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Course: Agricultural Mechanics

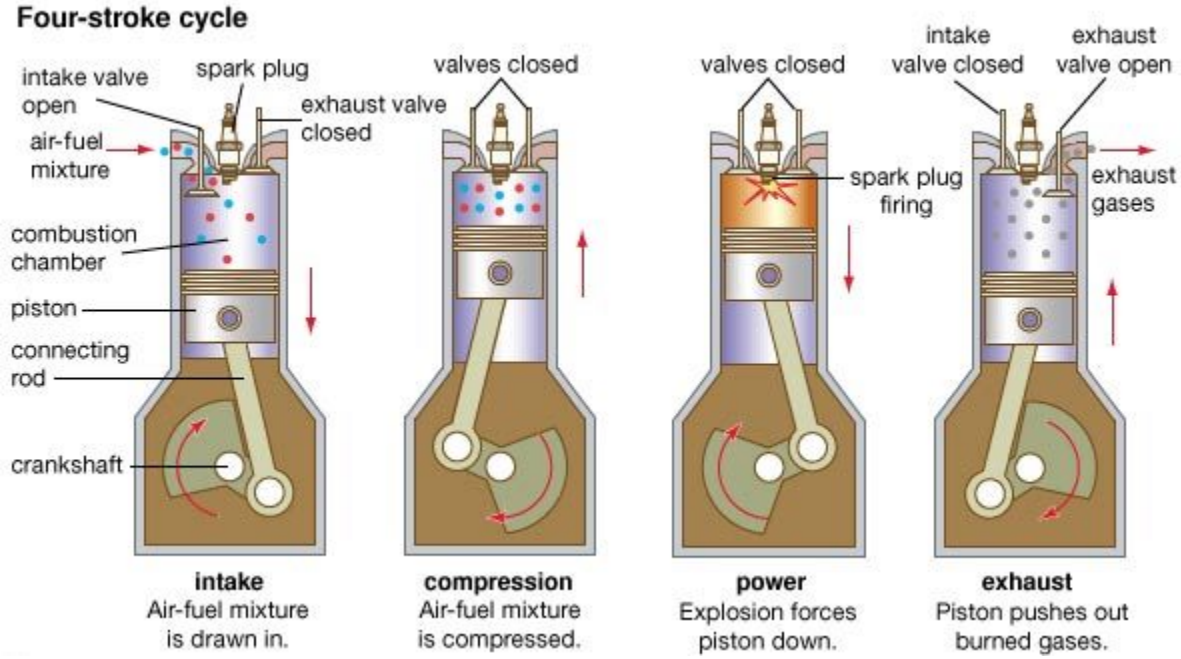
Unit Title: Small Gas Engines

Materials: Engine blocks

I. **Lesson Title**
   a. Intake, Compression, Power, Exhaust!
II. **Situation**
   a. This is an Agricultural Mechanics class that has just finished up their previous unit. They are now beginning on the 4-stroke small gas engines. Students may have some to a lot of knowledge about the 4-stroke engine. Students should be in 9^{th}- 12^{th} grade.
III. **Teachers Objectives**
   a. Identify parts of the 4-stroke engine through hands on learning with 85% accuracy.
   b. Describe the difference between the 2 and 4 stroke engines through hands on learning with 90% accuracy,
   c. Demonstrate disassembly and reassembly of small engines through hands on learning with 80% accuracy.
IV. **Teaching Procedures**
   a. **Interest approach**
      In many of our daily activities, around our homes and community, we use equipment powered by small gas engines. What are a few of these items and how can you, the student, benefit from acquiring adequate knowledge & skills for maintaining and repair of these engines.
   b. **Reasons to Learn**
      i. Why is it important to understand the parts of a 4-stroke engine?
      ii. Why should we know how to assemble and disassemble?
   c. **Questions to Answer**
      i. What is the correct way to assemble and disassemble a 4-stroke engine?
      ii. What are the 4-strokes to a 4-stroke engine?
   d. **Answers to Questions**
      i. In the most basic form, an engine consist of a cylinder, piston(s), connecting rod, and crankshaft.
         1. Cylinder: the bore in which the piston travels
         2. Piston: an engine part that slides back and forth in a cylinder and creates reciprocating (up and down) motion during the combustion process.
         3. Connecting rod: an engine part that links a piston to the crankshaft
         4. Crankshaft: an engine part that converts reciprocating motion created by the engine pistons to rotating motion
      ii. For the engine to run properly, it is important the correct sequence occurs
         1. Intake: the cylinder must be filled with a flammable mixture of air and fuel
            a. Piston moves downward

