Internal Combustion Engine

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CHAPTER 1

Internal Combustion Engine

Learning Objectives

- Define combustion engine and internal combustion engine.
- Explain how an internal combustion engine works.
- Describe how kinetic energy from an internal combustion engine is used to turn the wheels of a car.

This race car isn’t really burning up the road. The flames were added digitally to suggest that the car is zooming down the road at a high rate of speed. A race car can move so fast because it has a powerful combustion engine.

Introducing Combustion Engines

A combustion engine is a complex machine that burns fuel to produce thermal energy and then uses the energy to do work. In a car, the engine does the work of providing kinetic energy that turns the wheels. The combustion engine in a car is a type of engine called an internal combustion engine. (Another type of combustion engine is an external combustion engine.)

How Internal Combustion Engines Work

An internal combustion engine burns fuel internally, or inside the engine. This type of engine is found not only in cars but in most other motor vehicles as well. The engine works in a series of steps, which keep repeating. You can follow the steps in the Figure 1.1.
1. A mixture of fuel and air is pulled-into a cylinder through a valve, which then closes.
2. A piston inside the cylinder moves upward, compressing the fuel-air mixture in the closed cylinder. The mixture is now under a lot of pressure and very warm.
3. A spark from a spark plug ignites the fuel-air mixture, causing it to burn explosively within the confined space of the closed cylinder.
4. The pressure of the hot gases from combustion pushes the piston downward.
5. The piston moves up again, pushing exhaust gases out of the cylinder through another valve.
6. The piston moves downward again, and the cycle repeats.

Q: The internal combustion engine converts thermal energy to another form of energy. Which form of energy is it?
A: The engine converts thermal energy to kinetic energy, or the energy of a moving object—in this case, the moving piston.

**How Energy from the Engine Turns the Wheels**

In a car, the piston in the engine is connected by the piston rod to the crankshaft. The crankshaft rotates when the piston moves up and down. The crankshaft, in turn, is connected to the driveshaft. When the crankshaft rotates, so does the driveshaft. The rotating driveshaft turns the wheels of the car.

**How Many Cylinders?**

Most cars have at least four cylinders connected to the crankshaft. Their pistons move up and down in sequence, one after the other. A powerful car may have eight pistons, and some race cars may have even more. The more cylinders
a car engine has, the more powerful its engine can be.

Summary

- A combustion engine is a complex machine that burns fuel to produce thermal energy and then uses the energy to do work. An internal combustion engine burns fuel internally, or inside the engine.
- In an internal combustion engine, a mixture of fuel and air is burned in a closed cylinder, forcing a piston to move up and down.
- In a car, the moving piston rotates a crankshaft, which turns a driveshaft. The turning driveshaft causes the wheels of the car to turn.

Review

1. What is a combustion engine? What is an internal combustion engine?
2. Explain how an internal combustion engine works.
3. Describe how kinetic energy from a car engine is used to turn the wheels of the car.

References

1. . . CC BY-NC
2. Christopher Auyeung. CK-12 Foundation . CC BY-NC 3.0