

Fundamentals of Small Gas Engines

Objectives:

Describe the four-stroke cycle engine operation and explain the purpose of each stroke

Explain the concept of valve timing

Describe two-stroke engine operation and explain the principles of two-cycle operation

List the advantages and disadvantages of two-cycle and four-cycle engines

Engine Type Jig Saw

- Each group will be assigned an engine type.
- Using the Dry-Erase board, create a “Poster” with the following:
 - Drawing of an example of your engine
 - Describe how your engine functions
 - Year that your engine was invented
 - Uses of your engine

Combustion Engine Types

External Combustion

- Separate the heat source from the source of power.
- Drives a turbine which provides power for use
- Examples: Steam & Stirling engines



Internal Combustion

- the combustion of a fuel is used to push a piston within an cylinder
- mechanical power moves the other parts of the drive train



Seven main types of internal combustion engines

- **2 stroke cycle**
- **4 stroke cycle**
- *Compression (diesel)*
- *Rotary*
- *Rocket*
- *Gas Turbine*
- *Jet*
- *Otto*

4 – Stroke Engine

Common uses of Four-Stroke

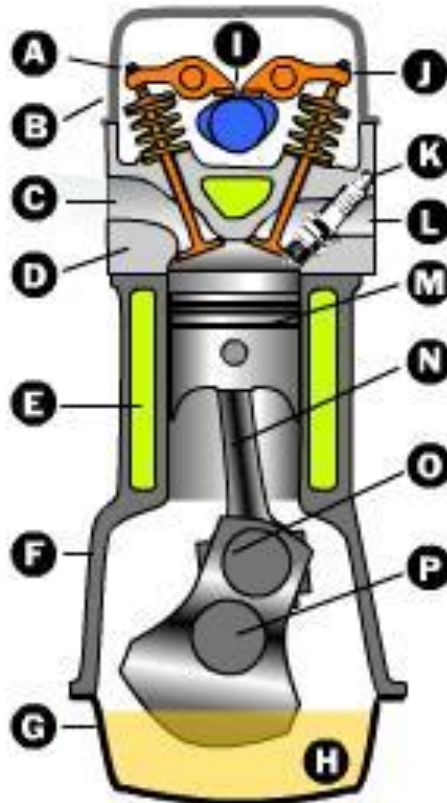
- Automobiles
- ATV's (4 wheelers)
- Snowmobiles
- Snowblowers
- Lawnmowers
- Motorcycles



The Basics

- A four-stroke engine:
 - Is an internal combustion engine
 - Converts gasoline into motion
 - Is the most common car engine type
 - Is relatively efficient
 - Is relatively inexpensive

Four-Stroke Cycle Engine Parts



A Intake Valve,
Rocker Arm
& Spring

B Valve Cover

C Intake port

D Head

E Coolant

F Engine Block

G Oil Pan

H Oil Sump

I Camshaft

J Exhaust Valve,
Rocker Arm
& Spring

K Spark Plug

L Exhaust Port

M Piston

N Connecting Rod

O Rod Bearing

P Crankshaft

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Function of Parts

- A. Intake Valve- opens at the proper time to let in air and fuel.
- B. Valve Cover- Protects the valves and the valve springs. Keeps dirt out and lubricating oil in.
- C. Intake Port- the passageway in a cylinder head for the fuel and air to pass through.
- D. Head- a platform containing most of the parts of the combustion chamber.
- E. Coolant- circulating water and antifreeze to keep the temperature regulated.
- F. Engine Block- cast in one piece. The basis for most of the parts of the engine.