b. Intake valve open
c. Gas is entering the cylinder

2. Compression: the mixture of air and fuel must e compressed into a smaller space and then ignited by a spark
   a. Piston moves upward
   b. Both valves closed
   c. Gas is being compressed
3. Power: once the air and fuel mixture is ignited the, force of the expanding, burning mixture can be used for power production
   a. Spark plug ignites gas, driving the piston downwards
   b. Both valves closed
   c. Drives the engines
4. Exhaust: the burned mixture must be removed from the cylinder
   a. Piston is moving upward
   b. Exhausted valve is open
   c. Piston drives burnt fuel out of the cylinder



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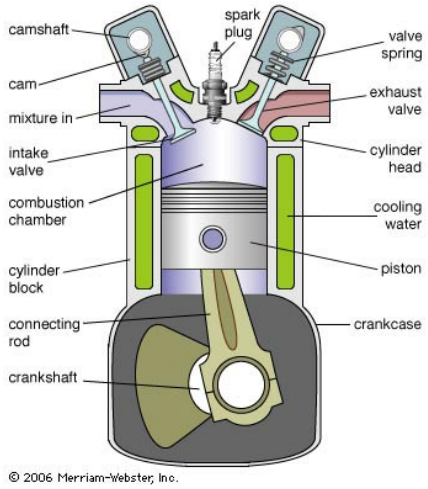
iii. Engine components

1. The main structural component of the engine is the *engine block*.
   a. This provides support for all the other components and houses some internal parts of the engine
2. The lower part of the engine block houses the crankshaft, and is referred as the crankcase

    a. The crankcase provides support for the crankshaft and camshaft. It also serves as the oil reservoir for lubrication of moving
3. On top of the engine block sits the cylinder head.
    a. The cylinder head seals the combustion chamber. On gasoline engines, it also houses the spark plug, which is used to ignite compressed air and fuel mixture.
4. The piston is a cylindrical engine part that fits into the cylinder and moves from top dead center (TDC) to bottom dead center (BDC) and back again (reciprocating motion) as the engine runs
5. The piston is connected to the crankshaft by the connecting rod
6. The piston, with the aid of piston rings, seals the piston to the walls of the cylinder to make a tight fit
7. The piston is attached to the connecting rod by a wrist pin. A wrist pin is a short length of tubular steel that slides into a hole in the side of the piston through a bearing in the small end of the connecting rod, and into a hole on the other side of the piston
8. The other end of the connecting rod, the larger end, connects to the crankshaft
    a. The connecting rod connects the piston to an offset journal on the crankshaft, enabling the reciprocating (back and forth) movement of the piston to be converted to rotating motion of the crankshaft
9. Attached on the other end of the crankshaft is the flywheel. The flywheel can be made out of cast iron, alloy, or aluminum. Depending on the type or style of engine, the flywheel can also house magnets that help generate electricity for the ignition system and electrical accessories.



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Disassemble and Reassemble a 4 Cycle Engine

The following links will take you to videos and other materials on assembling a 4 stroke engine.

https://www.youtube.com/watch?v=d_Pt1TNwM20

https://www.youtube.com/watch?v=h9mSlcV07UU

http://www.indianmcinfo.com/Indian_stuff/pdfs/Lesson/4strokeenginestopendnbr14.pdf

As the instructor, show the students the correct way to disassemble and reassemble a 4 stroke engine. Then let the students practice on their own!

I. **Testing Solution Through Application**
   a. **Students will disassemble and assemble 4 stroke engines.**
   b. **Evaluate students using the rubric:**

0 – No attempt to complete task. (Disassembly / reassembly)
1 – ½ of task completed in attempt.
2 – Task completed with parts left over.
3 - Task completed, engine starts but needs adjustment.
4 – Task completed, engine starts no further adjustments needed.

II. **Closure**
   a. What is the correct way to assemble and disassemble a 4-stroke engine?
   b. What are the 4-strokes to a 4-stroke engine?