the two energy converters: An accumulator and a fuel tank or gas tank are the two energy storage. The individual motors can work together in different ways:

-Parallel: The drives act simultaneously on the part to be moved,

-Serial: Only one drive acts directly on the part to be moved. The other drive provides power that is converted and fed to the direct-acting drive.

Mixed forms are also possible.The hybrid drive thus has the following advantage: the internal combustion engine operates at operating points with higher efficiency and can be temporarily switched off.

Other Drive Types

After the primary energy source, the drive types can be subdivided further:

- thermal power drive, which can convert heat or thermal energy partially into electrical energy.
-pneumatic drive, the so-called gas expansion engine, which can provide drive energy with compressed compressed air.
- mechanical drive operated with spring or flywheel.

3.THE CHEMICAL ENERGY STORAGE IN THE INTERNAL COMBUSTION ENGINE

Direct combustion in internal combustion engines converts the chemical energy of the fuel into motive power. The oxygen in the air serves as an oxidizer. The conventional fuels in transportation technology are gasoline (also called petrol) and diesel. These are liquid fuels.

Gasoline (Petrol)

Motor gasoline is usually abbreviated as gasoline. It is a complex mixture of over 100 different, mostly light hydrocarbons. The origin of gasoline is mostly petroleum. Combustion carbon dioxide emissions are 2360 g / l, meaning that when 1 liter of gasoline is burned, 2360 g of CO_2 are released. The volume-related energy density is 8.9 kWh / l (32MJ / l): Each liter of gasoline can contain 8.9 kilowatt hours of power (3.2 * 107 joules of energy)

Gasoline is divided into the following types:

-Normal gas ROZ15 91 (not available in Switzerland, Spain, Sweden etc.)
-Super / Eurosuper RON 95 (In Switzerland: Lead Free 95)
-Super plus RON 98 (in Switzerland: unleaded or super), u.a. used in aviation (under the name MoGas).

Diesel

Diesel, also called diesel fuel or diesel oil, is a mixture of different hydrocarbons that is suitable as fuel for a diesel engine. Deviating from this, there is the specification for marine diesel or marine diesel oil.

Diesel is made from crude oil. It is largely obtained by distillation of crude oil. Diesel has several larger molecules compared to petrol, so more dust will be produced by burning the diesel.

The physical state of the diesel is liquid. The carbon dioxide emissions from burning the diesel are 2650g / l, which means that if 1 liter of diesel is burnt, 2650g CO_2 will be released. The volume-related energy density is 9.8 kWh / l (35.3 MJ / l): Each liter of diesel can contain 9.8 kilowatt hours of power (3.53 * 107 joules of energy).

Other ingredients and properties are regulated by the standard DIN EN 59018: for today's engines and downstream emission control systems, the high sulfur content is detrimental, therefore the sulfur content is limited. By 2009, it had to be reduced to 10mg / kg.

Natural gas

Natural gas is a combustible natural gas found in underground reservoirs. Natural gas consists mainly of highly flammable methane, but differs in their chemical composition. In addition to methane, natural gas also contains larger proportions of hydrocarbons: ethane, propane and butane. In normal condition, natural gas is gaseous. For easy transport, the natural gases are compressed or liquefied.

According to the composition, natural gases are classified into different types: L (low) and H (high). Natural gas H means a higher methane content (87% to 99%), while L contains methane content of 80% to 87%.

Natural gas is a non-toxic, colorless and usually odorless gas. The ignition temperature is approx. 600 ° C. To burn 1 m³ of natural gas, about 2 m³ of oxygen or 10 m³ of air are consumed.

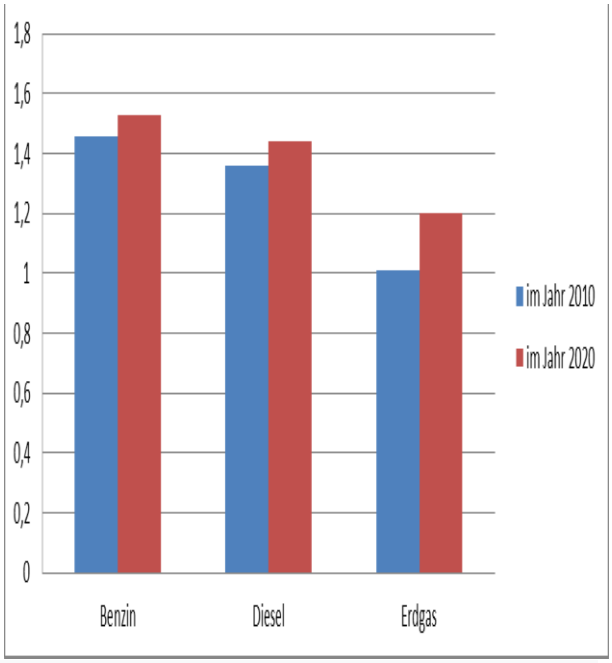
As stated above, natural gas can be changed by technical processes into other states of aggregation, so that the transport of the natural gas without pipelines is made possible.

• Compressed natural gas (CNG): compression, in pressure vessels.
• Liquefied natural gas (LNG): gas liquefaction by compression and / or cooling.

Due to the similar values of calorific value, air requirement and thus mixture calorific value as with gasoline, the conversion of vehicles with gasoline engines from gasoline to natural gas operation is largely no problem.

However, due to the infrastructure for natural gas vehicles still in development, a bivalent use of natural gas and gasoline with the same engines is common practice. At petrol stations you can find natural gas in two ways: H-gas and L-gas. Obviously, H-gas has a slightly higher energy content compared to L-gas. And the energy content of 1 kg of natural gas (H-gas) is equivalent to about 1.5 liters of gasoline or 1.33 liters of diesel.
Another advantage of natural gas is the environmental friendliness. Compared to gasoline, natural gas is relatively low in pollutants. Natural gas cars generate up to a quarter less carbon dioxide than conventional vehicles. Furthermore, one kilogram of natural gas costs on average one third less than one liter of gasoline.

Figure 2 Price change of natural gas in comparison to the gasoline and diesel until



2020 in Euro

The present statistic shows a forecast of the price development of crude oil, gasoline, diesel and natural gas from 2010 to the year 2020. The results make it clear that in 2020 the price of natural gas could average € 1.2 per liter. And the price of natural gas remains consistently cheaper than gasoline and diesel.

CONCLUSION

In contrast to the rail vehicle, the drive energy must be stored in a motor vehicle. The fuels used today for vehicle propulsion offer a high energy density, but the conventional fuels are predominantly obtained from fossil primary energy, which is limited. Therefore, other energy storage devices are being investigated.
In contrasting the storage effort, it is important to know how much storage mass and volume is needed to maintain a given mechanical energy.
Although petrol and diesel derived from crude oil can cause environmental problems, both are still the most widely used vehicle fuels. There was published articles on the comparison of gasoline and diesel, which shows that gasoline is suitable for less-drivers, while diesel is more economical for longer journeys.
Although the initial cost of a diesel vehicle is higher, it can be amortized over the term.
Diesel vehicles can pull heavier loads due to the higher energy content of the fuel that provides more power at lower engine speeds. It means that a diesel truck can accelerate quickly despite a great deal of weight which is important.
The future will be for electric drives, hydrogen drives, the one that can reduce the pollution.

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