Function of Parts

- G. Oil Pan- where the oil is collected and recirculated.
- H. Oil Sump- the collected oil primarily for lubricating the crankshaft and rod bearing
- I. Camshaft- a round shaft with lobes, that rotates to open and close the fuel and exhaust valves.
- J. Exhaust Valve- open at the proper time to release the exhaust
- K. Spark Plug- a device, inserted into the combustion chamber for firing an electrical spark to ignite air-fuel mixture
- L. Exhaust Port- the passageway in a cylinder head, for the exhaust to pass through

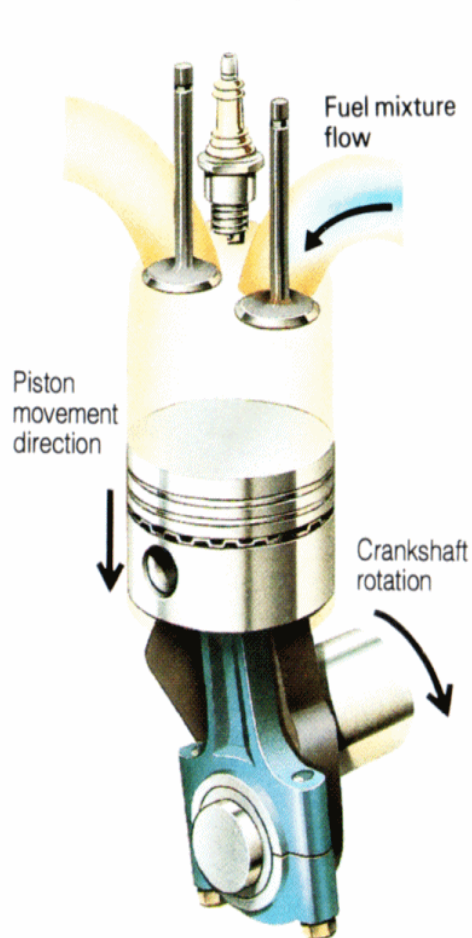
Function of Parts

- M. Piston- the part of the engine that moves up and down in the cylinder converting the gasoline into motion
- N. Connecting Rod- links the piston to the crankshaft.
- O. Rod Bearing- used to reduce friction to the rod and crankshaft
- P. Crankshaft- converts the up and down motion of the piston into a turning, or rotating motion

How does a 4 stroke engine work?

