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Opinion Article

An Overview of Internal Combustion Engine Design

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DESCRIPTION

An internal combustion engine, also called as a heat engine, it is a piece of mechanical equipment that powered by a fuel, such as gasoline, natural gas or diesel. The fuel is introduced into a chamber, mixed with oxygen, and then ignited. The explosion is utilized to generate mechanical work, either by forcefully pushing a piston or by propelling air at an incredibly high speed.

Internal combustion engines are generally classified into intermittent combustion and continuous combustion engines. Intermittent combustion engines are used for land and water vehicles like cars, motorcycles and ships. Continuous combustion engines are utilized in gas turbines, jet engines and most rocket engines.

Most industrial internal combustion (IC) engines within the low-power range, about 30 hp (horse power) or less are gasoline powered because diesel engines are too heavy. For example, during a small engine-powered water pump, a gasoline engine would account for perhaps 60% of the cost of the entire package. With diesel power, the value would be closer to 90%.

Thus, in the low-power range, the selection of engine centers largely on such factors as a choice between four and two-cycle operation and between cast-iron or aluminum construction.

Four cycle engine

The four-cycle engine is usually the preferred gasoline power plant. It has a reputation for long, trouble-free operation, idles smoothly and operates well at low speeds, does not require lubricant within the fuel, and usually does not have an exhaust with visible smoke. Small engines are normally air cooled for simplicity and weight savings.

Up to about 40 hp (horse power), four-cycle engines usually have simple L-head valve arrangements, which are less costly than an overhead cam. The overhead-cam arrangement provides more power and fuel economy and is mostly found in larger engines. Small engines use the same simple breathing mechanism found on automotive engines. More complicated fuel injection and supercharging is reserved for larger, more expensive engines and for diesels.

Above 10 hp (horse power), four-cycle engines are normally made of cast iron. With smaller engines, the buyer has a choice between cast iron and die-cast aluminum. The aluminum engine is less costly if manufactured in large quantities. Iron is claimed to wear better, but proponents of the aluminum engine say it lasts equally long if properly maintained. Iron has a greater tolerance to dirt, while dirt ingestion is quite harmful to an aluminum engine.

Automotive, marine, and aircraft engines are considerably more sophisticated than small industrial engines, and aluminum is used successfully in large engines in these applications.

Two cycle engine

A two-cycle engine puts out considerably more power than a four-cycle engine of an equivalent size. The advantage of the two-cycle in power-to-weight ratio runs from 50% to as high as 300% or more. For example, a 40-hp four-cycle engine might weigh 250 lbs. while a two-cycle engine of the same power weighs only 65 lbs. One 2-cycle engine develops 80 hp (horse power) from only 440-cc displacement.

Because of this high-power-to-weight ratio, the two-cycle engine is usually preferred for sport vehicles or where the engine must be lifted, held, or carried by hand. Power saws and most outboard marine engines are two cycle, as are most snowmobiles.

New developments during this area have automakers rethinking previous two-cycle engine concepts. One research firm found that by finely atomizing the fuel, combustion is more complete, exhaust is clean enough to dispense with the catalytic converter, and idle is more carefully controlled. In other applications, the two-cycle engine has an unfavourable reputation for rough idle, poor operation at low speeds, temperamental behaviour, and rapid fouling. Because they have a tendency to work best at high speed, they may have short service lives.

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