THE TWO-STROKE CYCLE ENGINE

INTRODUCTION

It should be noted that nearly all motorcycles produced today have four-stroke engines. Only a few older model motocross bikes still have two-stroke engines. In the past, two-stroke engines were the only engine configuration used for motocross bikes. However, due to stricter pollution requirements, and power delivery considerations, nearly all competition motocross bikes are being manufactured with four-stroke engines.

Because of high emissions, two-stroke engines have been banned for street motorcycles of 100cc or higher displacement since 1985.

It may seem hard to believe, but the premier motorcycle racing league in Europe, Moto GP, used to race two-stroke engines that had a V-4 cylinder configuration and 500cc displacement. These engines made power in a violent manner, and they brought plenty of excitement to the racetrack as they were not easy to ride and it was common to watch riders getting thrown off their bikes.

The 250cc and 125cc Moto GP classes also had two-stroke engines. However, the 250cc class has now been replaced with the 600cc four-stroke bikes.

FOUR-STROKE AND TWO-STROKE ENGINE DIFFERENCES

There are only 2 strokes of the piston that complete one full cycle of the two-stroke engine. The crankshaft will rotate 180 degrees for each stroke of the two-stroke engine. Thus, the crankshaft will turn 1 full revolution, or 360 degrees, in order to complete the 2 strokes, (one cycle), of the engine. Power will be produced during one full revolution of the crankshaft in the two-stroke engine.

The first main difference between the four-stroke cycle engine and the two-stroke cycle engine is that the two-stroke engine does not use valves. The intake of air-fuel mix into the cylinder, and getting the exhaust waste out of the cylinder is controlled by the piston and not valves. There is no intake

valve or exhaust valve in the two-stroke engine. The timing of the intake and exhaust function is also controlled by the piston.

Instead of using valves, the two-stroke cylinder wall has 3 ports which are basically 3 “holes” in the cylinder wall. These ports are covered and uncovered as the piston travels up and down the cylinder.

The 3 ports are described as follows.

The **intake port** allows air-fuel mix to enter the crankcase below the piston.

The **transfer port** allows air-fuel mix to travel out of the crankcase, through a “tunnel” in the cylinder wall, and into the cylinder area above the piston - the combustion chamber - where it will be compressed before being ignited.

The **exhaust port** allows the combustion waste gasses to exit the cylinder.

The second main difference between the four-stroke and two-stroke engine, is that the air-fuel mixture in the two-stroke engine first passes through the crankcase as it travels to the combustion chamber. The air-fuel mix does not go immediately into the cylinder. It first goes into the crankcase.

In the four-stroke engine, the air-fuel mix passes through the intake port, past the intake valve, and directly into the combustion chamber. There are no detours. Air-fuel mix does not travel through the crankcase in a four-stroke engine.

The third main difference between four stroke and two stroke engines is that the two-stroke engine produces power during every one revolution of the crankshaft. In contrast, it takes two revolutions of the crankshaft for the four-stroke engine to produce power.

The four-stroke engine uses four piston strokes to complete one engine cycle of intake, compression, power and exhaust. The two-stroke cycle engine uses only two piston strokes to complete one engine cycle.

The fourth main difference is that the engine oil in a two-stroke engine is mixed with the gasoline before it is poured into the fuel tank. There is no separate oiling system. The four-stroke engine contains a separate oiling system.

Fuel economy is not very good in two-stroke engines. Two-stroke engines burn fuel during every one revolution of the crankshaft. Four-stroke engines burn fuel during every two revolutions of the crankshaft. Thus, the two-stroke burns more fuel than a four-stroke engine during the same period of time – i.e. revolutions of the crankshaft. This makes for poor fuel economy.

Because the intake and exhaust events happen at the same time in the two-stroke combustion chamber, some raw unburned fuel escapes out the exhaust port and into the atmosphere. This emission of hydrocarbons results in high air pollution. For example, incomplete combustion occurs at low rpm, which results in unburned exhaust gasses emitted from the two-stroke engine. At high rpm the two-stroke engine inefficiency results in unburned fuel being pushed out of the combustion chamber.