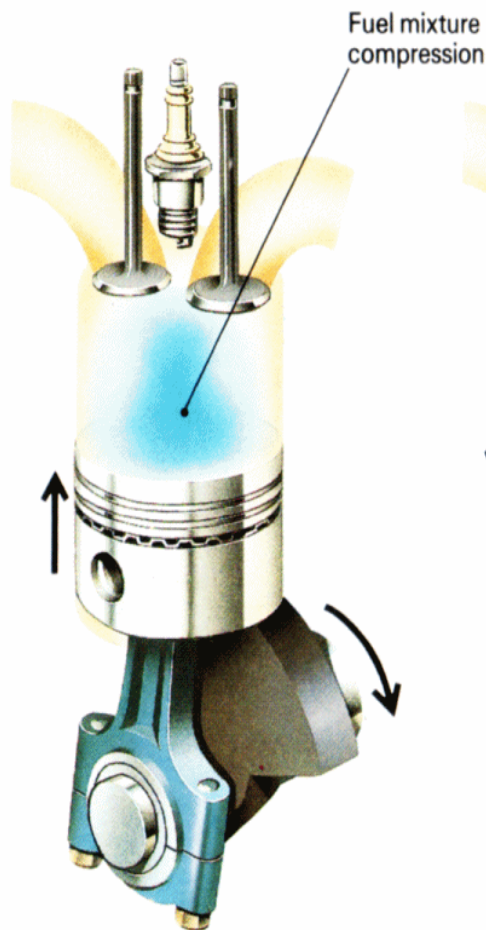
- <http://youtu.be/SYd40qWQ9Bc>

The four-stroke cycle



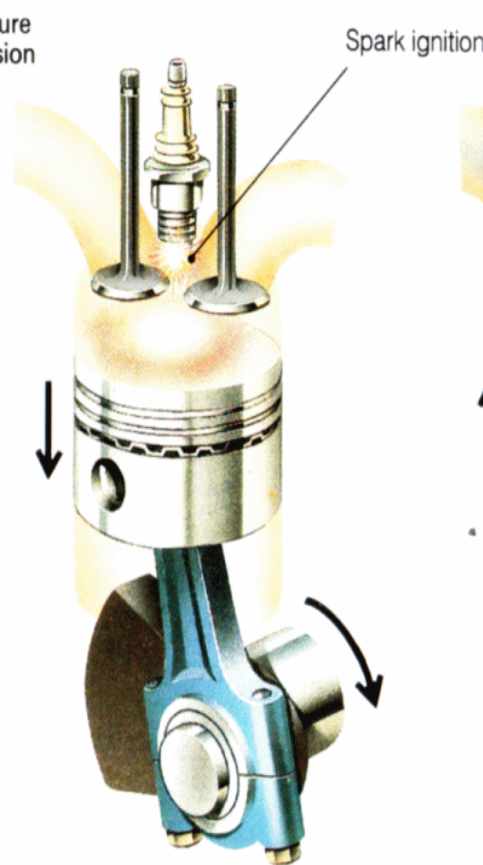
On the induction stroke the piston is descending, the inlet valve is fully open and the exhaust valve closed.

INTAKE



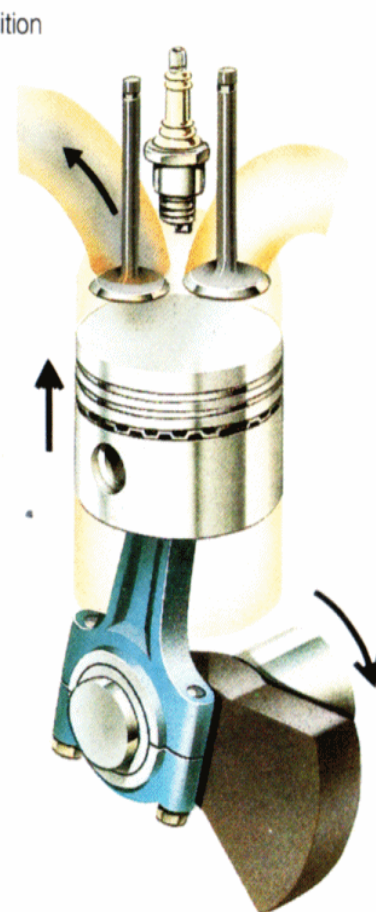
As the piston rises on its compression stroke the exhaust valve is still closed and the inlet valve is closing.

COMPRESSION



The power stroke drives the piston downwards as the ignited gases expand. Both the inlet and exhaust valves are closed.

POWER



The hot gases in the cylinder escape through the open exhaust valve as the piston rises again for the exhaust stroke.

EXHAUST

Four-Stroke Cycles

- These four strokes require two revolutions of the crankshaft. The process continuously repeats itself during the operation of the engine.
- Thus the engine only fires once every four strokes or every second time the piston reaches the top of its travel.

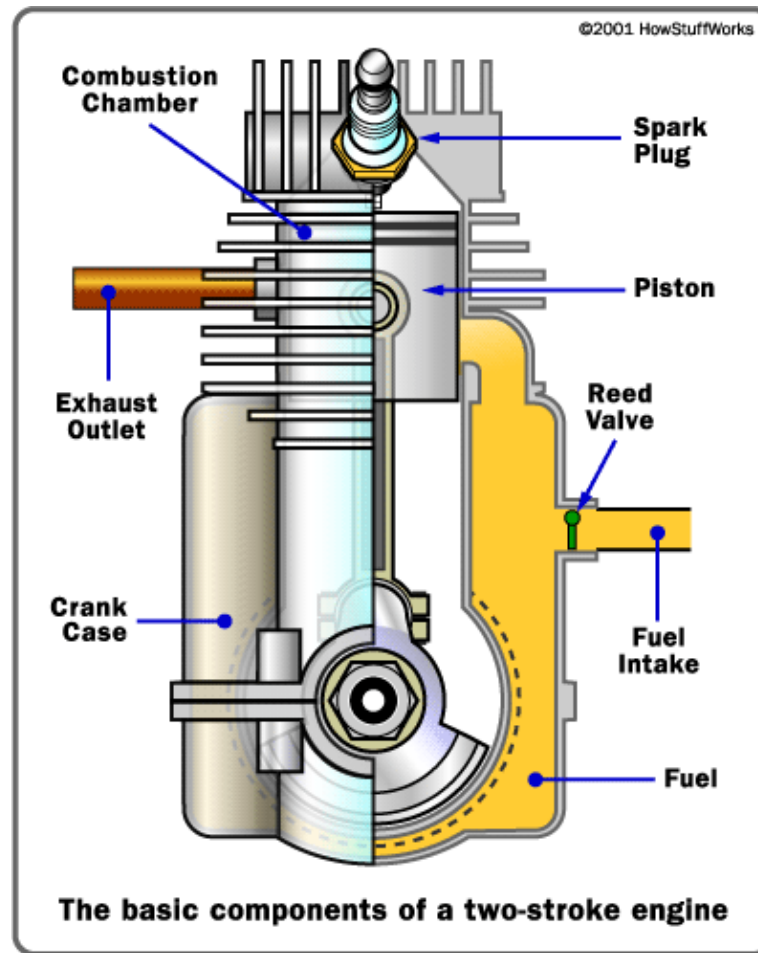
2 – Stroke Engines

Common uses of Two-Stroke

- Chain saws
- Lawn cutters
- Snowmobiles
- Outboard motors
- Dirt bikes



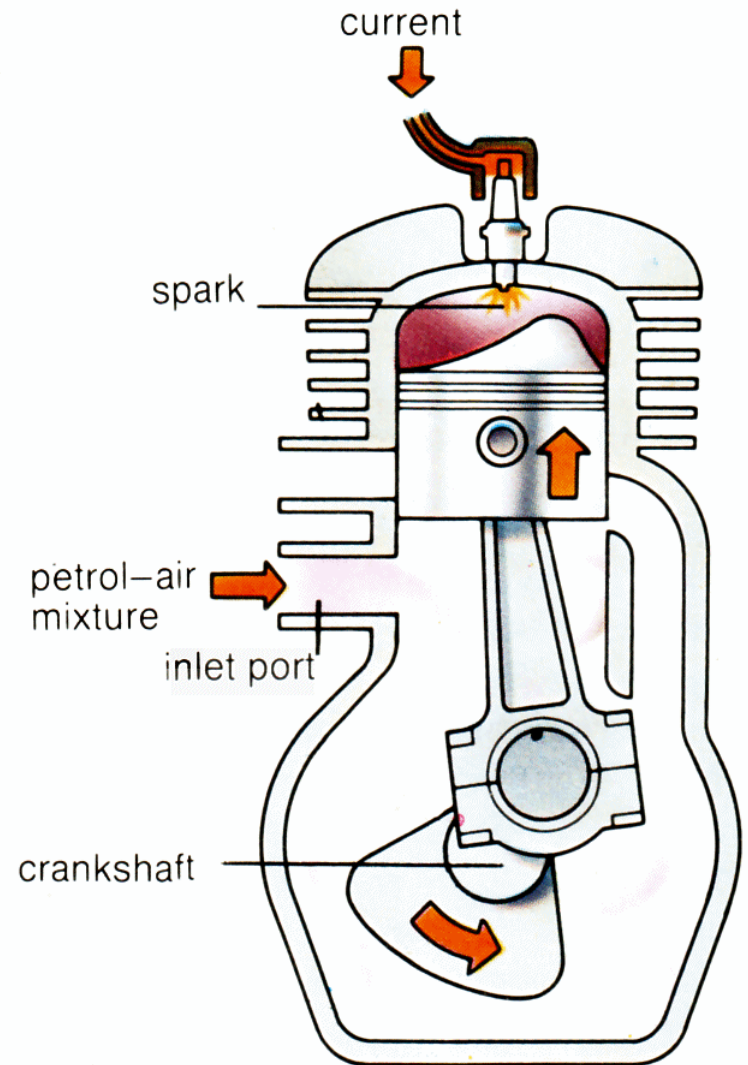
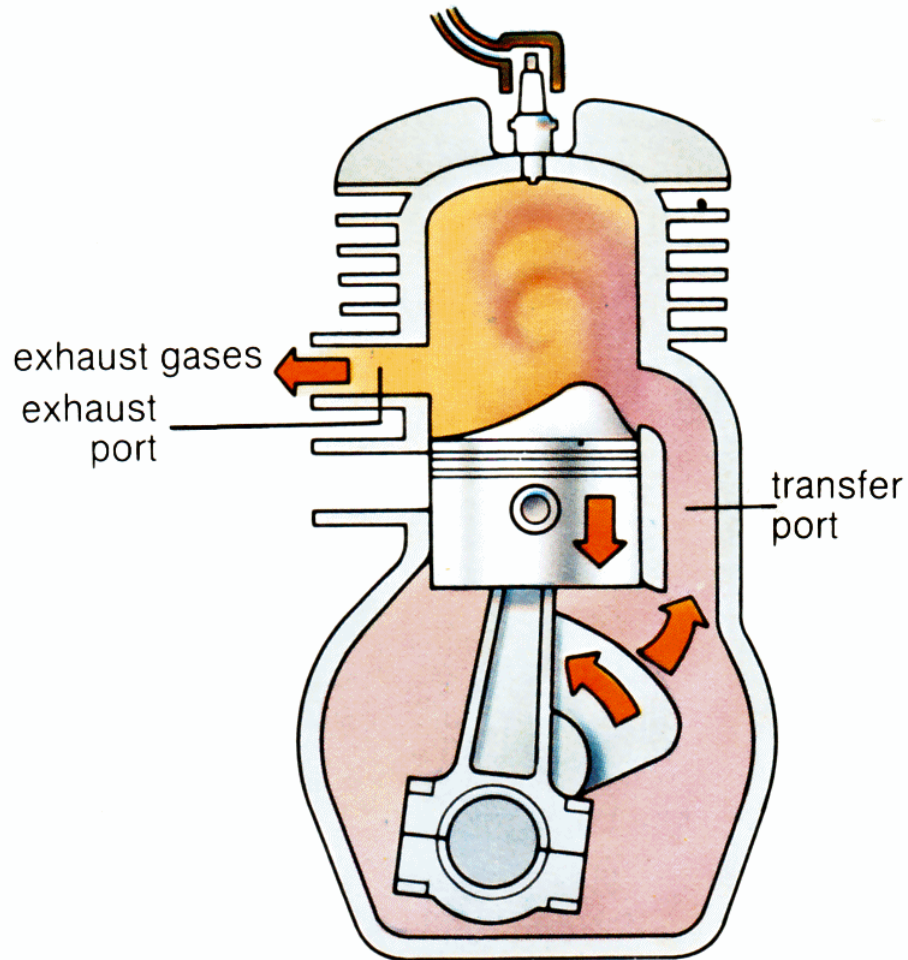
Parts of a Two Stroke Engine



How do 2 stroke engines work?

- <http://youtu.be/LuCUmQ9FxMU>

2 stroke engine



Stroke	Piston Direction	Actions Occurring during This Stroke	Explanation
Stroke 1	Piston travels up the cylinder barrel	Induction & Compression	As the Piston travels up the barrel, fresh fuel/air mix is sucked into the crankcase (bottom of the engine) & the fuel/air mix in the cylinder (top of the engine) is compressed ready for ignition
Stroke 2	Piston travels down the cylinder barrel	Ignition & Exhaust	The spark plug ignites the fuel/air mix in the cylinder, the resulting explosion pushes the piston back down to the bottom of the cylinder, as the piston travels down, the transfer port openings are exposed & the fresh fuel/air mix is sucked from the crankcase into the cylinder. As the fresh fuel/air mix is drawn into the cylinder, it forces the spent exhaust gases out through the exhaust port.

2 – Stroke vs. 4 - Stroke

Comparison

2-Stroke vs. 4-Stroke Engines

- <http://youtu.be/hV3LImCslpo>
- As you watch the video clip, list the Pros and Cons for each type of engine