Finally, two-stroke engines are firing every revolution of the crankshaft, and this results in an engine that runs hotter and engine parts fail much quicker than in four-stroke engines due to wear and metal fatigue from the heat.

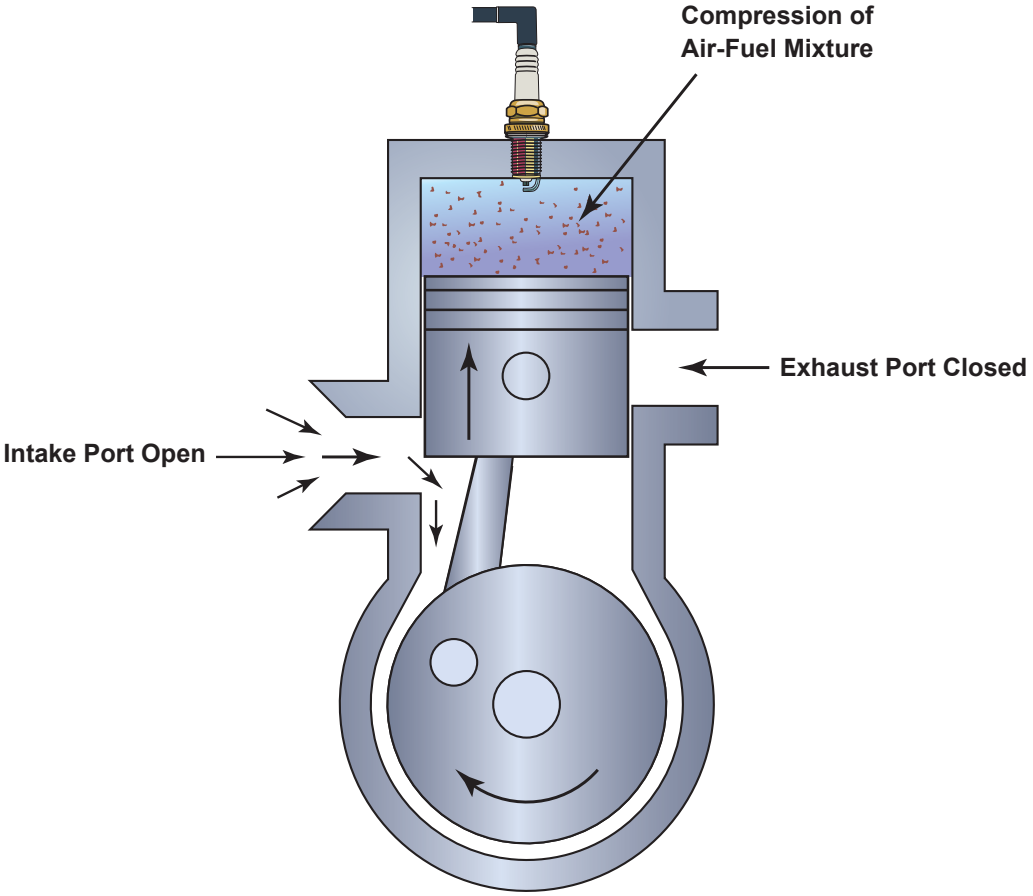
THE TWO STROKES OF THE TWO-STROKE CYCLE

The Up-Stroke of the Piston:

Three main events happen during the piston upstroke in the two-stroke engine.

1) As the piston moves up to compress the air-fuel mix, the sides of the piston cover the exhaust port and the transfer port as it travels upward. This creates a sealed combustion chamber so the air-fuel mix can be compressed.

2) In addition, as the piston moves up, the lower side of the piston uncovers the intake port. The intake port is a third “hole” in the cylinder wall. The upward movement of the piston also causes low pressure in the crankcase. This low pressure in the crankcase causes outside air-fuel mixture at atmospheric pressure to rush through the intake port and into the crankcase to fill the low-pressure area.



THE PISTON UPSTROKE – Intake and Compression Events

As the piston rises, the left side of the piston unblocks the intake port, and the vacuum created from the up-stroke draws air-fuel mix into the crankcase. As the piston continues to rise, it compresses the air-fuel mix in the combustion chamber. The right side of the piston seals off the exhaust port so the combustion chamber is sealed.